SCIT

School of Computing and Information Technology

Faculty of Engineering & Information Sciences

CSCI321 - Project

Topic Code: CSIT-20-S3-07

Project Topic: Financial Market Simulator

Project Proposal

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The Project Sponsor has authorized the project and has agreed that it be initialized

Project Sponsor	Project Manager
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Content Page

1. Executive Summary

This project will develop application software that provide beginners to the stock market a financial market simulator called MarketForStarters. This application will have basic financial market simulator features such as Stock Price Simulation, Virtual Trading Platform, Personal Trading Portfolio and Market Watchlist. Furthermore, this simulator will have added unique features of Beginner Friendly Interface, Education on the Impacts of Major Historical Events, and Key Financial information that will allow beginners to make an informed decision when buying or selling stocks. These unique features will position the application to compete with exiting players, such as Wall Street Survivor, HowTheMarketWorks and MarketWatch.

This is an application originally targeted at newcomers to the Stock Market. This project team will start with the companies listed in Strait Times Index (STI 30). This idea was conceived due to an opportunity that arose from the surge of new active accounts in the Singapore Stock Exchange (SGX).

On the front end, the simulator will be using HTML, CSS, JavaScript and Tableau. On the back end, it will be using PHP, Python, and MySQL. This simulator will be developed using the Waterfall methodology, which is a sequential process.

In addition to presenting the proposed solution, this Project Proposal will also include the project Vision, Goals, Project Deliverables and Timelines, Project Organization, Development Methodology, Change Management Risk and Issues and Critical Success Factors.

2. Project Background

2.1. Project Objectives

Learning Objectives

- To develop project management and report writing management skills
- To have a practical experience in building a full-fledge application
- To apply our technical knowledge in real-life situations

Product Objectives

- To provide a learning platform for users to buy/ sell stocks with virtual money
- To provide a beginner-friendly user interface
- To provide stocks' fundamental data that enable users to make more informed decisions

2.2. Problem Description

Stock traders have to beat the market in order to make profit. The fact that the stock market consists of many products (i.e. shares, options, ETFs, etc.) makes it hard for beginners to start. To top it off, there are several uncertain factors that determine their price movement, such as supply and demand, internal organization decisions, political environment, natural disasters, etc.

People who are risk-averse would thus tend to avoid the stock market all together. This is one of the reasons why a financial market simulator exists. A financial market simulator provides a platform for users to trade with virtual money but with real time updated stock prices. The platform provides a virtual environment for anyone to trade without the risk of losing real money. It allows them to practice and improve their trading techniques, thus building confidence in the process.

2.3. Market Research on Demand for Financial Market Simulators

With the presence of the internet, more people are entering the financial market as a source of income. Our research shows that the top 3 existing stock market simulators are Wall Street Survivor, HowTheMarketWorks, and MarketWatch.

As of now, Wall Street Survivor has more than 150,000[1] active users yearly with about 15,000[2] new registrations monthly. HowTheMarketWorks has more than 400,000[1] active users yearly with about 50,000[2] new registrations monthly. MarketWatch have an estimate of more than 400,000[3] active users yearly, with an estimate of more than 50,000[3] new registrations monthly. The relationship between the total number of active users and new registrations from the above market simulators shows that there is a demand for financial market simulators.

More recently, due to COVID-19 outbreak, the Singapore Exchange (SGX) market saw a surge in unique trading accounts participating in the market. The number of active users nearly doubled, from 60,000[4] in Dec-2019 to 150,000[5] in Jun-2020. This shows that there is an increased number of beginners in the stock market, that adds to the existing huge demand for stock market simulators.

Listed below is a list of the common and unique features for each platform:

Features	**Wall Street Survivor**	**HowTheMarketWorks**	**MarketWatch**
Buy/ sell shares	✔	✔	✔
Watchlist	✔	✔	✔
Portfolio	✔	✔	✔
Order history	✔	✔	✔
Show popular stocks	✔	✔	✔
Courses about financial market	✔	✔	
Beginner friendly interface			

[1] Stock-Trak, 2020. [online] Content.stocktrak.com. Available at: <https://content.stocktrak.com/> [Accessed 6 August 2020].

[2] Stock-Trak, 2020. [online] Content.stocktrak.com. Available at: <https://content.stocktrak.com/advertise-with-us/> [Accessed 6 August 2020].

[3] WolframAlpha, 2020. *Marketwatch.Com - Wolfram|Alpha*. [online] Wolframalpha.com. Available at: <https://www.wolframalpha.com/input/?i=marketwatch.com> [Accessed 6 August 2020].

[4] SGX, 2019. *SGX Monthly Market Statistics Report Dec 2019_FA2*. [ebook] SGX, p.24. Available at: <https://api2.sgx.com/sites/default/files/2020-01/SGX%20Monthly%20Market%20Statistics%20Report%20Dec%202019_FA2.pdf> [Accessed 4 August 2020].

[5] SGX, 2020. *SGX Monthly Market Statistics Report June 2020_FA_0*. [ebook] SGX, p.24. Available at: <https://api2.sgx.com/sites/default/files/2020-07/SGX%20Monthly%20Market%20Statistics%20Report%20June%202020_FA_0.pdf> [Accessed 4 August 2020].

Features	Wall Street Survivor	HowTheMarketWorks	MarketWatch
Financial ratios			
Charts that stocks reacting to world events			

Details of the extensive features for each platform can be found at Appendix A while complete comparison can be found in Appendix B.

The common features allows users to trade shares on a virtual platform, review their portfolio and order history, and keep track of potential market opportunities by adding them into their watchlist. The platform also provides courses to learn about the financial market. However, their user interface is complicated, and this can be seen from the overwhelming number of tabs and drop-down options from the website shown below.

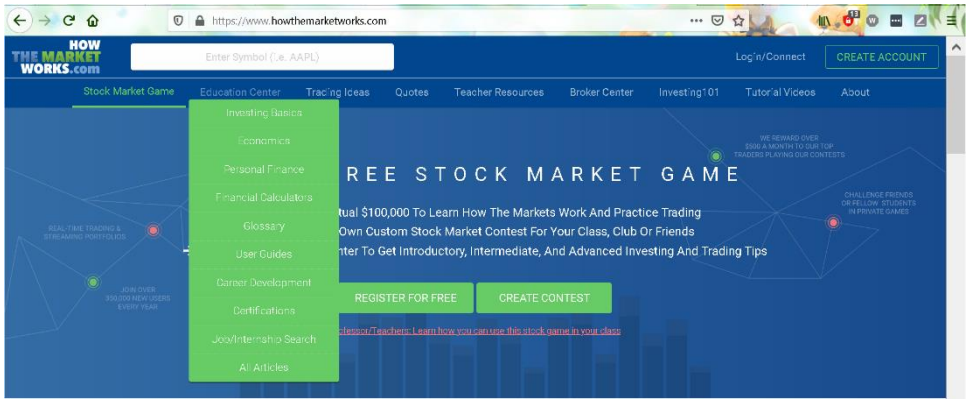

Figure 1: Complex User-Interface at HowTheMarketWorks

Our proposed platform intends to resolve this issue by removing the extensive learning courses and introducing key financial ratios and historical charts that reacts to world events to make more informed decisions.

2.4. Technical Research on Technologies for Financial Market Simulators

We have identified and researched that the following technologies required for our product are mature and readily available:

2.4.1 Front-end

User interface solutions: HTML, CSS, JavaScript

HTML and CSS are the core building components of a web user interface. They will provide structures and visual components for users to see. They will be built into pages that our users will access and interact with. JavaScript will provide the capability to power general user interactivity and communicate to the API.

Key features:

1. Used and developed worldwide
2. No significant competitors

Data representation solutions: Tableau

Tableau will help users to visualize the stock market prices, in this case candle charts that will be updated based on data that the back end will supply.

Key features:

1. Can accommodate a huge amount of data
2. Robust security
3. Support several data sources

2.4.2 Back-end

Back-end solutions: PHP

PHP is a server side scripting language required to format the data that is required by the front-end and communicate it to the API for the front-end to receive.

Key features:

1. Simple
2. Open source
3. Flexibility

Data gathering and processing solutions: Python

Python will be used to get the components required such as the stock price, valuation, balance sheet and etc with the use of a library named BeautifulSoup. BeautifulSoup is a Python library for pulling data out of HTML and XML files.

Key features:

1. Open Source
2. Scalable

Database solutions: MySQL

MySQL is going to be used as the database to store information such as credentials. It is an open-source relational database management system (RDBMS).

Key features:

1. Scalable to 8tb of data
2. A very fast database language
3. Low memory leakage problems

2.4.3 Hosting and Payment

Server solutions: Domain

A domain from DOT TK called www.marketforstarters.tk is going to be used as the project domain

Key features:

1. Free to use

Server solutions: Payment Gateway

We will be using stripe. It is integrated in the PHP code of the back-end complemented with front-end payment form using HTML,CSS and Javascript.

Key features:

1. Accepts payment from all over the world
2. Comes with payment fraud detection system
3. Embedded with auto currency conversion

Server solutions: Digital ocean

We will be using Digital Ocean Droplet, a Linux-based cloud server to host web services such as Apache, PHPmyAdmin, MariaDB etc.

Key features:

1. Hosted in Solid State Drives
2. Comes with DNS management
3. Affordable price range

3. Project Proposal

3.1. Vision & Goals

As the stock market is a huge space where everyone is given the chance to earn some living, the ultimate vision for this project is to allow people from all walks of life to familiarize themselves with the stock market. We hope that one day they can make a profit with the real-life stock market.

The goals for this project are:

1. To provide a simulated environment for users to experience of stock trading with real-time data
2. To provide a learning environment to the newcomers to experience failure without incurring real monetary losses
3. To provide newcomers with some knowledge about what to look out for when buying or selling stocks

3.2. Proposed Solutions to Problems Identified

Below is a comparison of the features of MarketForStarters (our simulator) to other simulators existing in the market:

Comparison of features of Stock Market Simulators							
	Stock Price Simulation	Virtual Trading Platform	Personal Trading Portfolio	Market Watchlist	Beginner Friendly Interface	Education on the Impacts of Major Historical Events	Key Financial Information
Wall Street Survivor	Yes	Yes	Yes	Yes	No	No	No
How The Market Works	Yes	Yes	Yes	Yes	No	No	No
Market Watch	Yes	Yes	Yes	Yes	No	No	No
MarketFor Starters (Our Simulator)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

All existing financial market simulators come with basic features that are required to simulate stock trading. However, there is not enough guidance on how to use these features on the simulators. Hence, they are more suitable for people who are knowledgeable about the stock market. Our financial market simulator comes with additional features that make it easier for beginners to start trading stocks in the simulator.

3.3. Product Features/Functionalities

1. **Stock Price Simulation**
   A candle chart that will simulate the movement of the stock prices will be displayed and updated live every 30-40 minutes**.**

2. **Virtual Trading Platform**
   Every user will have a user account and will be provided with S$100,000 in virtual cash. They can buy or sell stocks using this virtual money.

3. **Personal Trading Portfolio**
   This feature will list down all the stocks or other products that have been purchased, complete with the amount of lots purchased, the total price of purchase, potential earning and loss; and current market valuation.

4. **Market Watchlist**
   Users get to favorite and track whichever stocks they are interested in.

5. **Beginner Friendly Interface**
   The simulator will present a friendly user interface where complicated words can be mouseover to display their meaning. If the word needs more explanation, a link to the glossary will be provided.

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6. **Education on the Impacts of Major Historical Events**
   Major historical events can affect stock prices to scale up or plummet. There will be a learning page that features a summary of such events. It will show stock prices a month before and after the event took place. This serves as a comparison for the users.

7. **Key Financial Information**
   When the user clicks on a particular stock that they want to view, the simulator brings them to the page with the stock chart. Users will be able to see the 6 important ratios of the stock with a click of a button.

Our simulator will follow the Singapore Exchange (SGX) operation time which allows local users to transact in a normal working operation time.

3.4. Project Deliverables and Timelines

Financial Market Simulator

MarketforStarters
FYP-20-S3-09

Project Start: Sat, 4/7/2020

TASK	ASSIGNED TO	PROGRESS	START	END
Project Initiation			4/7/20	8/8/20
Develop Literature Review			4/7/20	25/7/20
Develop Project Proposal			4/7/20	25/7/20
Develop Project Requirement			25/7/20	8/8/20
Develop Project Website			4/7/20	25/7/20
Submission of Documents			8/8/20	8/8/20
Project Design & Execution			9/8/20	18/9/20
Software Design			9/8/20	10/9/20
Database Design			9/8/20	10/9/20
Develop Product Prototype			9/8/20	17/9/20
Prototype Presentation and Submission			18/9/20	18/9/20
Porject Implementation & Testing			19/9/20	31/10/20
Develop Test Plan			19/7/20	24/7/20
Develop System Test Case / Log			25/7/20	29/7/20
Develop User Manual			30/7/20	4/8/20
Project Delivery			1/11/20	21/11/20
Finalize Website			1/11/20	21/11/20
Project Submission			21/11/20	21/11/20
Project Presentation			21/11/20	21/11/20
Develop Project Progress Report			4/7/20	21/11/20
Reflective Diary - Weekly (Individual)			4/7/20	21/11/20

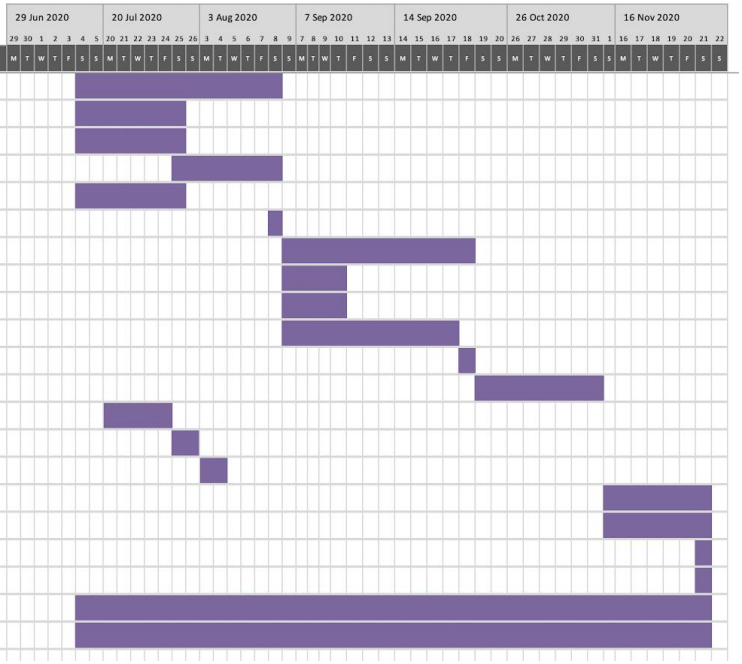


Figure 2: Project Timeline with Gantt Chart

3.5. Project Organization

The proposed project organization comprises the following roles:

Roles	Responsibilities
Project Sponsor	● Provide resources and overcome barriers for the project ● Provide input into project scope and other documents
Project Manager	● Assumes the role of a Product owner and Scrum Master ● Ensures the team is working towards its goals and remains on track for project delivery ● Manages the project, its risks and financial performance
BPR/Change Facilitator	● Creates agenda and determines activities to meet the meeting objective ● Provides implementation support
Product Design Team Leader	● Coordinates with technical team to meet the user requirements/needs ● Controls and manages all digital design activities for the best user experience ● Authorizes the implementation of new application features
Technical Team Leader	● Translates user needs to technical requirement for the software developers ● Establishes a technical vision in the team ● Resolves technical disagreements ● Manages the technical quality of team deliverables
Quality Assurance Team Leader	● Ensures that the software meets the business requirements ● Guard the software from bugs, errors and possibly security issues

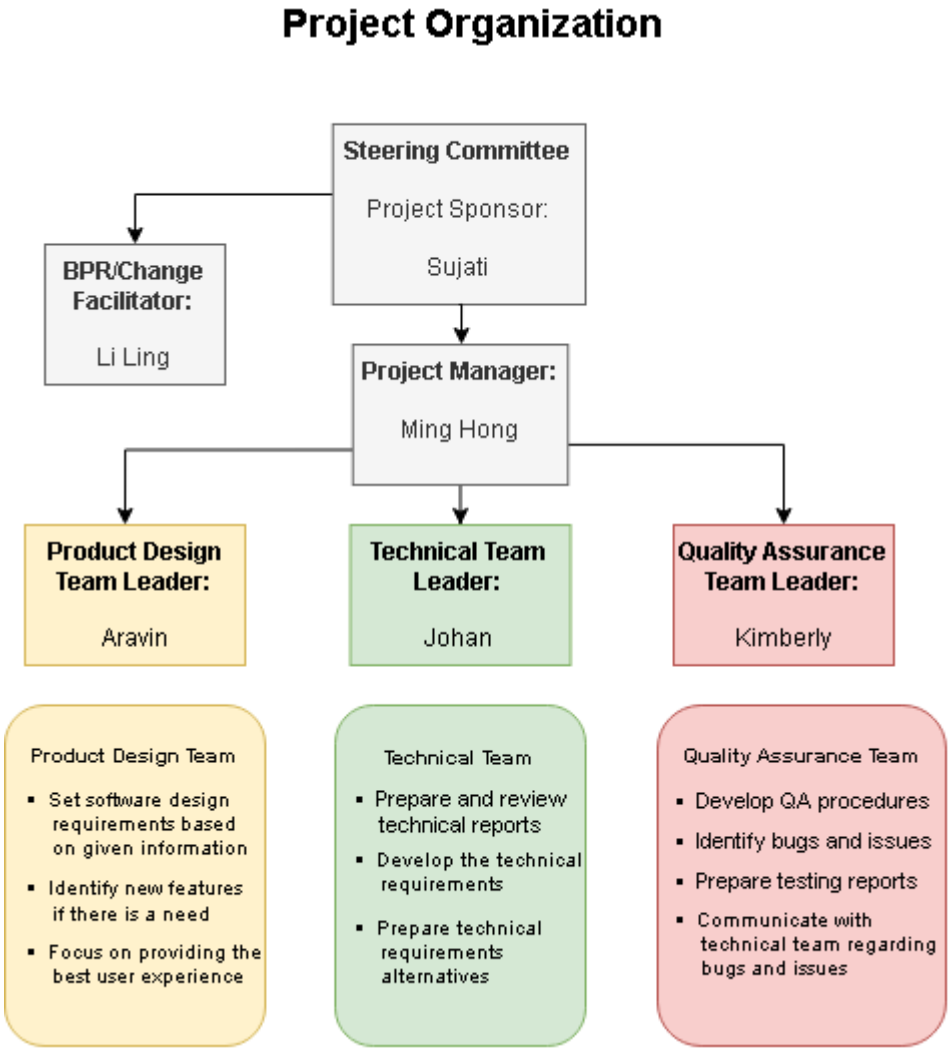


Figure 3: Project Organisation Chart

3.6. Development Methodology

The software development methodology that our team will be adopting would be the waterfall model. Waterfall model is a sequential process, where each phase must be completed before the next phase can commence.

We have chosen the waterfall model because it allows developers to know the full scope of work in advance and is more efficient in terms of progression due to the clearly defined phases.

1. Requirement Gathering and Analysis

We will come up with a Requirement Specification document where we gather what this project requires and have it endorsed by the User Requirement Team Leader, making sure that the project requirements have been agreed upon by both the user and technical teams, before we move on to system design.

2. System Design

Using the approved Requirement Specification, we will be defining the technical specifications such as the programming languages for developing the website, data layers, interfaces and architecture of the system design, as well as the hardware requirements.

3. Integration and Testing

The system will be integrated from the development of small programs called units, whereby each of the unit is developed and tested for its functionality.

4. Implementation

Programmers will assimilate the requirements and specifications that were specified in the prior stages to create a functional product.

5. Deployment of System

Once the implementation phase is completed, the finalized product will be deployed to a live environment.

6. Maintenance

Due to regular usage of the product by users, support and maintenance is required to keep the product functional and up-to-date. Therefore, there is a need to release patches to address these issues. Better versions will also be released to enhance the product.

3.7. Change Management Plan

To provide for and manage unforeseen market and technological changes, change management plan comprises the following:

1. Change Management Role

All changes will have to be approved by the user team leader, Kimberly, and/or technical team leader, Johan, for technical requests. Project members and project clients can request for any changes to be made. The change facilitator, LiLing will then review the request before submitting the change request form to the user team leader and/or technical team leader.

2. Project Change Request Form

The change request form will consist of the name of the requester, description and reason for changes, impact of the change, proposed action for it as well as status of the request form. Please see Appendix C for the form.

3. Change Management Log

The change management log is used to help keep track of the project change requests so that the change requests can be easily prioritized, addressed and referenced later. Please see Appendix D for the log.

4. After Project Review

All members in the team will take a step back after the end of the project to evaluate the successes and failures as well as identifying the process changes for the next step, which is a part of continuous improvements of change management for the project.

3.8. Project Returns and Risk

3.8.1. Project Returns

The Project will require one-off development budget of $21,782 and annual maintenance budget of $31,792 in first year to $31,792 in the fifth year. The Project will generate revenue from subscription and advertising fees, which is estimated to be $26,000 in the first year to $1,261,000 in the fifth year.

The Project's Net Present Value (NPV) is estimated to be about $1,918,316, as shown in table below.

Net Present Value (NPV)						
Year	**0**	**1**	**2**	**3**	**4**	**5**
Discount factor	1.000	0.962	0.925	0.890	0.856	0.824
Revenue	-	26,000	126,850	337,500	701,150	1,261,000
Cost	21,782	31,792	31,792	31,792	31,792	31,792
Net Cashflow	- 21,782	-5,702	95,058	305,708	669,358	1,229,208
PV of Cashflow	- 21,782	-5,927	87,928	272,080	572,970	1,012,867
Net PV	**1,918,136**					

The assumptions made for the calculations above:

1. Cost of capital is 5% of the cost of borrowing from bank
2. Inflation rate is 1% resulting in cost increase
3. Project will last 5 years for redevelopment needs in later years

The following fees and charges for the above:

1. Subscription fee S$5 per month
2. Payment processing fee 3.4% + S$0.50[6]
3. Advertising fee based on the number of pixels used

Graph on the growth of customers and revenue per year is in Appendix E. The details of the project cost breakdown are in Appendix F.

[6] Stripe. (2020). Pricing & fees. Retrieved August 04, 2020, from https://stripe.com/en-sg/pricing

3.8.2. Project Risks

No	Risk	Description	Risk Rating	Risk Mitigation Plan
1	Schedule risk	Every software project is different. Therefore, this makes it difficult to estimate and schedule the development time of the project.	Medium	Hold regular meetings to ensure everyone is on track with progress.
2	Requirements change	New requirements and features are discovered later in the project life cycle. This may threaten the estimated deadline and increase the cost needed to complete the project.	Medium	Hold a prioritisation meeting about new features with key stakeholders. The meeting would discuss the trade-off, and time and cost estimates.
3	Specifications breakdown	The product specifications may not be complete or have conflicting requirements for the developer to work on.	Medium	Assigned Johan with the final say on the product specifications to resolve conflicting arguments.
4	Productivity problems	The long lifespan of projects makes it tough for developers to work productively consistently. Time lost cannot be gotten back.	Medium	Work in short iterations, so that there will be a constant sense of urgency in the team.
5	Operational risk	The responsibilities among team members might not be clear from the start. Thus, this may impede the speed of work.	Medium	Hold regular meetings to enable team members to know the work required from them and clarify concerns.
6	People differences	We just got to know one another and have our own approach to getting work done. Thus, this may cost us time when deciding on which idea to adopt before every collaborative work.	Low	Understand team members by talking things out early. Get to know what best works for everyone. Come to an agreement on the collaborative method, such as working platform, software, and time and place for meetings and

No	Risk	Description	Risk Rating	Risk Mitigation Plan
				discussions.
7	Competency gap	Team members may not have the experience and skill set required of his/her role.	Low	Share learning materials with one another to learn the core skill set needed for the role.

3.9. Critical Success Factors

The team has identified factors that determine the success of the project

1. **Careful planning**

   Every individual in the team comes with different skill sets and schedules. The project came with a limited and short time to complete. Thus,the project has to be planned and divided into sets of tasks that can be delegated according to each individual member equally and adjust the workload to fit in the schedule.

2. **Individual competency**

   To develop an outstanding and complex system, a certain degree of software development skill is required. Each of us is equipped with different skill sets which may complement each other and help develop the project best.

3. **Strong team bond and communication**

   When the project is divided into parts that each individual tackles with his or her own skillset, there is a need for good communications as all the parts are integrated. Thus, good communication and a strong team bond will tackle this project successfully.

4. **Hardware capability**

   This project is a software (web) development project. Thus, the hardware (i.e. laptops or PC) capability is a strong determinant on this project. There are prerequisites from certain software that we are using. Hence, our hardware needs to match the requirements. If higher specifications of hardware are used, the faster the project can progress.

Appendices

Appendix A

Features Comparison among Financial Market Simulators

Features	**Wall Street Survivor**	**HowTheMarketWorks**	**MarketWatch**	**Our Product**
Buy/ sell shares	✔	✔	✔	✔
Short Selling	✔	✔	✔	
Margin trading	✔	✔	✔	
Option trading	✔			
Day trading		✔		
Limit orders			✔	
Stop loss			✔	
Partial shares			✔	
Watchlist	✔	✔	✔	✔
Portfolio	✔	✔	✔	✔
Order history	✔	✔	✔	✔
Show popular stocks	✔	✔	✔	✔
Courses about financial market	✔	✔		
Financial calculator		✔		
Beginner friendly interface				✔
Financial ratios				✔
Charts that stocks reacting to world events				✔

Appendix B

Details on Other Financial Platform Differences

2.3.1 Wall Street Survivor

Wall Street Survivor aims to reach out to the general public that is interested to learn about the financial market.

The three main advantages are:

1. Trading strategy
    a. Unique trading strategies include option trading
2. Build-in learning course
    a. To learn more about investing and the financial market
3. Chat system
    a. To come up with better investment strategies

2.3.2 HowTheMarketWorks

HowTheMarketWorks aims to reach out to students taking finance classes to learn about the financial market. Similar to Wall Street Survivor, they are under the same parent company, Stock-Frak Family. Therefore, they offer similar features like the learning courses.

The three main advantages are:

1. Trading strategy
    a. Unique trading strategies include day trading
2. Extensive learning material
    a. Learning courses to learn investing
    b. Glossary to learn the terminologies
    c. Financial calculator to make investing decisions
3. Designated learning for teacher-students
    a. Available materials for teachers to educate students

2.3.3 MarketWatch

MarketWatch aims to reach out to the more experienced general public that is also interested to learn about the financial market.

The three main advantages are:

1. Trading strategy
    a. Unique trading strategies include limit orders, stop loss and partial shares
2. Articles and analysis
    a. To help investors make tough decisions
3. Chat system

a. To come up with better investment strategies

As of now, Wall Street Survivor has more than 150,000 active users yearly with about 15,000 new registrations monthly. HowTheMarketWorks has more than 400,000 active users yearly with about 50,000 new registrations monthly. MarketWatch has more than 300,000 active users yearly, with an estimate of 30,000 new registrations monthly, given the relationship between the total number of active users and new registrations from the above market simulators. This shows that there is a demand for financial market simulators.

Appendix C

Project Change Request Form

Project Name	Name of project		
Requested By	Name of requester	**Date**	Date request was raised
Request No.	Request number	**Name of Request**	Brief name of request
Change Description	Description of the change		
Change Reason	Give the justification for the change		
Impact of Change	Specify the impact of the change in terms of cost impact, budget impact, schedule impact, and impact on other projects.		
Proposed Action	Does the project manager propose this change is accepted/rejected and why.		
Status	**In Review**	**Approved**	**Rejected**
Approval Date	The date the change was approved or rejected		
Approval By	Who approved the change (project manager)		

Appendix D

Template of Change Management Log

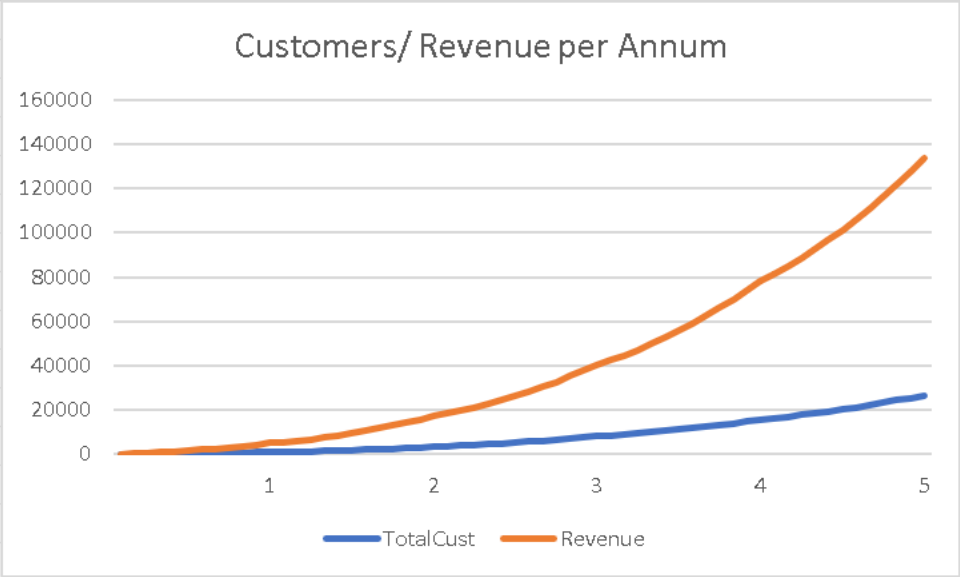
CHANGE MANAGEMENT LOG TEMPLATE

PROJECT NAME		PROJECT MANAGER		LAST UPDATED	
ORGANIZATION		DATE CREATED		VERSION NO.	
PROJECT DESCRIPTION					

ID NUMBER	OWNER NAME	ESTIMATED COMPLETION DATE	ACTUAL COMPLETION DATE	ESCALATION REQUIRED	DESCRIPTION OF REQUESTED CHANGE	STEPS REQUIRED	IMPACT SUMMARY	FINAL OUTCOME & RATIONALE	CHANGE REQUESTED BY	DATE OF REQUEST	CHANGE TYPE	CURRENT STATUS	PRIORITY

Appendix E

Graph on Growth of Customers and Revenue per Annum



Appendix F

Project Cost Breakdown

Project Cost			
Type	**Quantity**	**Cost per unit**	**Total cost**
One-time cost (Development stage)			
Website domain (marketforstarters.tk)	1	Free[7]	Free
Computer	5	S$1,700.00	S$8,500.00
Software • MySQL, WAMP	5	Free[8]	Free
Development cost	25 man-month	S$500 per month	S$12,500.00
Project web hosting	1	S$6.99 per month[9]	S$34.95
Database hosting	1	S$15.00 per month[10]	S$75.00
Internet connection (300 Mbps)	5	S$26.90 per month[11]	S$672.50
		Total starting cost	**S$21,781.95**

[7] .tk, 2020. *Dot TK - Find A New FREE Domain*. [online] Dot.tk. Available at: <http://www.dot.tk/en/index.html?lang=en> [Accessed 4 August 2020].

[8] MySQL, 2020. *Mysql :: Mysql Downloads*. [online] Mysql.com. Available at: <https://www.mysql.com/downloads/> [Accessed 4 August 2020].

WampServer, 2020. *Wampserver*. [online] WampServer. Available at: <https://www.wampserver.com/en/> [Accessed 4 August 2020].

[9] Hosting, S., 2020. *Web Hosting Crafted For Top Website Performance & Speed*. [online] Siteground.com. Available at: <https://www.siteground.com/web-hosting.htm> [Accessed 4 August 2020].

[10] DigitalOcean, 2020. *Managed Databases MYSQL*. [online] Digitalocean.com. Available at: <https://www.digitalocean.com/products/managed-databases-mysql/> [Accessed 4 August 2020].

[11] W, 2020. *300Mbps Plan - Broadband Singapore L Lowest-Priced 1Gbps Home Fibre Broadband In Singapore*. [online] Broadband Singapore l Lowest-Priced 1Gbps Home Fibre Broadband In Singapore. Available at: <https://www.whizcomms.com.sg/300mbps-broadband/> [Accessed 4 August 2020].

Project Cost			
Type	**Quantity**	**Cost per unit**	**Total cost**
Yearly cost (After development stage)			
Website domain renewal	1	S$13.61	S$68.04
Software maintenance cost	60 man-month	S$500 per man-month	S$30,000.00
Project web hosting	1	S$6.99 per month	S$34.95
Database hosting	1	S$15.00 per month	S$75.00
Internet connection (300 Mbps)	5	S$322.80	$1,614.00
		Total yearly cost	**S$31,791.99**

References

Corporate Finance Institute. n.d. *Three Best Stock Simulators - Learn To Trade Stocks Online*. [online] Available at: <https://corporatefinanceinstitute.com/resources/knowledge/trading-investing/three-best-stock-simulators/> [Accessed 18 July 2020].

Griffiths, M., n.d. The Top Five Software Project Risks. [online] Project Smart. Available at: <https://www.projectsmart.co.uk/top-five-software-project-risks.php> [Accessed 25 July 2020].

Hayes, A., 2019. *9 Cognitive Biases That Affect Your Business*. [online] Investopedia. Available at: <https://www.investopedia.com/articles/investing/022015/how-cognitive-bias-affects-your-business.asp> [Accessed 19 July 2020].

Hops, R., 2013. *Portfolio Wars: Me Vs The Intern - Wall Street Survivor*. [online] Wall Street Survivor. Available at: <https://blog.wallstreetsurvivor.com/2013/08/09/portfolio-wars-me-vs-the-intern/> [Accessed 17 July 2020].

ITProPortal. 2010. *Top 10 Software Development Risks*. [online] Available at: <https://www.itproportal.com/2010/06/14/top-ten-software-development-risks/> [Accessed 17 July 2020].

Lamas, S., 2020. *Is Recency Bias Swaying Your Investing Decisions?*. [online] Morningstar, Inc. Available at: <https://www.morningstar.com/articles/979322/is-recency-bias-swaying-your-investing-decisions> [Accessed 20 July 2020].

Moth, D. and Moth, D., 2012. *Site Speed: Case Studies, Tips And Tools For Improving Your Conversion Rate – Econsultancy*. [online] Econsultancy. Available at: <https://econsultancy.com/site-speed-case-studies-tips-and-tools-for-improving-your-conversion-rate/> [Accessed 19 July 2020].

Whatfix Academy. 2019. *10 Proven Change Management Models*. [online] Available at: <https://academy.whatfix.com/10-change-management-models/> [Accessed 16 July 2020].

Obaidullah, J. 2019. *NPV and Inflation*. [online] Available at: <https://xplaind.com/264707/npv-and- inflation/> [Accessed 4 August 2020]