

PROJECT PROPOSAL

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1. Glossary

Glossary	Explanation
API	Application Programming Interface
MVP	Minimum Viable Product
PI	Program Increment
R&D	Research and development course
SDA	Stock Data Analysis
UAT	User Acceptance Testing

2. Foreword

This is the proposal report for an interesting Research and Development project. This project will give an effective web site for the investors to do a lot of market activities in just one place. It will give not only the stock price but also the technical anticipated by the most state-of-the-art Artificial Intelligence and Machine Learning algorithms. Not only that, but the website will also provide the reliable stocks' new, specific instructions for the beginners and moreover. We will provide a friendly-for-user website about the Vietnam stock market for the investors with the easiest instructions for the beginner to join in Vietnam's stock market.

This document will show the potential of the project as well as the ability of the development team to meet the requirements of the customer. The document will be provided for the clients Mr. Binh and Ms. Trang and the professors are responsible for the R&D course. We would like to express our sincere thanks for the team members who joined in this project, Mr. Ngo Thai Binh and Ms. Nguyen Thi Diem Trang from Netcompany, the two professors Dr Lam Quang Vu, MSc. Petteri Kaskenpalo and our supervisor Dr. Le Thi Nhan.

3. Overview

3.1 The document

This is the project proposal document for the Stock Data Analysis (SDA) provided by Netcompany for a group of four students in the Research and Development course taught by University of Science and Auckland university of Technology.

This Stock Data Analysis (SDA) gave the initial description as project management data analysis at first. However, in the process of exchanging and interacting with the customer, the project requirements turn into stock market predictions based on available data sets. The customer wants this project to be a fixed price and fixed duration project, and the final product will be available at the end of April 2022.

The risks that could cause the lack of working progress will be identified and provided the solution of each risk with the trigger might cause them.

The skill analysis of each team member will be provided with the specific level of each skill.

The estimated budget for this project will be 3000\$ and this price will not change though all the working progress.

And this proposal is written to implement projects and solve problems for customer.

3.2 The client

Netcompany is a Danish IT consultancy headquartered in Copenhagen, Denmark. The company was founded in 2000 by André Rogaczewski, Claus Jørgensen and Carsten Gomard and since that, it has become an international company with more than 3000 staff in its offices in Denmark, United Kingdom, Norway, The Netherlands, Poland, and Vietnam.

3.3 The Problem and Solution

Netcompany has a group of investors that wants to have a website to check the stock market's information. For convenience in grasping market trends, customers want an application to view the stock market price and provide reliable news about the stock market. The website should also give the auto technology prediction in the coming hours or days without hiring stock forecasters. However, this will be a difficult problem for software developers because the stock market is complex and has many different price ranges. In addition, the stock price is always changing, and it fluctuates continuously from time to time.

The stock market is a volatile place. The cause of that fluctuation comes from many sources: market trends, investor sentiment, company's financial statements, etc. There are two ways to analyze securities: Fundamental analysis and technical analysis.

Fundamental analysis assumes that stock prices do not inevitably reflect the true intrinsic value of the underlying business. And our solution for our customers lies in the second analytical method. Technical analysis generally assumes that a stock's price reflects all available information and that prices generally move according to trends. In other words, by analyzing a stock's price history, you may be able to predict its future price behavior. If you have ever seen someone trying to identify patterns in stock charts or discussing moving averages, that's a form of technical analysis (Frankel, 2021).

The major goal of this project is to create a stock predicted website. We shall make an online website have an online stock market price list with a service for the customer registered account. Beside the main page, we also have the technical analysis chart that will predict the future trend of stock by AI algorithm. At the end of our project, we will have a web page to show the table of stock information, study pages for beginners, account protection, information about stocks pages and the charts of real price and predicted price, with some other interesting functions.

4. Scope and objectives

4.1 Project Objectives and Success Criteria

The purpose of this SDA project is to create a website that displays stock indices of a stock exchange, from which customers can refer to make decisions to buy or sell stocks. The dataset must come from a reliable source and the dataset will be obtained from the Vietnam's stock market API. We will fetch data from the API for our research and testing. Therefore, the dataset can be reliable when we finish collecting and building our website. We found some potential API such as Cafef, Vndirect API, which have a lot of stocks from some big companies. The available data will be analyzed and predicted through the application of the most suitable algorithm. Based on those predictions, along with additional information that the customer knows about, the customer can decide whether to invest in that stock or not. The business objective of this project directly assists clients in predicting stock prices in the coming hours or days.

Mutual goals for the milestones and deliverables for this project have been identified. To be successful in this SDA project, the following objectives must be met within the specified time and budget allocation:

- Complete a web app that meets the requirements within the next 6 months
- Finalize product related documents within the next 6 months
- Complete the chosen algorithm within the next 4 months.
- Create demo products within the next 4 months.
- Archive versions of the application for the next 6 months.
- Prepare all presentation materials for the next 6 months to present to stakeholders.

We will apply the appropriate algorithmic model found to predict the future by hours and days instead of predicting for months or years. The purpose of this is to reduce most of the risk of the effects of unexpected factors outside the world economic market (Wang, 2012).

Accept criteria of the Stock Data Analysis project include:

- Web app that shows charts representing stock market prices as well as with the table of the stock information.
- The algorithm can predict about 60% correctly.
- Successfully deploying web apps and functions to web browsers.
- Price chart viewing and price prediction functions can work well.
- Have an account to meet the account protection requirement of users.
- It is possible to switch back and forth between different types of shares

5. Scope

❖ Constraints

- Costs must not exceed the estimated budget.
- The final product must be released within 6 months.
- Must have a UAT version for customers to try before releasing the final version.
- The final product must satisfy the Minimum Viable Product (MVP).
- There are documents and resources that prove the predictions are reliable.

5.1 Requirements

ID	Feature	Description
1	Register account	As a customer, I'm able to register account
2	Login/Logout	As a customer, I'm able to login/logout
3	Overview page	<p>As a customer, after logged in successfully, I'm able to see the overview page:</p> <ul style="list-style-type: none"> + I can see the search button for search index + I can see the list of capitalization-weighted index of all companies listed on the stock exchange and their values (date, point, volume)). E.g.: (these indices are just an example. We will choose them depend on what dataset we can find) + VNIndex of HoSE + VN30 + HNX-Index + HNX30-Index + UPCOM + Favorite indices list: <ul style="list-style-type: none"> + If it is unavailable, display empty + I can see the information of each stock index <ul style="list-style-type: none"> + date, price, volume + I can click the index to view the chart
4	Search index	<p>As a customer, I'm able to search index</p> <ul style="list-style-type: none"> + I can search by index + I can add index search result to favorite list + I can click the index search result to view its chart
5	Index chart	<p>As a customer, I'm able to view index chart:</p> <ul style="list-style-type: none"> + I can see the list of charts that I would like to view. They are line chart (by default) & candlestick chart + I can view the index chart: <ul style="list-style-type: none"> + line chart: <ul style="list-style-type: none"> + x-axis: time unit (date or month) + y-axis: price (VND) + prediction area + When I hover to the line, I can see the popup which will display a price + I can choose to candlestick chart to view index + I can see the bar chart which will display the volume of index by time unit in the bottom

		<ul style="list-style-type: none">+ I can see the prediction volume area+ When I hover to the column, I can see the popup which will display a price+ I can do comparison by choosing other indices+ In the current chart, I can see one more line chart of the comparing index.
6	Setting reminder	<p>As a customer, I can set reminder:</p> <ul style="list-style-type: none">+ I can choose the expectation point in the prediction area in a chart+ I can create reminder by adding title, timing, content.+ I can receive the reminder via email.
7	Manage user profile	<p>As a customer, I'm able to view and update my profile:</p> <ul style="list-style-type: none">+ I can view and update username, email, avatar, password+ I can view reminder lists+ I'm able to remove a reminder in a list

Additional requirements may be added as needed, with the approval of the project sponsor, as the project progresses.

5.2 Project Deliverables

According to each PI, there will be documents that need to be completed accompanied by some parts of the overall product.

- First PI:
 - **A0100 - Analysis Report:** As the conclusion of the project clarification phase, this report serves as a consolidation of the initial requirements of Project Data Analysis. Based on the clarifying report, a high-level design and corresponding acceptance criteria are given in the design phases. Architectural model, Requirement's description, development principles, implementation perspective, technical documentation will be included in this document. Also, provide an updated project roadmap (which can be updated throughout the project), a map of identified project dependencies, and a list of initial risks and issues.
 - **O0500 - Software Architecture - Clarification Phase:** The purpose of this document is to describe the software architecture. i.e., what components are included in the solution and how the components that have been developed as part of Stock Data Analysis (SDA) are designed and developed. The document also describes the necessary architectural principles for e.g., logging, caching, security management, etc.
 - **Demo and Compare Algorithms:** Demo the learned algorithms and write a report comparing the efficiency between those algorithms.
- Second PI:
 - **D0100 - User Interface Guidelines:** The User Interface Guidelines document the styling of base elements and general HTML sections. The document also describes the design of reusable components available in Project Data Analytics.
 - **DD130 - Detailed Design:** The purpose of DD130 - Detailed Design is to develop an implementation perspective from O0500 - Software architecture and extension based on descriptions of components, classes, properties, methods, and relationships. It is also a prerequisite for giving an accurate construction estimate. Estimates should always be confirmed after detailed design is done.
 - **D0160 - User Interface Design:** The User-Interface Design documents the visual design of all pages on the Stock Data Analysis (SDA). The document also describes the components used for each page, as well as the structural layout and navigational flow.
 - **O0500 - Software Architecture**
 - **Mockup:** Mockup of the website's user interface prototype
 - **Algorithm Report:** Describe in detail the algorithm that will be applied to the data prediction
- Third PI:
 - **Manual Test Document:** Product a list of specific test case for all the website with the status fail or pass for the test and give for the developer fix and update the status on time.

- **Demo Product:** Product demo with interface as well as some main functions
- Fourth PI:
 - **Final Product:** Release the final product with all required functionalities.

6. Project methodology and Approach

6.1 Vision

To deliver deliverable products, we will research and identify the most suitable Machine Learning algorithm to predict the stock market based on collected data sets. After that, we will build a web application to represent the prediction results. The project is divided into four project increments.

6.2 Method and Approach

❖ Scrum

Scrum has been used since the early 1990s as a framework for developing, providing, and maintaining complex products. Scrum illustrates the relative effectiveness of the product management and work techniques, allowing to make improvements to the product, team, and workplace environment.

Therefore, we will apply the Scrum process to manage this SDA project. We will divide the project into four main PIs and each PI will be broken down into smaller appropriate Sprints. Before each Sprint, there will be a planning meeting to divide tasks and have weekly status reports. On average, each sprint will last about 2 weeks.

❖ Project Management

Jira will be used as a project management system for the SDA project, including task division, task assignment, and performance tracking, time tracking. Beside that, we also use Notion to draw Gantt Chart.

7. Risks Management

The following risks for the TVP project have been identified. The project manager will determine and employ the necessary risk mitigation/avoidance strategies as appropriate to minimize the likelihood of these risks: (1-lowest, 4-highest)

- **Probability:** from 1 (lowest) to 4 (highest)
- **Impact:** from 1 (lowest) to 4 (highest)
- **Risk Score:** *Probability x Impact*
- **Risk ranking:** based on risk score
 - I (1, 2): Not serious, do not need to be immediately resolved.
 - II (3, 4): Not serious, need to be immediately resolved.
 - III (6, 8, 9): Serious, do not need to be immediately resolved
 - IV (9, 12, 16): Serious, need to be immediately resolved

Risk Identification		Qualitative Rating				Risk Response	
Risk	Risk Category	Probability	Impact	Risk Score	Risk Ranking	Risk Response	Trigger
Human absence due to personal issues	Human Resources	2	3	6	III	Reschedule the tasks or assign them to another member	Team members must inform all team.
The data set is not large enough to affect the accuracy of the algorithm	Technical Accuracy	1	4	4	II	1. Change another appropriate dataset. 2. Add more data to the dataset.	The accuracy of result prediction fluctuates throughout many runs.

Poor quality of data	Technical Accuracy	2	4	8	III	1. Change to another appropriate data set. 2. Cleaning the dataset.	There are some duplicated data, or missing value.
The accuracy of the prediction algorithm is less than 60%	Technical Accuracy	2	4	8	III	Change another algorithm to test if the accuracy is higher	Throughout 5 runs, the accuracy results all less than 60%

In addition, risks related to people (conflicts, ...), technical (lack of skills, knowledge, ...), in terms of time (time consuming tasks, ...) will be resolved in Scrum retrospective at each sprint among team members.

8. Skill Analysis

8.1 Skill needs for the projects

Group	Skill Expertise	Level				
		1	2	3	4	5
Technical Skill	Coding skill			x		
	React		x			
	MongoDB		x			
	NumPy, Pandas, Matplotlib		x			
	Scikit-learn, TensorFlow	x				
Team Skill	Presentation				x	
	Research				x	
	Problem Solving				x	
	Conflict management			x		
	Time managing					x

Our team is good at presentations, research and problem solving. We are optimistic about our time management skills, too. Although we have fundamentals of coding, our skills in using Python libraries are not very good. Furthermore, we need to have domain knowledge in the stock market. Therefore, our team will improve knowledge, skills and do the tasks in the project simultaneously.

8.2 Skill matrix

Name	Role	Technical Skill						Soft Skill				
		Code	React	MongoDB	NumPy, Pandas, Matplotlib	Scikit-learn, TensorFlow	Machine Learning	Presentation	Time management	Research	Problem Solving	Conflict management
Nguyễn Bảo Nguyên	Leader, Researcher	x			x	x		x	x	x	x	x
Quách Hoàng Minh	Researcher	x			x	x	x	x	x	x	x	x
Ngô Gia Hân	Developer	x		x	x		x	x	x	x	x	
Nguyễn Vũ Anh Thư	Tester + Supported Developer	x	x					x	x		x	x
Basic	Basic level of capability											
Moderate	Intermediate level of capability											
Advantage	Advantage level of capability											

9. Summary Milestone Schedule

The project Summary Milestone Schedule is presented below. As requirements are more clearly defined this schedule may be modified. Any changes will be communicated through project status meetings by the project manager.

Project Milestone	Start Date	Due Date
Project Start	October 14 th , 2021	October 21 st , 2021
PI Planning	October 22 nd , 2021	November 12 th , 2021
First PI	November 15 th , 2021	December 31 st , 2021
Second PI	January 3 rd , 2022	January 28 th , 2022
Third PI	February 7 th , 2022	March 25 th , 2022
Final PI	March 28 th , 2022	April 30 th , 2022
Project Complete	-	April 30 th , 2022

9.1 Gantt Chart

Below is a Gantt chart showing the major tasks of the team. However, for each sprint, these tasks will be broken down accordingly and be assigned to each member.

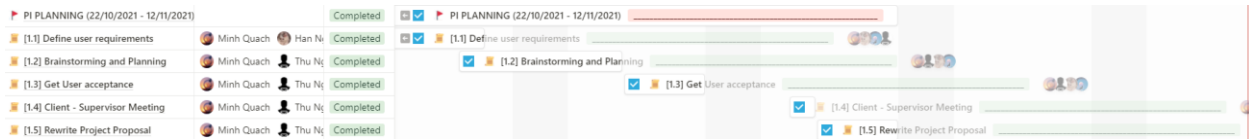


Figure 1: PI Planning from 22/10/2021 to 12/11/2021

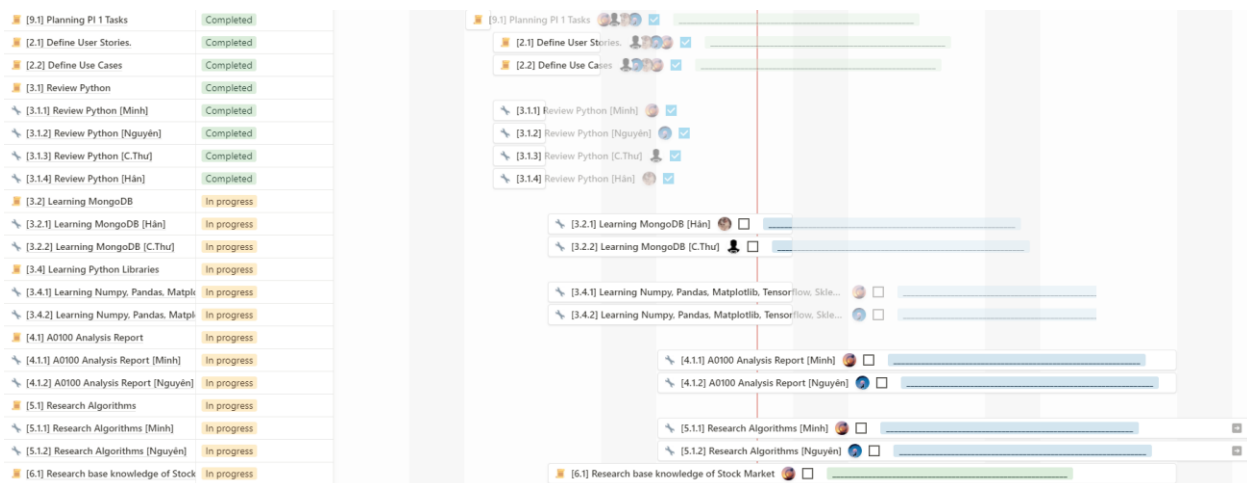


Figure 2: PI 1 from 15/11/2021 to 31/12/2021

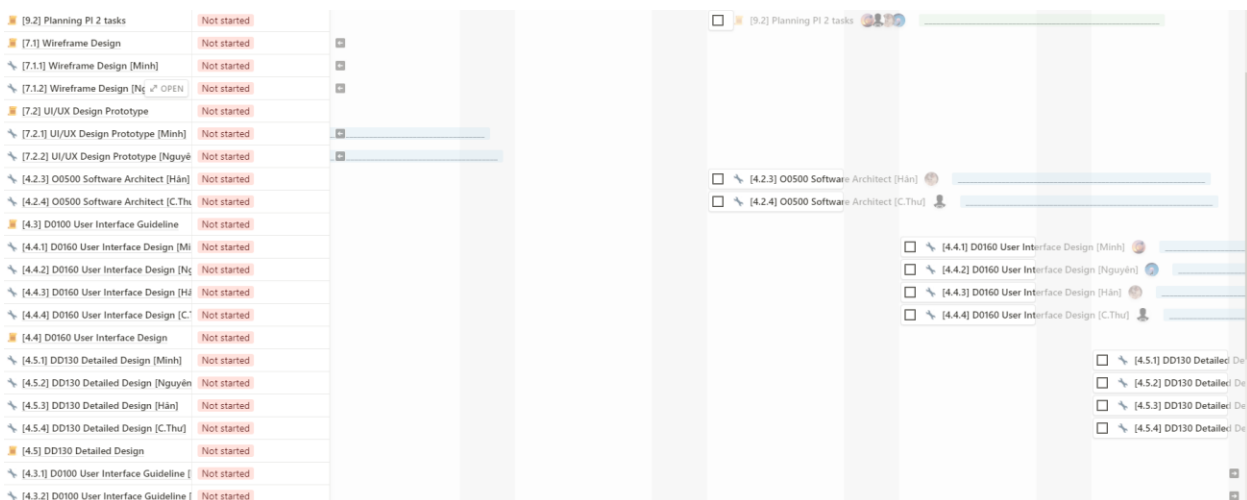


Figure Figure 3: PI 2 from 3/1/2022 to 28/2/2022

Week from 31/1/2022 to 4/2/2022 is Lunar New Year holidays

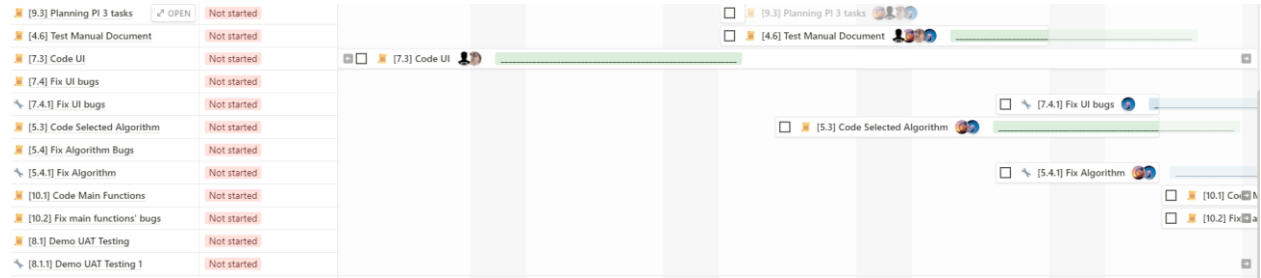


Figure 4: PI 3 from 7/3/2022 to 25/3/2022



Figure 5: PI 4 from 28/3/2022 to 30/4/2022

10. Summary Budget

Our project is a fixed cost and fixed duration project.

The following table contains a summary budget based on the planned cost components and estimated costs required for the successful completion of the project.

Project Component	Component Cost
Personnel salary	\$2,400
Traveling fee	\$96
Other (license...)	\$500
Total	\$3,000

- Number of people: 04
- Price 1 person/hour: \$2
- Time/day: 2,5 hours/day
- Personnel salary: $1200 \text{ (hours)} \times \$2 \text{ (person/hour)} = \$2,400$
 - Total Estimated time: $4 \text{ (person)} \times 2,5 \text{ (hours/day)} \times 120 \text{ (days)} = 1200 \text{ (hours)}$.
- Traveling fee: $\$2 \times 2 \text{ (every 2 weeks)} \times 6 \text{ (months)} \times 4 \text{ (person)} = \96

11. Project Approval Requirements

The complete project is defined when a product that predicts stock market trend is tested and proven to be the best solution by the accompanying research papers. Along with that, all technical and process documents are handed over to the company, the product must be fully deployed within the time and cost constraints indicated in the proposal. In addition, this successful measure needs to include instructions for using and installing the product along with a video showing the application process in action. Success will be supported by the project sponsor Netcompany, specifically the representative of Miss. Nguyen Thi Diem Trang was identified.

12. Project Manager

Ngo Thai Binh is the project manager, and he is responsible for creating main tasks and deadlines for each task. This task is given to the team leader, Nguyen Bao Nguyen. Nguyen divides the tasks into 4 PI and identifies the smaller tasks of each team member in the PI. Mr. Binh's team has four members including a team leader, business analyst, developer, and tester. After each phase of the project, the product will be delivered by Mr. Binh to the Project Owner, Nguyen Thi Diem Trang.

13. Disclaimer

Clients should note the general basis upon which the Auckland University of Technology undertakes its student projects on behalf of external sponsors:

While all due care and diligence will be expected to be taken by the students, (acting in software development, research or other IT professional capacities), and the Auckland University of Technology, and student efforts will be supervised by experienced AUT lecturers, it must be recognized that these projects are undertaken in the course of student instruction. There is therefore no guarantee that students will succeed in their efforts.

This inherently means that the client assumes a degree of risk. This is part of an arrangement, which is intended to be of mutual benefit. On completion of the project, it is hoped that the client will receive a professionally documented and soundly constructed working software application, some part thereof, or other appropriate set of IT artefacts, while the students are exposed to live external environments and problems, in a realistic project and customer context.

In consequence of the above, the students, acting in their assigned professional capacities and the Auckland University of Technology, disclaim responsibility and offer no warranty in respect of the “technology solution” or services delivered, (e.g. a “software application” and its associated documentation), both in relation to their use and results from their use.

14. References

Stock Market Data (NASDAQ, NYSE, S&P500). (n.d.). (Kaggle) Retrieved from
<https://www.kaggle.com/paultimothymooney/stock-market-data>