UTM UNIVERSITI TEKNOLOGI MALAYSIA
SCHOOL OF COMPUTING
Faculty of Engineering

Project Proposal Form MCSD 6215
Sem:…1… Session:…2024/2025…

SECTION A: Project Information.

Program Name: **Masters of Science (Data Science)**

Subject Name: **Project 1 (MCSD 6215)**

Student Name: Liew Yng Jeng

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Project Title: Empowering SMEs with Predictive Analytics for Supply Chain Planning

Supervisor 1:

Supervisor 2 / Industry Advisor(if any):

SECTION B: Project Proposal

Introduction:

In modern supply chain management, accurate sales and demand forecasting is crucial for optimizing inventory levels, ensuring product availability, and minimizing stockouts or overstocking. Small and medium-sized enterprises (SMEs) are often impacted heavily by the current market volatility and have limited resources to work with. The traditional methods are used most of the time, which relies on historical data and assumptions, leading to inefficiencies and increased costs. Hence, this project aims to apply predictive analytics to empower small and medium-sized enterprises by supplying accurate forecast sales and demand trends, optimizing supply chain processes, and facilitating data-driven decision-making.

Problem Background:

Market volatility, incomplete data, and seasonal variations are often the cause of vulnerability of small and medium-sized enterprises when faced with daunting challenges in predicting demand and supply chain management such as resource constraints and limited access to advanced forecasting tools. These uncertainties may lead to serious problems such as excess inventory, stock-outs, or increased warehousing costs, which may significantly increase customer dissatisfaction and subsequently, cause missed sales opportunities. Since the current forecasting methods may be insufficient to meet all of the challenges in this competitive market landscape, it is critical to align the supply chain processes with the actual market demand. Hence, accurate forecasting analysis and supply demand are lifesavers for companies.

Problem Statement:

Small and medium-sized enterprises often require a lot of budget and resources to calculate data effectively and accurately, especially when real-time changes and seasonal variability are required to be taken into account. The challenges imply further that when faced with a massive amount of data, the continued reliance on traditional manual forecasting methods and the lack of real-time insights could not support further in achieving the accuracy of forecast demand calculations. This will lead to inefficient supply chain operations such as unstable inventory adequacy and declining customer satisfaction, which is unconducive to the company's development. This project hopes to address this gap by exploring more advanced and cost-saving forecasting methods to help small and medium-sized enterprises better understand and respond to their sales and demand trends.

Aim of the Project:

This project aims to provide an accessible, affordable, and effective prediction analytics approach to forecast market trends and demand, helping small and medium-sized enterprises optimize inventory management, minimize stockouts and overstock, and improve overall supply chain planning.

Objectives of the Project:

I. To collect historical sales and inventory data from small and medium-sized enterprises, and preprocess it to handle missing values, outliers, and seasonality

II. To analyze the complex forecasting results into actionable insights for small and medium-sized enterprises by using Tableau and Power BI

III. To assess the performance of various forecasting models using SARIMA, LSTM, and XGBoost based on the aspect of prediction accuracy, reliability, and suitability for small and medium-sized enterprises

IV. To provide actionable recommendations to improve inventory levels and reduce supply chain inefficiencies

Scopes of the Project:

This project focuses on suitable prediction analytics approaches for small and medium-sized enterprises to emphasize sales and demand forecasting and optimize supply chain operations and inventory management. The scope covers data acquisition, model evaluation, data visualization development, and framework recommendation. Firstly, historical sales and demand data will be collected and analyzed from database websites such as Kaggle and GitHub for data preparation. Next, predictive forecasting models will be created using the Deep Learning network Long Short-Term Memory, Traditional Machine Language SARIMA model, and XGBoost Machine Learning Algorithm. Lastly, data visualization software such as Tableau and PowerBI will generate an interactive dashboard for real-time supervision and decision-making. Using existing data, this project will explore the traditional and advanced predictive analytic approaches to provide cost-saving and efficiency in supply chain planning for small and medium-sized enterprises.

Expected Contribution of the Project:

- To supply an efficient and data-driven demand forecasting approach to help small and medium-sized enterprises improve supply chain performance.
- To reduce the costs, improve customer satisfaction, and optimize inventory management through simple and practical forecasting tools suitable for small and medium-sized enterprises.
- To provide an interactive dashboard to monitor sales trends, inventory levels, and demand forecasts in real-time.

Project Requirements:

Software:	Tableau, Power BI, Python Programming, Jupyter Notebook
Hardware:	8GB RAM HP Laptop
Technology/Technique/ Methodology/Algorithm :	Extreme Gradient Boosting (XGBoost), Seasonal Autoregressive Integrated Moving Average (SARIMA), Long Short-Term Memory (LSTM)

Type of Project (Focusing on Data Science):

[ ] Data Preparation and Modeling

[/] Data Analysis and Visualization

[/] Business Intelligence and Analytics

[/] Machine Learning and Prediction

[ ] Data Science Application in the Business Domain

Status of Project:

[/] New

[ ] Continued

If continued, what is the previous title?

SECTION C: Declaration

I declare that this project is proposed by:

[/] Myself
[ ] Supervisor/Industry Advisor ( )

Student Name: Liew Yng Jeng

16 Nov 2024

Signature **Date**

SECTION D: Supervisor Acknowledgement

The Supervisor(s) shall complete this section.

I/We agree to become the supervisor(s) for this student under aforesaid proposed title.

Name of Supervisor 1: .....

....
Signature **Date**

Name of Supervisor 2 (if any): .....

....
Signature **Date**

SECTION E: Evaluation Panel Approval

The Evaluator(s) shall complete this section.

Result:

[ ] FULL APPROVAL
[ ] CONDITIONAL APPROVAL (Major)*
[ ] CONDITIONAL APPROVAL (Minor)
[ ] FAIL*

***** Student has to submit new proposal form considering the evaluators' comments.

Comments:

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Name of Evaluator 1: .....

....
Signature **Date**

Name of Evaluator 2: .....

....
Signature **Date**