UNIVERSITI TEKNOLOGI MARA

PREDICTIVE ANALYTICS FOR PRODUCT DEMAND FORECASTING BY CATEGORY AT Q MART KUALA TERENGGANU

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ABSTRACT

Q Mart Kuala Terengganu manages several retail product categories, including Food, Beverage, Household, Personal Care, and Bulk. However, its demand-planning process relied mainly on historical records, manual checking, and management experience, which may lead to inaccurate demand estimation, overstock, stock shortages, higher storage costs, and missed sales opportunities. Therefore, this project aimed to identify the current demand-planning process and related problems, implement predictive analytics for product demand forecasting by category, and visualise the results through an interactive Microsoft Power BI dashboard. The project followed the Cross-Industry Standard Process for Data Mining methodology, which consists of Business Understanding, Data Understanding, Data Preparation, Modelling, Evaluation, and Deployment. Historical sales and inventory data from 2023 and 2024 were prepared and analysed using RapidMiner. Linear Regression, Random Forest, and ARIMA were applied to forecast product demand, while Linear Regression , Random Forest and ARIMA were compared using Root Mean Squared Error, Absolute Error, Relative Error, and Squared Correlation. The results showed that Linear Regression achieved the best overall performance, with an RMSE of 1933.386, an Absolute Error of 1445.875, a Relative Error of 5.53%, a Squared Correlation of 0.986, and a Derived Forecasting Accuracy of 94.47%. The forecast results indicated that Food recorded the highest predicted demand in 2025, while December was identified as the peak-demand month. The developed Power BI dashboard presented category performance, demand forecasts, top forecasted products, detailed monthly forecasts, inventory insights, and sales performance. Expert evaluation by three evaluators confirmed that the dashboard was generally functional, understandable, organised, and useful for supporting inventory decisions. Overall, this project provides Q Mart with a more structured and data-driven approach to demand planning. Future enhancements may include real-time data integration, additional forecasting variables, confidence intervals, safety-stock calculations, reorder alerts, and stockout warnings.