SMU — SINGAPORE MANAGEMENT UNIVERSITY

ARUKI®
BRINGING HUMANITY FORWARD

SMU-X

SALES QUANTITY PREDICTION

PROJECT STATEMENT

ASPT(Singapore) Pte Limited, is an Original Equipment Manufacturer (OEM) that specialises in selling spare machinery parts such as refrigerator parts, air-conditioner parts, washing machine parts and machinery tools. Their customer base spans multiple countries, with a market presence in 64 countries. Its operations largely run on a business-to-business (B2B) model, with some walk-in sales from local retail customers in Singapore.

Aruki currently predicts their sales **based on past experiences and knowledge** on the industry and would like to **improve their sales forecasting** with a more rigorous data-driven model.

OUR APPROACH

Time series and regression models are being explored in predicting sales quantity.

Time Series:
- Simple moving average
- Error, Trend, Seasonal (ETS)
- Naive model
- Simple exponential smoothing
- ARIMA
- Prophet
- TBATS
- Holt & Holt-Winter

Regression:
- Lasso/Ridge
- XGBoost
- Stepwise Linear Regression
- Random Forest
- Ensemble

The best model chosen on the basis of the **lowest "root-mean-squared error" (RMSE)**.

MODELLING: forecast App
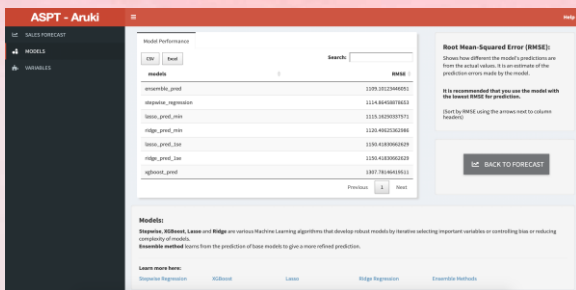
foRecast App

R Shiny app that provides client with an **interactive** and **aesthetically pleasing** interface for predicting monthly sales quantity.

The app is intuitive and is split into 3 tabs:
1. Sales Forecast
2. Model Performance
3. Variables

Sale Forecast
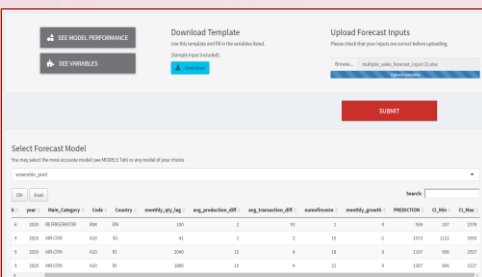- Upload of forecast input and forecast sales quantity selected preferable model

Models Performance
- Compare the RMSE results of the 7 trained models and learn more about them

Variables
- Use the variable plots to make an estimated value for your inputs in Forecast Input template

Features of foRecast

1 Multiple Entries

Variables inputs are keyed in **through Excel templates** rather than embedded input fields. This allows the app to handle submission of **multiple scenarios at once** and ensures **efficiency for clients.**
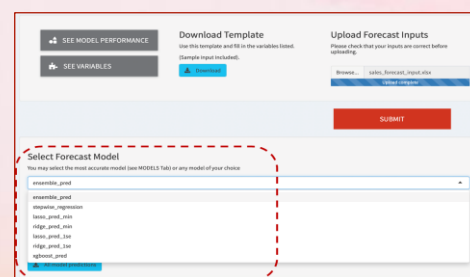
2 Sensitivity Analysis

Sensitivity analysis is incorporated into the predictions by **adjusting input** in the Excel template to **reflect their insights as business users.** As a guide, we have incorporated **95% confidence interval** on **every graphs** in the variable tab and on **our predictions.**

3 Multiple Models

Users are given the **flexibility** to choose which model to predict the sales quantity. Given that each models have different prediction value, this allow user to have **a range of the sales prediction quantity**.
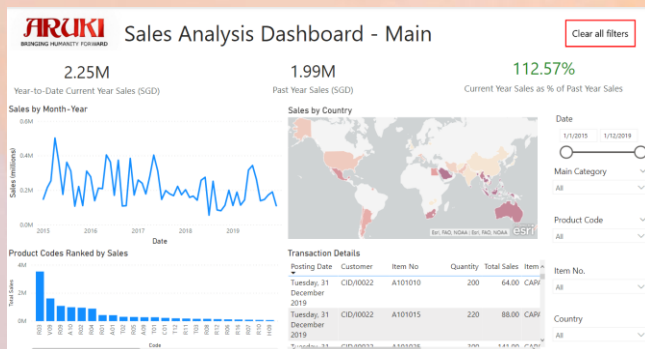
4 Automation

shinyShortcut

A **shortcut** is created **using a cmd file** so that the app can run simply with a few clicks and open up on the client's default browser instantly. This allows us to **streamline the process** of setting up the app.

POWERBI DASHBOARD

Main Dashboard
- The Main section is designed to be a **top-level analysis of sales** in Aruki with management-level personnel in mind. Therefore**, a line graph with total sales over time** is displayed prominently in this dashboard.
- As Aruki has **a global footprint**, there is also **a visual with total sales in each countr**y as well as a bar chart of top product codes .
- There are also transaction details if the manager wants **greater details**.
- The charts can be cross filtered by selecting data-points on other charts or applying filters, which is also applicable to other dashboard sections.
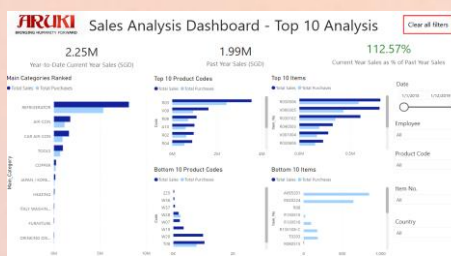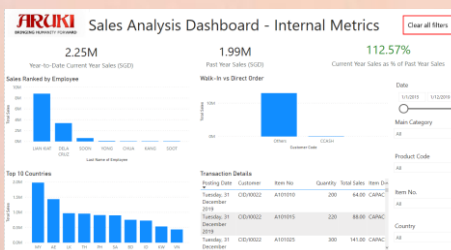
Top 10 Product Analysis Dashboard
The Top 10 Product Analysis allows for analysis of **top 10 and bottom 10** :
- Product Code
- Item Numbers

There will also be a tooltip which will enable the client to view Total Sales and Total Purchases over the past 5 years in order to assess the profitability and possible obsolescence of a particular product.

Internal KPI Dashboard
The Internal KPI dashboard provides analysis of **each employee's contribution** to sales in terms of their :
- Top 10 countries
- Ratio of direct orders to walk-in sales.

The tooltip provided will also allow for analysis **of sales over the past 5 years** overseen by each employee .Transaction details will also be included at the bottom right of the dashboard.
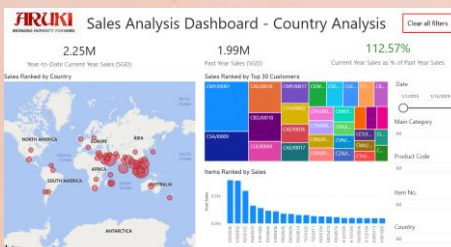
Country Analysis Dashboard
The Country Analysis dashboard provides analysis of **each country's sales** through their:
- Top 30 customers
- Top-selling item numbers

The tooltip will also have a bar chart displaying the trend of sales over the past 5 years. The largest tile on the treemap will rank customers by largest volume of sales .This will allow the client to assess demand from a particular country or customer over the past few years and adjust their marketing efforts accordingly.

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