**PHASE 2 : INNOVATION**

***PROJECT TITLE : PRODUCT SALES ANALYSIS***

Phase 2 of this project,which involves machine learning algorithms to predict future sales trends or customer behaviors can be approached as follows:

**Data Preparation**:

* Gather historical sales data, including product sales, customer information, and timestamps of transactions.

Preprocess the data to handle missing values, outliers, and format it for machine learning.

**Feature Engineering:**

* Extract relevant features from the data, such as product attributes (e.g., category, price), customer demographics, and time-related variables (e.g., day of the week, season).

**Data Split:**

* Divide the data into training and testing sets. The training set will be used to train your machine learning models, while the testing set is for evaluating their performance.

**Model Selection:**

* Choose machine learning algorithms suitable for your prediction tasks. For sales trend prediction, time series forecasting models like ARIMA, Exponential Smoothing, or machine learning models like Random Forest, Gradient Boosting, or LSTM could be considered.

For customer behavior prediction, classification or clustering algorithms like logistic regression, decision trees, k-means clustering, or neural networks can be explored.

**Training and Tuning:**

* Train your selected models on the training data and fine-tune hyperparameters to optimize their performance.

Use cross-validation techniques to ensure model robustness.

**Evaluation:**

* Assess the performance of your models using appropriate metrics (e.g., Mean Absolute Error, Root Mean Squared Error for sales prediction, or accuracy, precision, recall for customer behavior prediction).

Ensure that the models generalize well to new data.

**Incorporate Predictions:**

* Use the trained models to make predictions on future sales trends and customer behaviors.

**Visualizations:**

* Incorporate the predictions into your IBM Cognos dashboards to provide real-time insights. For instance, display forecasted sales trends, recommend marketing strategies based on predicted customer behavior, and assess the impact of these strategies on inventory management.

**Actionable Insights:**

* Use the machine learning predictions to derive actionable insights for inventory management and marketing strategies.

For instance, recommend optimal inventory levels for top-selling products during peak sales periods or suggest personalized marketing approaches for different customer segments.

**Monitoring and Iteration:**

* Continuously monitor the model performance and update them as new sales data becomes available.

Iterate on your analysis and prediction models to improve accuracy and relevance.