**Ideation Phase**

**Defining the Problem Statements**

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| **Project Name** | **FUTURE SALES PREDICTION USING DATA SCIENCE** |

**FUTURE SALES PREDICTION USING DATA SCIENCE**

**Problem Definition and Design Thinking**

**Introduction**

In today's competitive business world, knowing how much you'll sell in the future is important. We're using data science to figure this out. It's like using a crystal ball, but instead, we'll use data and fancy math. Our goal is to make a smart tool that helps companies make better decisions, save money, and do well in the market. We're going to analyze a lot of data, use cool computer tricks, and tell companies what they can expect in the future. Come with us on this journey to help businesses succeed by using data science to predict future sales**.**

we will outline the problem statement, the steps involved in solving it, and the design thinking approach that will guide our project.

**Problem Statement**

Objective: Develop a future sales prediction system to address a specific Company's challenges with demand uncertainty, enabling optimized inventory and resource allocation.

Data: We have collected historical sales data, including product details, time series, and external variables such as market conditions and promotions, for analysis and modeling.

**Key Challenges:**

1. Data Quality and Integration: Ensuring the accuracy, completeness, and consistency of diverse data sources, including sales records, external market data, and product information, can be a significant challenge.

2. Seasonality and Trends: Identifying and accounting for seasonality, trends, and other time-dependent patterns in the sales data to make accurate predictions.

3. External Factors: Incorporating and modeling external factors like economic conditions, competitor actions, and unforeseen events (e.g., natural disasters or pandemics) that can impact sales.

4. Model Complexity: Balancing model complexity with interpretability, as overly complex models can be challenging to understand and maintain.

5. Scalability: Ensuring that the predictive model can scale efficiently as the volume of data and the complexity of the business grow, without sacrificing accuracy or performance.

**Design Thinking Approach**

**Empathize:**

It involves understanding customer needs, preferences, and behavior through comprehensive data analysis. It integrates customer feedback, historical sales data, and market trends to create accurate predictive models. By leveraging advanced algorithms and machine learning, it anticipates customer demands, optimizes inventory management, and identifies growth opportunities, ultimately driving increased sales and customer satisfaction.

**Actions:**

- Create a detailed roadmap outlining your goals, strategies, and timelines to achieve your objectives effectively.

- Implement your plans with precision, utilizing the necessary resources, skills, and tools to accomplish your tasks and meet your targets.

- Continuously assess your progress, gather feedback, and adjust your actions as needed to stay on course and improve outcomes.

**Define:**

Based on understanding of customer needs deeply, developing creative data-driven solutions, and iterating predictive models to enhance sales strategies and customer engagement..

**Objectives:**

- Focus on understanding and addressing customer needs, preferences, and behaviors for more accurate sales predictions.

- Employ an agile approach to continually refine predictive models and sales strategies based on evolving data and customer feedback.

**Ideate:**

It involves brainstorming and generating innovative ideas to improve sales forecasting, customer targeting, and market strategies, fostering creative solutions through collaborative thinking and exploration.

**Actions:**

- Gather, clean, and engineer data, choose appropriate machine learning algorithms, and optimize models for accurate sales prediction.

- Enhance predictions by integrating external data sources and conducting continuous validation and scenario analysis.

- Continuously monitor and update models, gather feedback, and adapt strategies to improve sales forecasting and remain agile in a dynamic market.

**Prototype**

The prototype for future sales prediction combines a Linear Regression model utilizing historical data, customer demographics, and external variables. It extracts features like seasonality and economic indicators, delivering sales forecasts with RMSE and MAE validation. The user-friendly web interface allows date range and segmentation selection, presents sales data through graphs, provides export options, and collects user feedback, creating a dynamic, data-driven sales planning tool with continuous improvement in mind.

**Actions:**

- Build data preprocessing and modeling scripts, create a user-friendly web interface for input and real-time forecasting, and integrate the prediction model for seamless functionality.

- Assess prototype performance with a dataset subset, gather user feedback to enhance usability, and ensure scalability while providing essential documentation and training resources.

- Continuously improve the prototype based on user input and performance data, expanding its capacity for larger datasets and users, and offering training and support for optimal utilization..

**Test**

Incorporate user feedback to validate usability and model accuracy, measuring performance with metrics like RMSE. Continuously refine and adapt predictions based on feedback and market changes.

**Actions:**

- Divide the dataset into training and testing subsets to enable model evaluation.

- Train predictive models using the training data and fine-tune hyperparameters for optimal performance.

- Assess model accuracy using evaluation metrics like MAE, RMSE, and R-squared, ensuring robust predictions.

- Gather user input on the web interface, focusing on usability and prediction accuracy to drive improvements.

**Implement**

Once the prototype successfully achieves its intended objectives and garners favorable user feedback, proceed with full-scale implementation. Transition the prototype into the production environment, ensuring seamless integration into the sales forecasting process. Provide comprehensive training and support for end-users to facilitate a smooth transition and maximize the system's utility.

**Actions:**

- Train the ultimate machine learning model using the complete dataset, optimizing its predictive capabilities.

- Deploy the model within a production-ready web application, making it accessible for sales forecasting.

- Conduct rigorous testing to verify the application's robustness and user-friendliness, addressing any issues that may arise.

- Provide training and support to users to ensure effective utilization of the deployed system for future sales prediction.

**Iterate:**

Iterating in the context of future sales prediction involves a dynamic process of collecting and leveraging user feedback. This feedback informs continuous refinements in both the machine learning model and the user interface, ensuring that the system remains accurate and user-friendly. Regular updates and adjustments enable the system to stay aligned with evolving market dynamics and user expectations, enhancing its predictive capabilities over time.

**Actions:**

- Continuously monitor the model's performance and periodically retrain it with fresh data to ensure accurate sales predictions.

- Actively address user feedback, making essential enhancements to the web interface for improved usability and satisfaction.

- Keep abreast of machine learning and real estate pricing model advancements, exploring opportunities to enhance the prediction system with cutting-edge techniques and technologies.

**Conclusion**

In this document, we've outlined our comprehensive strategy for tackling future sales prediction through data science and machine learning. We've defined the scope of the problem, identified critical challenges, and presented a design thinking approach encompassing empathizing with user needs, defining clear objectives, ideating innovative solutions, prototyping, testing, implementing, and iterating.

Our overarching objective is to develop a highly accurate and user-centric solution that empowers stakeholders in the realm of sales forecasting. This tool is poised to deliver valuable insights, benefiting both businesses and consumers alike within the ever-evolving market. Through our structured approach, we aim to create a dependable resource that makes a positive impact on the sales and marketing landscape.