**Product Sales Analysis with IBM Cognos**

***Project Definition:***

The project involves using IBM Cognos to analyse sales data and extract insights about top selling products, peak sales periods, and customer preferences. The objective is to help businesses improve inventory management and marketing strategies by understanding sales trends and customer behaviour.

******

The project aims to leverage IBM Cognos for in-depth analysis of sales data to extract valuable insights. By understanding sales trends and customer behaviour, the project aims to help businesses enhance their inventory management and marketing strategies.

The Product Sales Analysis project, powered by IBM Cognos, is a comprehensive initiative designed to delve into sales data and unveil valuable insights crucial for enhancing inventory management and optimizing marketing strategies. By discerning sales trends, identifying top-selling products, and understanding customer preferences, this project offers actionable recommendations that enable businesses to make informed decisions and drive profitability.

This project centres on examining sales data to uncover valuable insights related to product performance, sales patterns, and customer behaviour. By utilizing IBM Cognos, a robust data analytics platform, this initiative seeks to empower businesses to make data-driven decisions that lead to improved inventory management and more effective marketing strategies.

In summary, the "Product Sales Analysis with IBM Cognos" project is an extensive effort to tap into the potential of sales data. It encompasses data collection, preparation, analysis, visualization, and recommendations, all aimed at aiding businesses in understanding sales trends and customer behaviour to drive improved inventory management and more effective marketing strategies. This project forms a crucial part of data-driven decision-making and long-term business success.

**Scope of this Project:**

The scope of the "Product Sales Analysis with IBM Cognos" project encompasses a range of specific activities and objectives, which define the boundaries of the project.

1. **Data Collection:**

- Gather sales data from various sources, including transaction databases, e-commerce platforms, and point-of-sale systems.

- Ensure the data collected is comprehensive, accurate, and up-to-date.

2. **Data Preparation**:

- Clean and preprocess the collected data to eliminate duplicates, correct errors, and handle missing values.

- Standardize data formats for consistency and reliability in analysis.

3. **IBM Cognos Setup:**

- Configure the IBM Cognos environment to accommodate the sales data and ensure it is ready for analysis.

- This includes setting up data connections, user access controls, and defining report templates.

4. **Analysis Objectives Definition:**

- Clearly outline the objectives and questions that the analysis seeks to address. These objectives provide a roadmap for the analysis.

5. **Data Modeling:**

- Develop data models that are structured to organize and prepare data for analysis.

- Data models make it easier to explore the dataset and extract insights effectively.

6. **Visualizations:**

- Create visualizations using IBM Cognos, such as charts, graphs, and dashboards, to effectively communicate the findings from the analysis.

- These visualizations serve as a user-friendly interface for stakeholders.

7. **Data Analysis:**

- Utilize IBM Cognos and, if necessary, other statistical and analytical tools to delve into the data, exploring trends, patterns, and relationships.

8**. Insights Derivation:**

- Derive actionable insights from the data analysis. These insights are conclusions drawn from the data that can guide decision-making.

**9. Recommendations**:

- Provide clear, data-backed recommendations for improving inventory management and marketing strategies based on the derived insights.

**10.** **Project Deliverables**:

- Prepare and deliver key project documents, including reports, documentation, visualizations, and actionable insights.

The project's scope is not only limited to the technical aspects of data analysis but also extends to the strategic and practical application of the insights derived from the analysis. It focuses on enhancing business decision-making related to inventory management and marketing strategies, ensuring that the insights gained are put into action to drive sales and profitability.

**Resources and tools**:

**Data Resources:**

1. **Sales Data:** Access to comprehensive and accurate sales data is a primary resource. This data can come from various sources, including databases, e-commerce platforms, and point-of-sale systems.
2. **Historical Data:** Historical sales data is valuable for identifying trends and seasonality. The availability of historical data is crucial for this analysis.
3. **Customer Data:** Customer data, including demographics, purchasing history, and behavior, is essential for understanding customer preferences and behavior.
4. **Product Data:** Detailed information about the products, including descriptions, categories, and pricing, is required for identifying top-selling products.

**Tools to collect these data:**

Kaggle datasets, AWS Public datasets, Google Dataset search, Data hub, etc..

**Technology Resources:**

1. **IBM Cognos Software:** The core technology resource for this project is IBM Cognos. Ensure that it is properly licensed and configured for data analysis and reporting.
2. **Data Cleaning and Preprocessing Tools:** Depending on the complexity of the data, you may need data cleaning and preprocessing tools like OpenRefine or Trifacta.
3. **Statistical Analysis Tools:** If your project involves advanced statistical analysis, you may require software like R or Python with statistical libraries.
4. **Data Visualization Tools:** Tools like Tableau, Power BI, or Python libraries (e.g., Matplotlib, Seaborn) can be used for creating visualizations.
5. **SQL Databases:** If your data is stored in a relational database, ensure you have access to the appropriate SQL database management system (e.g., SQL Server, PostgreSQL).
6. **Collaboration and Communication Tools:** Tools such as Slack, Microsoft Teams, and project management software are useful for team communication and collaboration.
7. **Cloud Computing and Data Warehousing (if needed):** If dealing with large datasets, cloud-based solutions like Amazon Web Services (AWS), Google Cloud, or Microsoft Azure can provide scalable storage and computing resources.
8. **Version Control Software:** If multiple team members are working on the project, version control tools like Git can help manage code and report revisions.
9. **Documentation and Reporting Tools:** Tools like Microsoft Word or LaTeX can be used for preparing project documentation and reports.
10. **Security and Data Privacy Tools:** If your project deals with sensitive customer data, ensure that you have the necessary security and data privacy tools and protocols in place.
11. **Training Resources:** Depending on the skills of your team, you may need training resources to ensure that team members are proficient with the selected tools.

**Technological tools available to achieve all this:**

IBM Congos Analytics, Microsoft Excel, Python with libraries, Tableau, Git, Talend ,Appache Nifi and many more

***Design Thinking:***

***1.Analysis Objectives:***

**1. Identify Monthly Sales Trends:**

**Objective:**

Uncover trends in the sales of products P1, P2, P3, and P4 during different months over the years.

**Insights to Extract:**

* Identify months with consistently high or low sales for each product.
* Explore any seasonality or periodic patterns specific to products P1, P2, P3, and P4.

**2. Determine the Highest Selling Product Over the Years:**

**Objective**:

Determine which product (P1, P2, P3, or P4) has seen the highest total unit sales over the given years.

**Insights to Extract:**

* Identify the product with the maximum cumulative unit sales.
* Compare and analyze the contribution of each product to the total sales.

**3. Estimate Sales on December 31st:**

**Objective:**

Provide an estimate of the number of units of each product (P1, P2, P3, and P4) that could be sold on December 31st every year if all retail centers were kept open.

**Insights to Extract:**

* Calculate average sales on December 31st for each product, considering historical data.
* Estimate total sales for each product on December 31st.

**4. Analyze Impact of Dropping a Product:**

**Objective:**

Analyze the potential impact of dropping the production of any one product (P1, P2, P3, or P4).

**Insights to Extract:**

* Assess the contribution of each product to total revenue and unit sales.
* Provide insights into the consequences of discontinuing a specific product on overall business performance.

**5. Predict Sales and Revenues for 2024:**

**Objective:**

Predict sales and revenues for each product (P1, P2, P3, and P4) for the year 2024.

**Insights to Extract:**

* Utilize time series forecasting to estimate sales and revenues.

Validate the accuracy of the predictive model using historical data.

**Illustrating with an Example:**

**Sales Analysis for an E-commerce Retailer (Multiple Products)**

**1. Identify Top-Selling Products:**

- Objective: Identify the top-selling products based on total revenue generated over the past year.

- Example: After analyzing the sales data, we find that the top five best-selling products are:

1. "Product A" (20% of total revenue)

2. "Product B" (15% of total revenue)

3. "Product C" (12% of total revenue)

4. "Product D" (10% of total revenue)

5. "Product E" (9% of total revenue)

**2. Analyze Sales Trends:**

- Objective: Analyze monthly sales trends over the past three years to identify seasonality and overall growth patterns.

- Example: Our analysis reveals that sales consistently peak in December due to holiday shopping. There is also a noticeable increase in sales during the summer months, indicating a seasonal trend.

**3. Understand Customer Preferences:**

- Objective: Segment customers based on demographics and analyze the preferences of each segment.

- Example: We identify three customer segments - "Young Shoppers," "Family Shoppers," and "Senior Shoppers." We find that "Young Shoppers" prefer electronics, "Family Shoppers" prefer clothing and toys, and "Senior Shoppers" prefer home and garden products.

**4. Peak Sales Periods:**

- Objective: Identify peak sales periods and analyze the factors driving these peaks.

- Example: Black Friday and the pre-Christmas period consistently result in the highest sales due to extensive discounts and promotional campaigns.

**5. Product Performance Analysis:**

- Objective: Analyze the performance of individual product categories.

- Example: We observe that the "Electronics" category is the fastest-growing, with a 15% increase in sales year-over-year. Conversely, the "Home and Kitchen" category has seen a slight decline in sales.

**6. Customer Loyalty Analysis:**

- Objective: Analyze customer retention by calculating the CLV for different segments.

- Example: "Young Shoppers" have the highest CLV, indicating the importance of retaining and engaging this segment through tailored marketing.

**7. Pricing Analysis:**

- Objective: Analyze the impact of price changes on sales volume.

- Example: A 10% price reduction for "Product F" resulted in a 30% increase in sales volume, while a 5% price increase for "Product G" led to a 15% sales decline.

**8. Inventory Management Recommendations:**

- Objective: Calculate inventory turnover rates and recommend stock level adjustments.

- Example: "Product H" has a low turnover rate, suggesting a surplus of inventory. We recommend reducing stock levels to minimize holding costs.

**9. Marketing Effectiveness:**

- Objective: Evaluate the ROI of recent marketing campaigns.

- Example: The recent email marketing campaign generated a 12% increase in sales, while the social media ad campaign had a 20% ROI and drove sales growth.

**10. Geographic Analysis:**

- Objective: Analyze regional sales trends and preferences.

- Example: Customers in the Midwest region prefer "Outdoor and Sports" products, while customers in the Northeast prefer "Electronics" and "Clothing."

By achieving these analysis objectives for a diverse product portfolio, the retailer can optimize its inventory, marketing strategies, and customer targeting to maximize revenue and enhance the customer experience across various product categories.

**2. Data Collection:**

Design thinking is a human-centered approach to problem-solving that focuses on understanding and addressing the needs of users. In the context of product sales analysis, design thinking can be a valuable framework for developing a deep understanding of customer behaviors, preferences, and pain points. This report discusses the process of data collection within the design thinking process and how they can be applied to enhance product sales analysis

## 1. Point of Sale (POS) Systems:

* **Source:** Most businesses with physical locations use POS systems to process transactions. These systems automatically capture transaction data, including items purchased, prices, payment methods, and timestamps.
* **Method:** Data is collected in real-time as customers make purchases. It can be stored electronically in a database or cloud-based system for later analysis.

**2. E-commerce Platforms:**

* **Source:** Online retailers and businesses selling products through e-commerce platforms generate a wealth of data through their websites. This includes transaction records, product details, and customer information.
* **Method:** E-commerce platforms typically offer analytics and reporting tools that track user behavior, sales, and customer demographics. This data is collected automatically and can be exported for further analysis.

**3. Customer Relationship Management (CRM) Systems:**

* **Source:** CRM systems house customer-related data, including contact information, purchase history, preferences, and demographics.
* **Method:** CRM systems automatically capture and store customer data as they interact with your business. This data is maintained and updated over time, providing valuable insights into customer behavior.

**4. Surveys and Feedback Forms:**

* **Source:** Customer surveys and feedback forms can provide valuable demographic information and insights into customer preferences.
* **Method:** Businesses can create and distribute surveys to customers through various channels, such as email, website pop-ups, or in-store feedback forms. Responses are collected and analyzed for demographic and preference data.

**5. Loyalty Programs and Membership Systems:**

* **Source:** Many businesses offer loyalty programs or memberships that collect data on customer purchasing habits and demographics.
* **Method:** Data is collected as customers sign up for these programs and make purchases. Loyalty cards or apps often track customer behavior, offering discounts or rewards in return for data.

**6. Social Media and Online Analytics:**

* **Source:** Social media platforms and online analytics tools provide data on customer engagement, sentiment, and behavior.
* **Method:** Businesses can use analytics tools to monitor social media interactions, track website traffic, and analyze customer sentiment expressed in online reviews and comments.

**7. Market Research and Third-party Data Providers:**

* **Source:** Businesses can acquire demographic data and market research reports from third-party data providers.
* **Method:** These data sources are typically purchased or licensed, providing businesses with access to a wide range of demographic and market data that can complement their internal data.

**8. In-store Tracking and Sensors:**

* **Source:** Some physical retail stores use tracking technologies like Wi-Fi or Bluetooth beacons to collect data on customer movements and interactions with products.
* **Method:** These sensors collect data passively as customers move through the store, providing insights into foot traffic, popular product locations, and customer dwell times.

**9. Mobile Apps and Beacons:**

* **Source:** Businesses with mobile apps can collect data on customer interactions with the app, including product views, cart additions, and location data if using beacons.
* **Method:** Data is collected as customers use the app, and analytics tools track user behavior to provide insights into their preferences and engagement.

**10. Purchase History and Receipts:**

* **Source:** Purchase history records and receipts generated at the time of sale contain valuable transaction data.
* **Method:** These records are typically stored electronically and can be accessed and analyzed later. They provide details about individual transactions, including products purchased and payment methods.

To ensure ethical and legal compliance when collecting customer data, it's essential for businesses to adhere to relevant data privacy regulations. Additionally, businesses should communicate their data collection practices and provide customers with options for data opt-out or deletion if required by law.

**3.Visualisation Strategy:**

# Creating interactive dashboards and reports with IBM Cognos Analytics involves several steps, from data preparation to visualization. Here's a plan to visualize insights effectively using IBM Cognos Analytics:

**1. Data Preparation:**

* Data Source Integration: Connect IBM Cognos Analytics to your data sources, whether they are databases, spreadsheets, or other data repositories.
* Data Cleaning and Transformation: Ensure that your data is clean and well-structured. Perform any necessary data cleaning and transformation tasks, such as handling missing values or aggregating data.

**2. Data Modeling:**

* Define Data Models: Create data models that define how your data sources are structured and how they relate to each other. Define measures (numeric data) and dimensions (categorical data) for reporting.
* Build Data Packages: Use the Data Module feature in Cognos Analytics to build data packages that encapsulate your data models and make them accessible for reporting.

**3. Report and Dashboard Creation:**

* Create a New Report or Dashboard: Open IBM Cognos Analytics and start a new report or dashboard project.
* Select Visualization Types: Choose the appropriate visualization types (charts, tables, maps, etc.) for your data and insights. Consider using interactive visualizations like drill-through charts.
* Drag and Drop: Use Cognos Analytics' drag-and-drop interface to add data elements (dimensions and measures) to your report or dashboard.
* Customize Visualizations: Customize the appearance and behavior of your visualizations. Configure chart types, colors, labels, and tooltips.
* Add Filters and Parameters: Include interactive filters and parameters that allow users to customize their view of the data. These are essential for interactivity.
* Define Interactivity: Set up interactive elements like drill-through actions, tooltips, and master-detail relationships to enhance user engagement.
* Layout Design: Organize the layout of your dashboard or report, arranging visualizations, filters, and other elements for a clear and intuitive user experience.

**4. Data Exploration:**

* Test and Validate: Ensure that your visualizations accurately represent the insights you want to convey. Test filters and interactivity to verify they work as intended.
* Iterate: Be prepared to iterate on your design based on user feedback and further insights you gain from your data.

**5. Sharing and Distribution:**

* Publish: Once your interactive dashboard or report is complete, publish it to the Cognos Analytics server for sharing.
* Set Permissions: Configure user permissions to control who can access and interact with your dashboards and reports.
* Schedule and Automate: If needed, set up schedules to automate report delivery to stakeholders.

**6. Documentation and Training:**

* Document Design Choices: Document the design choices you've made, including visualization types, data sources, and filters.
* User Training: Provide training or documentation to end-users on how to interact with and get the most out of the interactive dashboards and reports.

**7. Continuous Improvement:**

* Monitor Usage: Track how users interact with your dashboards and reports to identify areas for improvement or additional insights.
* Feedback Loop: Encourage users to provide feedback, which can inform future enhancements.
* Iterate and Update: As your business needs evolve or new insights emerge, update and enhance your dashboards and reports according.

**8. Understand Your Audience**:

- Before designing visualizations, understand the needs and preferences of the audience. Are they executives, sales managers, or marketing teams? Tailor the visualizations to their requirements.

**9. Dashboard Design:**

- Create interactive dashboards that serve as a central hub for insights. Dashboards should be visually appealing, user-friendly, and provide a high-level overview.

- Consider creating multiple dashboards to address different aspects of the analysis, such as sales trends, product performance, and customer segments.

**10. Visual Representation:**

- Use a variety of visual elements, including charts, graphs, tables, and maps, to represent data. Choose the most appropriate visualization type for the data being presented. For example:

- Line charts for sales trends over time.

- Bar charts for product comparisons.

- Pie charts for market segment distribution.

- Heatmaps for geographic analysis.

- Tables for detailed data.

**11. Interactivity:**

- Leverage IBM Cognos features to make visualizations interactive. Allow users to filter data, zoom in on specific time frames, or drill down into specific product categories or customer segments.

**12. Cross-Filtering and Highlighting:**

- Implement cross-filtering, where interacting with one visualization updates others. For example, selecting a product category in one chart should filter data in other charts to show related information.

- Use highlighting to emphasize specific data points or trends. For instance, clicking on a specific product in a bar chart should highlight that product's performance across other charts.

**13. Geographic Mapping:**

- Utilize maps to show geographic trends. Highlight regions with the highest and lowest sales, and use color-coding to represent data density or values.

**14. Key Performance Indicators (KPIs):**

- Display critical KPIs that summarize the most essential information on the dashboard. This might include total revenue, year-over-year growth, and customer acquisition rates.

**15. Data Alerts:**

- Implement data alerts to notify users when specific conditions are met. For example, set up alerts to trigger when sales exceed or fall below a certain threshold.

**16. Mobile-Friendly Design:**

- Ensure that dashboards are responsive and can be viewed on various devices, including smartphones and tablets.

**17. Export and Sharing Options:**

- Enable users to export dashboards and reports in various formats (PDF, Excel, etc.) for offline use or sharing. Implement role-based access control to restrict data access as need

**18. User Feedback Loop:**

- Establish a feedback mechanism for users to suggest improvements or report issues with the dashboards. Use this feedback to continually enhance the visualizations.

**4. Actionable Insights:**

**Deriving insights from data through interactive dashboards and reports in IBM Cognos Analytics can significantly impact inventory management and marketing strategies. Here's how we can use these insights to make informed decisions in these areas:**

**Inventory Management:**

**1.Demand Forecasting:**

* Insight: Analyze historical sales data to identify trends and seasonal variations in product demand.
* Action: Use these insights to forecast future demand accurately. Adjust inventory levels to match anticipated demand, reducing overstock or stockouts.

**2.Inventory Optimization:**

* Insight: Monitor inventory turnover rates and identify slow-moving or obsolete items.
* Action: Optimize inventory by reducing excess stock of slow-moving items and reallocating resources to fast-moving products.

**3.Supplier Management:**

* Insight: Analyze supplier performance data to identify reliable and cost-effective suppliers.
* Action: Collaborate with preferred suppliers and negotiate favorable terms to maintain a well-stocked inventory efficiently.

**4.Reorder Point and Safety Stock:**

* Insight: Use real-time data on sales and inventory levels to calculate reorder points and safety stock.
* Action: Ensure that you maintain sufficient inventory to meet demand while minimizing excess stock.

**5.Stockouts and Backorders:**

* Insight: Monitor inventory levels against demand in real time.
* Action: Implement automated alerts or notifications to proactively address stockouts or backorders and minimize customer dissatisfaction.

**Marketing Strategies:**

**1.Customer Segmentation:**

* Insight: Use customer demographics and purchase behavior data to segment your customer base.
* Action: Tailor marketing campaigns and product recommendations to specific customer segments, increasing the relevance of your marketing efforts.

**2.Product Recommendations:**

* Insight: Analyze cross-selling and upselling patterns to identify related products.
* Action: Implement product recommendation engines to suggest complementary items to customers, boosting average order values.

**3.Campaign Performance:**

* Insight: Track the real-time performance of marketing campaigns and promotions.
* Action: Adjust campaign strategies on the fly based on which tactics are driving the most sales or engagement.

**4.Inventory Clearance:**

* Insight: Identify slow-moving or excess inventory.
* Action: Create targeted marketing campaigns to promote these items, offering discounts or incentives to clear the inventory quickly.

**5.Personalized Marketing:**

* Insight: Leverage real-time customer data to personalize marketing messages.
* Action: Send personalized email offers or notifications to customers based on their recent browsing or purchase history.

**6.Competitor Analysis:**

* Insight: Continuously monitor competitor pricing and promotions.
* Action: Adjust your pricing and promotional strategies to remain competitive and capture market share.

**7.Customer Feedback Analysis:**

* Insight: Analyze customer feedback and reviews in real time.
* Action: Use feedback to improve products and customer service, and address any negative sentiments promptly.

**8.Social Media Engagement:**

* Insight: Monitor social media engagement and sentiment.
* Action: Engage with customers on social platforms, respond to inquiries, and address concerns to build brand loyalty.