INDIVIDUAL ASSIGNMENT TWO

LEVEL 6

COMP60022

DECISION ANALYTICS

HFK2422COM HFK2422COMF

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1 Introduction

1.1 Background Study

Sera Holdings is a famed conglomerate known for miscellaneous trade interests across various fields. This corporation was founded in 1985 by Jhon Sera, who is Chairperson and CEO. Sera Holdings branches are located all over the world. The main headquarters of Sera Holdings is located at Hyogo Japan. This enterprise revolves around real estate development and investment. This conglomerate widens its business domain by investing currency in technology, finance, energy, and consumer goods sectors.

Figure 1: Sera Holdings Head Quarters

These fields oversee Sera Holdings overall revenue and market share. Residential, commercial, and industrial properties are part of Sera Holdings real estate. It has developed many extravagant real estate projects globally. The technology department of Sera Holdings comprises of software development, IT services, tech startups, cybersecurity firms and data analytics. A wide range of financial products and advisory services are offered by the Finance sector through banking, insurance, and investment services. The energy sector of Sera Holdings carries out oil and gas exploration, renewable energy projects and utility services. Food and beverages, household goods and personal care items are produced by the consumer goods field.

Sera Holdings international market has spanned out to North America, Europe, Asia, and Africa. It has gained remarkable operational efficiency through strategic partnerships and conducting business projects with global firms. The board of directors and Jhon Sera lead the company, and the board of directors are formed out of skilled executives from diverse backgrounds. Compliance and integrity are ensured by the enterprise via implementing robust governance frameworks and policies. Risk mitigation and capitalization on opportunities across diverse market categories are archived through the corporation's diversified portfolio. Environmental sustainability, community development and employee welfare are corporate social responsibility initiatives of Sera Holdings. Strategic acquisitions and mergers toughen the conglomerate's position in the main markets. It meddles with innovative technologies such as AI, blockchain and IoT (Internet of Things) to carry out innovation and efficiency. Regulatory changes, market volatility, competitive pressures, effective coordination, and strategic alignment are challenges faced by this corporation. The growth of Sera Holdings relies on emerging markets, technological advancements, and sustainability initiatives.

1.2 Case Study

There has been a decline in Sera Holdings revenues ranging from 2023 to 2024 according to the Statistica website. Due to privacy and confidentiality issues a detailed statistical report cannot be obtained from any online or offline resources. Sera Holdings lost 6 billion in revenue in this period as a fact. We can hypothetically assess the revenue loss according to the following frequencies.

1. Q1 2023 Revenue Loss: 1.5 billion.
2. Q2 2023 Revenue Loss: 1.4 billion.
3. Q3 2023 Revenue Loss: 1.2 billion.
4. Q4 2023 Revenue Loss: 1.0 billion.
5. Q1 2024 Revenue Loss: 0.9 billion.

The total revenue loss of Sera Holdings can be graphed as follows.

1.3 5W Questions for the case study

- **Who**:- Employees, customers, and investors of Sera Holdings.
- **What**:- Ongoing revenue decline.
- **Where**:- Foremost in North American marketplaces, but also affecting international operations.
- **When**:- Striking decline observed from Q1 2023 to Q1 2024.
- **Why**:- To overcome increased competition from online retailers, poor strategic decisions, and changing consumer behaviors to maximize the revenue of Sera Holdings.

1.4 Problem Context

As the business of Sera Holdings started to boom, it extended its roots to other sectors around the globe. Even though the rapid growth of the business did not stay to thrive so much due to the consistent revenue loss.

1.5 Business Problem

This revenue loss resulted in financial viability and market losses. As the revenue of Sera Holdings dropped, the business reputation faded gradually. In addition, many job roles had to be shortlisted to cut out the labor charge.

1.6 Key Questions

The following questions guide us to narrow down issues upto a certain extent.

1. What are the major factors that contribute towards the revenue loss?
2. How data analytics and machine learning ease up the revenue loss?
3. What data analytic and machine learning methods can support to make decisions for revenue growth?

1.7 Research Objective

The main objective of this solution would be to analyze the corporation data using techniques of data analytics. Machine learning is applied to monitor the revenue loss and draw out strategies to increase the revenue.

2 Data Analytics

2.1 The Help of Data Analytics in Business

Revealing trends, patterns and insights are functions which are performed by data analytics. According to this scenario, all the insights which are derived from data fall into the financial data category. Segmentation is a process which splits the revenue data according to different variations of frequencies. These frequencies help us to comprehend well the points of decline and potential causes.

2.1.1 4V Concepts of Big Data

Sera Holdings produces daily large sums of data such as financial reports, transactions, IoT sensor readings and so on. These data may have value. Wither the data is meaningful or not, we need to store these data for a desired period. This raw data aids us in deriving useful information. The structure of these data varies between unstructured or structured. Traditional DBMSs are only capable of handling structured data. NOSQL databases can handle structured, semi-structured and unstructured data. Big Data has its own characteristics, and all these features are defined as 4Vs (Data Characteristics). Let us discuss the characteristics of Big Data further in relation to Sera Holdings.

1. Volume:- Real state, technology, finance, energy, and consumer goods sectors generate huge volumes of data such as financial data, IoT (Internet of Things) sensor data etc [SpringerLink, 2023].

2. Velocity:- All the collected data from the sectors are further processed to ensure the quality of the data through techniques such as integration, data cleaning and redundancy removal. The processed data is again taken to generate insights [Researchgate, 2021] [Tableau].

3. Variety:- The data shows its original form during the data collection process. The form of the data can change after the cleaning process. The data collected from the files of Sera Holdings may take semi-structured and unstructured forms [Pergamon, 2014].

4. Veracity:- The validity and consistency of Sera Holdings data ensured at this level by precision examination [SpringerLink, 2014].

2.1.2 Machine Learning

To recognize obscured schemes and estimate future revenue tendencies we need effective formulas. These types of Algorithms are utilized in machine learning. The processing power of humans is limited in comparison with Machine Learning models. These models are trained and tested by professionals. So, a limited number of errors occur compared with humans. It takes a decent amount of time for a human being to solve a complex problem, but Machine Learning Models solve complex issues within a limited time. So, we can rectify intricate dilemmas faced by Sera Holdings within a shorter time and it will also help us to make future projections.

2.1.3 Data Mining

This approach helps us to extract meaningful patterns from substantial datasets. As an example, we can inspect customer transaction history reports to distinguish trends and inclinations of Sera Holdings.

2.1.4 Knowledge Discovery

This is the process which involves converting raw data into meaningful information. Identification of the most profitable customer segments done by the knowledge discovery through the integration machine learning and data mining. This enables Sera Holdings to uncover insights that inform strategic decisions.

2.1.5 Relationship between Machine Learning, Data Mining and Knowledge Discovery

Finding patterns in large datasets are done by the data mining process. Those patterns are utilized for predictive modeling via machine learning. Data mining and machine learning results are combined in the knowledge discovery phase. This delivers meaningful insights for the decision-making process.

2.1.6 Justification of the Relationship between Machine Learning, Data Mining and Knowledge Discovery

These three concepts work together independently to support business decision making. Data mining techniques help machine learning algorithms to extract insights from data. Identifying and extracting valuable insights from data are done by the knowledge discovery mechanism. This helps the business decision making process.

2.1.7 Issue Trees

The revenue loss of Sera Holdings can be divided into three sections, and they are customer behavior, market trends and operational efficiency. Customer behavior again is further divided into gender based, age category, platform, seasonal / monthly and geographic analysis. Product popularity, competitor and trend are three subcategories that fall under market trends. Operational efficiency main branch widens to supply chain management, inventory control and cost management subbranches. Each subbranch poses a main question which further again poses two / three questions.

1. Customer Behavior
   (a) Gender based analysis
      - Which gender purchases more and less from Sera Holding owned supermarkets?
        - Which gender buys more?
        - Which gender buys less?

   (b) Age category analysis
      - Which age group items are sold more in Sera Holding owned supermarkets?
        - What are the age groups?
        - Which age group items sell most?

   (c) Platform analysis
      - Which platform(online or physical) has more and less sales in Sera Holding owned supermarkets?
        - Which platform has more sales?
        - Which platform has less sales?

   (d) Seasonal / monthly analysis
      - Which months have more and less income in Sera Holding owned supermarkets?
        - Which month has less income?
        - Which month has more income?

   (e) Geographic analysis
      - Which city site has more and less income in the real state and consumer goods fields?
        - Which city site has less income?
        - Which city site has more income?

2. Market Trends
   (a) Product Popularity
      - Which is the most and least selling product in Sera Holding owned supermarkets?
        - What product is sold most?
        - What product is sold least?

Surveys and Feedback	
Feature	**Data Type**
Survey Response ID	Non-Categorical
Customer Satisfaction Ratings	Non-Categorical
Feedback Comments	Categorical
Online Reviews	Categorical

Table 1: Surveys and Feedback

(b) Competitor Analysis

- What effect does other competitors have over Sera Holdings revenue?
  - Who are the main competitors in each field(Real Estate, Technology, Finance, Energy, Consumer Goods)?
  - What are the strengths and weaknesses of competitors compared to Sera Holdings?

(c) Trend Analysis

- How can the current trends affect Sera Holdings?
  - What are the emerging trends in each field?
  - How does Sera holdings adapting to these trends?

3. Operational Efficiency

(a) Supply Chain Management

- How can supply chain management affect the Sera Holding revenue?
  - Are there any delays or inefficiencies in the supply chain across different segments?
  - How can supply chain processes be optimized for each segment?
  - Are there issues with supplier reliability or logistics?

(b) Inventory Control

- What effect does inventory control have over Sera Holdings?
  - How accurate are demand forecasts for each segment?
  - Are there issues with overstocking or stockouts in the consumer goods segment?
  - What is the inventory turnover rate for each segment?

(c) Cost Management

- How can the cost management affect the Sera Holdings revenue?
  - Are operational costs rising in specific segments?
  - How efficient are the cost-control measures in place for each segment?
  - Are there redundancies or inefficiencies in operations that can be addressed?

2.1.8 Data to be collected

1. Customer Behavior

- Changes in Consumer Preferences
  - Surveys and Feedback table
  - Sales table
  - Market Research table

Sales	
Feature	**Data Type**
Product Category Sales	Non-Categorical
Product Return Rates	Non-Categorical
Product Exchange Rates	Non-Categorical

Table 2: Sales

Market Research	
Feature	**Data Type**
Market Trend Reports	Non-Categorical
Competitor Analysis Reports	Non-Categorical

Table 3: Market Research

- Purchasing Habits
  - Demographic table
  - Transaction table

Demographic	
Feature	**Data Type**
Customer ID	Categorical
Name	Categorical
Age	Non-Categorical
Gender	Categorical
Location	Categorical
Purchase History	Categorical

Table 4: Demographic

Transaction	
Feature	**Data Type**
Transaction ID	Categorical
Date of Purchases	Non-Categorical
Purchase Frequency	Non-Categorical
Purchase Value	Non-Categorical
Loyalty Program Participation	Categorical
Abandoned Cart	Non-Categorical

Table 5: Transaction

Competitor	
Feature	**Data Type**
Competitor Market Share	Non-Categorical
Customer Switching	Non-Categorical

Table 6: Competitor

    - Competitor table
- Platform Preferences
    - Sales Channel table
    - Customer Feedback table

2. Market Trends
    - Increased Competition
        - Competitive Analysis table
        - Industry Reports table
    - Changing Consumer Preferences
        - Trend Analysis table
        - Innovation Tracking table
    - Economic Factors
        - Macroeconomic table
3. Operational Efficiency
    - Supply Chain Management
        - Supply Chain Metrics table

Sales Channel	
Feature	**Data Type**
Sales Volume(Online)	Non-Categorical
Sales Volume(Physical Stores)	Non-Categorical
Website Traffic	Non-Categorical
Conversion Rates(Online)	Non-Categorical

Table 7: Sales Channel

Customer Feedback	
Feature	**Data Type**
Shopping Channel Preference	Categorical
Online Store Usability Ratings	Non-Categorical

Table 8: Customer Feedback

Competitive Analysis	
Feature	**Data Type**
Competitor Product Offerings	Categorical
Competitor Pricing	Non-Categorical
Market Share	Non-Categorical
Competitor SWOT Analysis	Categorical

Table 9: Customer Feedback

Competitive Analysis	
Feature	**Data Type**
Industry Growth Rates	Non-Categorical
Market Forecast Reports	Categorical
Benchmarking Reports	Categorical

Table 10: Industry Reports

Competitive Analysis	
Feature	**Data Type**
Trend Reports	Categorical
Consumer Behavior Studies	Categorical

Table 11: Trend Analysis

Competitive Analysis	
Feature	**Data Type**
Emerging Technologies	Categorical
Patent Filings	Categorical
RandD Activity Reports	Categorical

Table 12: Innovation Tracking

Competitive Analysis	
Feature	**Data Type**
Consumer Confidence Indices	Non-Categorical
Disposable Income Statistics	Non-Categorical
Economic Forecasts	Categorical
Inflation Rates	Non-Categorical

Table 13: Macroeconomic

Competitive Analysis	
Feature	**Data Type**
Lead Times	Non-Categorical
On-Time Delivery Rates	Non-Categorical
Inventory Levels	Non-Categorical
Inventory Turnover Rates	Non-Categorical
Supplier Performance	Non-Categorical

Table 14: Supply Chain Metrics

Competitive Analysis	
Feature	**Data Type**
Transportation Costs	Non-Categorical
Warehousing Costs	Non-Categorical
Distribution Efficiency	Non-Categorical

Table 15: Logistics

  - Logistics table
- Inventory Control
  - Inventory table
  - Demand Forecasting table
- Cost Management
  - Cost table
  - Efficiency Metrics table

2.2 Key Questions and Analytical Methodologies

Analytical methodology helps us to determine key queries and make conclusions. The following principles are used by machine learning.

1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning
4. Semi-Supervised Leaning

To analyze the revenue issue of Sera Holdings, the Clustering methodology is used, and it is an unsupervised data mining technique. This technique splits the data into several groups. These groups are used by machine learning

Competitive Analysis	
Feature	**Data Type**
Inventory Levels by Product	Non-Categorical
Stock Rates	Non-Categorical
Overstock Rates	Non-Categorical
Inventory Aging Reports	Non-Categorical

Table 16: Inventory

Competitive Analysis	
Feature	**Data Type**
Historical Sales	Non-Categorical
Forecast Accuracy	Non-Categorical

Table 17: Demand Forecasting

Competitive Analysis	
Feature	**Data Type**
Operational Costs	Non-Categorical
Production Costs	Non-Categorical
Cost of Goods Sold	Non-Categorical
Overhead Expenses	Non-Categorical
Administrative Expenses	Non-Categorical

Table 18: Cost

algorithms to make decisions in the future. Let us examine how we can evaluate the main queries applying the analytical methods.

Efficiency Metrics	
Feature	**Data Type**
Labor Productivity	Non-Categorical
Process Efficiency	Non-Categorical

Table 19: Efficiency Metrics

Main Questions	Methodology	Observation
Which gender purchases more and less from Sera Holding owned supermarkets?	We can examine the customer purchase records and identify the least and most sold items. After the examination, we can offer discounts for the least sold products.	Bar, Pie, and Line Graphs
Which age group items are sold more in Sera Holding owned supermarkets?	We can inspect the customer purchase records and identify purchasing trends of each age group. So that we could offer discounts or remarkable offers to age groups who have made fewer purchases.	Bar, Pie, and Line Graphs
Which platform (online or physical) has more and less sales in Sera Holding owned supermarkets?	We can observe the sales records and identify the total contribution of sales by each platform. Next, we can offer discounts for the online platforms used platforms considering cutting down the labor cost.	Bar, Pie, and Line Graphs
Which months have more and less incomes in Sera Holding owned supermarkets?	We can inspect the sales records and identify the numbers that Seras Holdings have made monthly wise. To boost the income of months less earned, we can offer exclusive offers / discounts for those months.	Bar, Pie, and Line Graphs
Which city site has more and less income in the real state and consumer goods fields?	First, we must gather all the sales records of each city and we need to summarize each record. All the summarized data should be put into a file for observations. When inspecting summarized data, we can notice climb ups and climb downs of income of each city. We can conduct campaigns / offer discounts to inflate the income of low earning cities.	Bar, Pie, and Line Graphs
Which is the most and least selling product in Sera Holding owned supermarkets?	When examining customer purchase records, we can recognize the customer trends so as their preferences. We can offer noteworthy discounts / offers for the items which have a low selling rate.	Bar, Pie, and Line Graphs

Table 20: Key Questions

2.3 Data Analytic Solutions

2.3.1 Insights / Knowledge

Spotlighting main intuitions into revenue trends, customer behavior and marketing conditions are findings from a data analysis. These findings help us to identify preferences of the customers or seasonal purchasing preferences of customers.

2.3.2 Recommendations

We can suggest the following strategies based on the insights that gathered from the analytical data.

1. To decrease the costs and enhance operational efficiency, supply chain management and inventory control systems should be utilized for the entire supply chains.
2. Targeted marketing campaigns and loyalty programs gives us the ability to attract and conserve customers.
3. We can use the machine learning algorithms and data analytics to make decisions by identification of trends in customer behavior and market.
4. Diminish garbage refine efficiency in all commercial operations by carrying out slant management techniques.
5. Diversify income sources by searching for new geological markets.
6. Multiply returns and lower inactive resources by evaluating and enhancing the utilization of existing capitals.
7. Access new mechanics, retails, and capabilities by strategic accords and partnerships.
8. Advance brand name and foment community friendliness by enlarging corporate social obligations.

3 Interventions

Based on the following recommendations, we can draw out the following intervention methods.

1. Minimize labor costs by encouraging customers to purchase items online.
2. Weaponize supply chain with enhanced inventory control systems that are compatible with RFID tagging to decrease the inventory holding charges and stockouts.
3. Streamlining processes, decreasing lead times and minimizing fees associated with transportation, warehousing, and procurement enable us to recognize inefficiencies and bottlenecks in supply chains.
4. Proposing discounts, loyalty points and VIP perks persuade the consumers to transform into advocates and intensify the number of purchases.
5. Conduct promotional campaigns.
6. Looking forward to marketing trends and customizing plans according to predictive analytics.
7. A robust data analytic framework helps to detect KPIs related to sales, inventory turnover, customer satisfaction, and operational efficiency.
8. Coordinate workshop seminars to develop the skills of employees.

4 Limits / Risks

There are certain risks associated with the solution and they are listed below.

1. The quality and accuracy of the data used in the analysis might not be 100% accurate.
2. There can be limitations in the machine learning algorithms and data mining techniques used in analysis.
3. Different challenges can occur during the implementation phase regarding recommended strategies and solutions.
4. Purchasers can be disappointed because of probable technical problems with online platforms.
5. RFID tagging systems can have an effect on the Sera Holdings budget.
6. Employee attitude and career fulfillment can be affected by the alterations in operations.
7. Commercial losses can occur to the customer deeds in loyalty arrangements.
8. Privacy of the purchasers can jeopardize in the data collection and examination process.

5 Conclusion

Data analytics and machine learning are vital aspects when it comes to making business decisions. We can identify the elements which contribute towards revenue loss and develop strategies to improve revenue loss by implementing data analytics and machine learning methods. 4V framework of big data is a key concept which is discussed in data analysis. Predicting patterns, recommending customized objects and building up inventory management systems are handled by machine learning algorithms. Informed business decision-making and driving business outcomes are part of the foundation derived by insights gained through the analysis. Resiliency in supply chain prevents prospects, improve performance and foster adaptability in the face of market insecurities. As the bottom line, Sera Holdings corporation needs to evolve with data analytics, data mining and machine learning methodologies to play a dominant role in global market.

References

Pergamon. Beyond the hype: Big data concepts, methods, and analytics, 2014. URL https://www.sciencedirect.com/science/article/pii/S0268401214001066. Accessed: 2024-06-11.

Researchgate. Data cleansing mechanisms and approaches for big data analytics: A systematic study, 2021. URL https://www.researchgate.net/publication/356292133_Data_cleansing_mechanisms_and_approaches_for_big_data_analytics_a_systematic_study. Accessed: 2024-06-11.

SpringerLink. Big data: A survey - mobile networks and applications, 2014. URL https://link.springer.com/article/10.1007/s11036-013-0489-0. Accessed: 2024-06-11.

SpringerLink. Big data, cloud computing, and data science engineering, 2023. URL https://link.springer.com/book/10.1007/978-3-031-19608-9. Accessed: 2024-06-11.

Tableau. What is big data? big data explained. URL https://www.tableau.com/learn/articles/what-is-big-data. Accessed: 2024-06-11.