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Project Submission Sheet – 2021/2022

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Date: 14th December 2021
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Business Intelligence and Business Analytics Project Implementation Report

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Abstract—The paper provides a detailed study about the business analysis of Staples. The company has corporate clients across the globe and is best in class in generating sales in furnishing products, home office accessories, electronics, and hard goods. The business model is analysed using the sales data of 2 years based on the unit orders generated by the employees, its gross profit margins, and country-wise distribution of earnings. All these insights are created using a business intelligence tool Tableau. The visualization provides information about some critical business flaws which has undermined the revenue potential of the company. The paper provides solutions with various business optimization methods which can improve the customer's integrity, reachability, and overall revenue growth of the company.

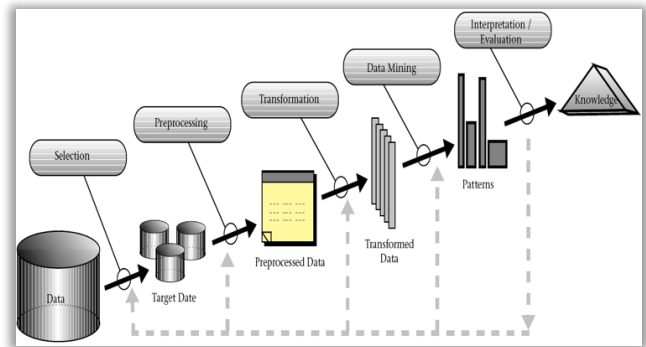


Fig. 1. Implementation flow chart - KDD [2]

I. INTRODUCTION

The sales data of Staples Inc. include the Customer, Employee, Product, Order Method, and Order data. The data is thoroughly examined to implement data pre-processing and cleaning. A star schema is designed by connecting relational entities across all the data tables. Data transformation is applied using various filters to convert raw data into target data on which actionable insights can be implemented. It is useful in studying business architecture with the help of various visualizations. The design solutions for Staples Inc. include a business dashboard that provides critical observations for the company's market performance.

As part of the business analysis process, a set of visualizations were created in order to understand the sales performance of Staples Inc. that includes:

- Total Gross Profit
- Total Revenue
- Month & Year wise Profit %
- Quarterly Product Sales Count
- Gross Profit % by Country
- Revenue by Product Category
- Top 5 Clients
- Gross Profit by Order Method

From the above listed visualizations, potential business flaws are identified and various optimization methods are suggested to improve its industry standard.

II. IMPLEMENTATION FLOW CHART

Knowledge Discovery Database (KDD) method was followed to implement the whole process. Process as mentioned in the Fig. 1 needs selection, pre-processing, transformation, data mining, and interpretation. Each of these processes has been explained in detail below.

A. Data Management

- Data Cleaning

Data cleaning is a process of cleaning the data by eliminating irrelevant and noisy data. This is needed because it helps to evaluate the result from the dataset.

In Staples Inc. dataset, there were some orders in the Order table where 'Unit Order' which is nothing but order quantity had '0' values which led us to filter those records in Tableau as it was not contributing to our aim.

- Data Integration:

Data Integration is the part of the process where heterogeneous data are combined with each other to form one common formatted dataset. The data sources can come from various parts of the databases and can be in different formats so it needs to be integrated so that they can be used for the interpretations.

Data integration can be performed using various integration tools which help to combine all the sources to a matching destination system. Below are some methods:

Extract, Transform, and Load (ETL):

Data are fetched from the various resources and fed into the warehouse or any database.

Extract, Load, and Transform:

Data is imported into the huge database system in its original format or raw format and further they are analysed and used for analytics purpose.

Replication of Data:

Data is replicated for the backup purpose which can be used in future so that it can be synced with the current transformed format.

Virtualization of Data:

Virtual data is formed by accessing the actual data from various different data sources and further used for the analytics purpose so that it can be used more efficiently.

Streaming Data Integration:

It is the on the go process which involves integrating the data sources by accessing the real-time data sources.

Data Integration technique are defined as triples $\langle G, S, M \rangle$ where,

G – represents the Global Schema

S – represents heterogeneous source of data schema

M – represents mapping between global schema and heterogeneous source of data.

The dataset was downloaded from the Kaggle website in the form of .csv file. There were five .csv file named Customer, Employee, Product, Order and Order Method which were imported and converted into Tables in the Tableau and further joined by creating the logical relationships between all the tables based on the primary and foreign key attributes.

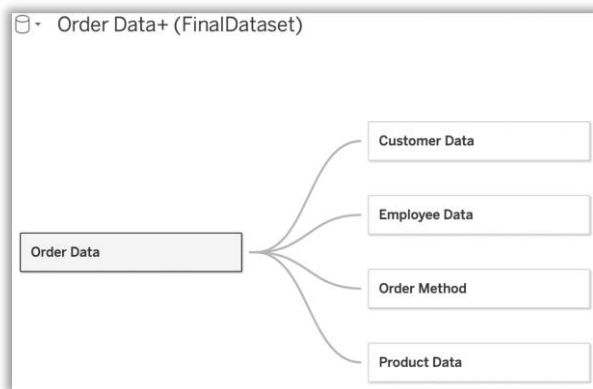


Fig. 2. Data Integration for Staples Inc. datasets.

- Selection of data:

Data selection is the process of identifying the and accessing the data from the actual data for finding some sights and evaluate the results. Data selection is one of the critical step in implementation because it is the step which will help to move forward step-by-step to analyse the problem.

For Staples Inc., relevant attributes are identified and selected which contributes to the knowledge of understanding the flaws of the business and further transforming them in a proper format.

- Transformation of data:

Transformation of data means the changing the form of the data as per the required form

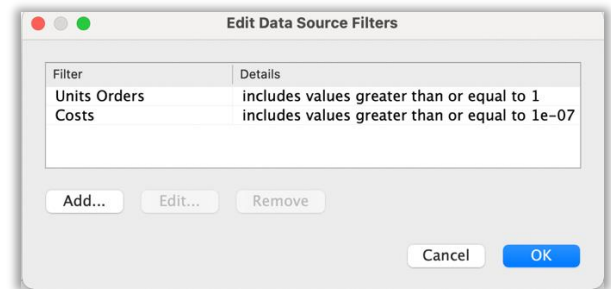


Fig. 3. Data Transformation for Staples Inc. dataset.

Fig. 3. shows the transformation performed on the dataset wherein 'Unit Orders' attribute in the Order table was filtered to provide values greater than or equal to 1. Another transformation was performed on the 'Costs' where cost of the product was filtered for the values greater than '1e-07' so that it won't impact the whole analysis of the data.

- i. Measures Created:

Profit % - A measure was created in Tableau in order to obtain aggregate profit percentages based on multiple contextual filters.



Fig. 4. Calculated Measure

B. SWOT (strengths, weakness, opportunities, and threats) Analysis

SWOT analysis is a framework which helps to understand the organisations competitive position and to plan strategies. SWOT also analyse the parameters like internal-external and current-future potential for the organisation. Companies use a SWOT as a direction and not as a prescription by having a look at its strengths and weaknesses. Fact-based analysis needs some important factors like core strengths, weaknesses, opportunities and threats. Company may know everything on how to succeed but after implementing SWOT analysis it forces them to observe the business from different ways and directions.

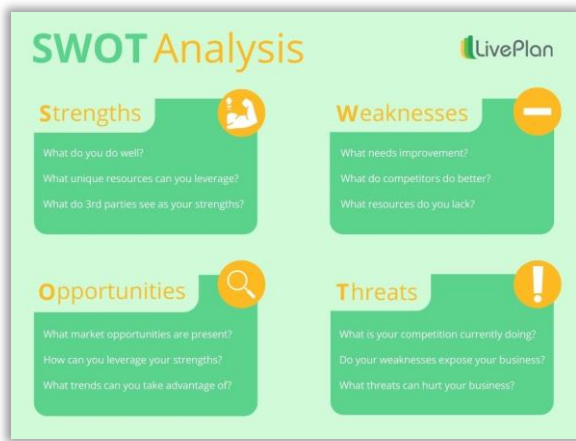


Fig. 5. SWOT Analysis [2]

Staple's SWOT Analysis:

Strengths:

1. Minimal Local Competition
2. Trust from customers and neighbourhood
3. Affordable Prices

Weaknesses:

1. Poor social media presence
2. Less online ordering

Opportunities:

1. Marketing on social media
2. An online store could boost revenue
3. New products could pull in new customers

Threats:

1. Bad online reviews
2. Online competitors
3. Could lose new traffic due to outdated products

C. Reports and Dashboards

- Data Mining:

Data mining is the process of identifying the trends from the data so that evaluations can be made. KDD helps to achieve this method by modelling the data.

Based on the objective, data mining was performed to gather the insights of the data in the form of data visualization in the tableau. Visualization can be performed using the bar graphs, Pie charts, line graphs and map. It helps to find sales trends of the corporate clients with respect to products along with their quantities and also with the sale price of the product.

- Pattern Evaluation:

Pattern evaluation is process wherein various patterns are identified which can help in the finding the objectives of the organisation.

This is the important step wherein logical sense has to be made based upon the criteria which needs to be focused on and the thought process is applied to answer the ups and downs reflected in the visualization of any chart. Many research and developments are made to find what actually led to the upward or downward trend of any visualization. Various interpretations and evaluations techniques were applied to find the patterns in the charts.

In order to take business decisions and develop strategies, data needs to be organized in a proper format.

Data should be meaningful and it needs to provide actionable insights about information that has to be conveyed. Visualizations can play a major role in representing data. Various business tools analyse data and help to create reports and dashboards that reduce tasks, efforts, and elaborate information in an easily understandable way. Visuals help to depict data and also facilitate the platform to take business decisions. Tableau is one of the powerful tools developed by Tableau Software Company. It helps in the analysis and automation of business decisions. It is an interactive visualization tool widely used in many industries. The primary task is to have the appropriate amount of data. Once adequate data is available, then with help of various tools and methods specific data patterns and trends in industry platforms can be studied. Tableau also provides a medium to create reports that can be shared with clients, stakeholders, or vendors. Tableau provides a single platform for the graphical representation of data with various interactions. The interactive dashboard provides a very clear graphical representation and in-depth understanding. It is an alternative to the traditional approach of analysing data in an excel sheet. By looking at a single dashboard higher management can get a depth understanding of trends, areas in which the company should focus more and help to make better business decisions. Sales Data has been used to create dashboards in Tableau to showcase the business outline of Staples Inc.

- Knowledge representation:

Representation of the Knowledge is the step where domain expert presents the insights of the findings in the charts like bar graph, pie chart and line graphs.

This is the step the knowledge gained from the outcomes of the visualizations are explained to domain expert and further it is communicated to the decision making team to make appropriate action towards the business.

Below are the snapshots of all the visualizations performed on the Staples Inc. dataset along with their explanations:

1. Month & Year wise Profit %



Fig. 6. Month & Year wise Profit %

To understand business trends, one needs to Study Company's performance over a specific time frame. Year-wise, quarter-wise, and then month-wise study helps to understand companies' past and current performance and various trends. A side-by-side bars visualization has been used to study Staples Inc.'s aggregate profit for the year 2020-21. The aggregate profit is one measure that has been created to showcase a comparison of profits obtained between the years 2020-21. Two different colours are used to differentiate between the two years. In this visual, a forecasting technique has been used to predict the aggregate profit for the year 2021 from July to December. The graph forecasted the average profit as

23.38%. For the July, August, and October months of the year 2021, the forecasted value of profit is higher for the corresponding months than that of the year 2020. It indicates that there are high chances to expect business growth. However, for the months September and November the forecasted profit is comparatively lower, which triggers the scope of analysis.

2. Quarterly Product Sales Count

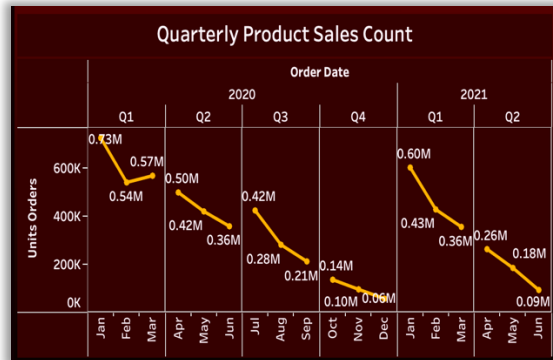


Fig. 7. Quarterly Product Sales Count

The sales business is directly proportional to how many units are sold in a given period of time. More the units sold, the more will be the profit. In this image, a line graph has been used to compare and study the number of units sold quarter-wise for the years 2020-21. From the image, it is clear that the number of units ordered has a decreasing trend which is not good for any business. For quarter 1 of the year 2020, unit orders have increased but, for other quarters the numbers have decreased which has impacted the revenue of Staples Inc. In order to increase the profit throughout the year, sales strategies in quarter 1 need to be replicated in other quarters to accelerate the business performance. From the graph, it is clear that the company failed to maintain its unit order sales record throughout the year. The quality analysis team has to check if quality has been degraded or not, the sales team has to work prominently on sales goals, a marketing team needs to take follow up from customers, and together profit can be increased. The relation between geographical location and units sold can also give meaningful insights. The focus should be more on the areas where the business shows decreasing sale trends.

3. Gross Profit by Order Method



Fig. 8. Gross Profit by Order Method

The order method sheet represents the gross profit with respect to the year and method through which the order has been placed. There are 3 different order methods by which customers can place their orders, retail, direct, and online sales. Comparison of different order methods based on year provides market trends and an understanding of customers' mindset. The graph suggests that the company has most of its business in the years 2020-21 by retail sales method whereas online sales are the least preferred method. Direct sales are moderately preferred by customers. The online team has to work hard on the company's online application and social media handling in order to improve the online sale.

4. Revenue by Product Category

Revenue by Product Category	
FURNITURE	\$213.7M
MAJOR APPLIANCES	\$376.6M
HOME ELECTRONICS	\$525.4M
BEDDING	\$107.6M
HARD GOODS	\$81.2M
HOME OFFICE	\$138.4M
ACCESSORIES	\$15.8M
MISC. NON-INVENTORY	\$0.4M

Fig. 9. Revenue by Product Category

One of the key aspects to improve business is to understand customers' demand and how to fulfil the requirements. Demand and supply is an unbreakable chain, so if demand is more then the company needs to have an adequate supply. Inventory management plays a major role in this scenario. As per the sheet, Customers have preferred Furniture the most and small products have been preferred the least. The company also has

good business in providing electronic appliances like air conditioners, refrigerators, and Vacuum accessories. Electronics and Furniture are contributing more than 50% to the company's revenue. To keep current customers and to generate more revenue the company must give some offers on these products. Also, by studying current market trends the company must add the latest Furniture and Electronics to its inventory.

5. Gross Profit % by Country

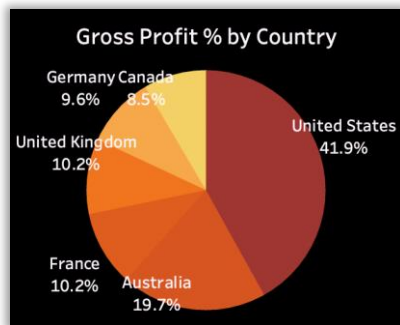


Fig. 10. Gross Profit % by Country

Staples Inc. has business in 6 different countries. The pie chart represents average profit across all these countries. Staples Inc. has its headquarters in the United States and that has influenced its business. The United States has more number of delivery centres, and hence, generates maximum gross profit. Canada has generated the least revenue and hence, Staples Inc. should focus more on Canada. Australia, the United Kingdom, France, and Germany have an average profit.

6. Top 5 Clients



Fig. 11. Top 5 Clients

As per Fig. 11., it shows top 5 clients which are the best customers in terms of the buyers. In which 'NECX Direct' is the corporate client who proves to be the prime customer who has brought sales revenue of about \$ 3.20M between the period 2020 and 2021. Apart from 'NECX Direct' there are other clients like 'Neeka', 'Pacific Tel', 'Valpatken' and 'Lee Valley' which contributes \$ 3.17M, \$ 1.64M, \$ 1.48M and \$ 1.47M respectively.



Fig. 12. Dashboard of Staples Inc.

III. BUSINESS OPTIMIZATION & CONCLUSION

In order to improve the business standard, all organizations must possess a decent methodology or models which can help improve the business performance in an efficient manner. Business optimization deals with improving the productivity of the business processes and it minimizes the costs by identifying loopholes in its architecture. The business performance is entirely dependent on how well the business architecture is organized along with its efficiency. A detailed and smart analysis of each minute point from lower to higher employee hierarchy will ultimately lead to a good business yield. Innovative approaches, automation, use of efficient BI tools, cost optimization, customer analysis, continuous improvements, market research, analysis of business trends, its comparison on a global scale, and expansion strategies will ultimately lead to the best possible business optimization. Delivering customer demands by using various marketing and sales strategies should be the primary goal. Opinions and experiences of employees and their customers from different business units must be taken into consideration. The business model of Staples Inc. has scope for various optimizations and techniques that can possibly cover the current drawbacks in the business model in order to achieve business goals.

1. Staples Inc. has very limited business through online sales methods. The current global market trend is more favourable towards E-commerce hence Staples Inc. should focus more on improving the Web and mobile application. With the help of Artificial intelligence, stats can be gathered and supply can be improved.
2. Engagement with one or more delivery partners in each country can be an effective way of dealing with direct customers as well as for small businesses.
3. The United States is contributing the highest revenue in Staples business. The key aspects of business techniques from the United States can be incorporated in other low-performing countries as well. The sales and marketing strategies can be considered as role models.
4. Canada is contributing very little towards the overall business of Staples Inc. Survey analysis on various factors such as weather conditions, locality of people, their general spending capacity, identifying warehouses for storage, forming contracts with third party agents, deploying marketing teams in various areas can definitely lead to evaluate the business potential across the country.
5. From the analysis it has been observed, that there are some states where no branches exist. As a result, effective ways should be incorporated to make these places operational.

6. It has been observed that the unit order sales have a decreasing trend throughout the year. This can be considered as an opportunity to increase business by implementing limited-time offers and deals through online platforms. Bucket shopping deals, Buy One Get One Free offers, Black Friday Sales, and various festive deals are methods that can prove to be effective in attracting customers.
7. Effective use of social media in different cities can help in attracting young businesses. Adding simplistic and eye-catching visuals can be used to attract customers.
8. Since, Staples Inc.'s business is having a decreasing sales pattern, the marketing team needs to take one on one follow-ups with clients in order to find out the root cause. Once it has been identified then building strategies to overcome the losses can be implemented.
9. From the overall profit of the company, a specific percent should be devoted to technology improvements, maintenance of warehouses, social media handles, and customer review surveys.

A. CONTINUOUS METHODOLOGY TO BE IMPLEMENTED

All the business optimization points can be considered as a collection of improvements across the entire business cycle. Executing these points in a timely manner will help in setting up a continuous improvement process that will be inclined towards a KAIZEN methodology. Performing these improvement tasks on a regular basis will make Staples Inc. more agile towards any diverse market changes which will strengthen their chances to survive in this fast-paced evolving market.

KAIZEN is a continuous improvement method where all the employees work towards implementing small improvisation in daily business processes which will together account for exponential business growth.



Fig. 13. KAIZEN Representation [4].

In conclusion, after analysing the business model of Staples Inc. and identifying its flaws, the above listed optimization methods needs to be implemented in order to overcome its losses.

REFERENCES

- [1] <https://www.staples.com/>
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