Managing Big Data

BMD004

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Individual Report

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1. Introduction

Big data management encompasses the activities related to the effective management, control, and oversight of both structured and unstructured data in enormous quantities. The aim of big data management is to ensure that the data is of high quality and easily accessible to support various big data analytics and business intelligence applications. The reliance on data for making business a crucial factor in deciding the course of action for businesses [1]. With the aid of Big Data Analytics, the report will detect and assess the value of sales and other co-factors connected to the retail organisation based on the data I have chosen for Walmart. Big data is a potent instrument that can analyse any data set and unearth vital information about the future requirements and growth prospects of a firm.

Big data management can give businesses an edge in the market by supplying valuable insights. With the ability to detect patterns, trends and opportunities, organisation can keep up with latest trends, predicts customer's needs, and adapt quickly to the market shifts. This can help organisation to get leverage in the market over others. The beginning of the report will depict the impact of Data analytics on the business and its performance and illustrates the influence of Big Data on Walmart in recent times. To begin the analysis process for the collected dataset, it is essential to gather data from the trusted data sources. In this report, I will supply the demonstration of the source to ensure its reliability. In addition to evaluating all the data, we will also define any transformations presented in the dataset. Following the data evaluation, it is necessary to uncover it Strategic Insights that are relevant to Walmart's operations. This will be accompanied by recommendations for the company to improve its capabilities and prepare for future trends.

2. PART - A

2.1 Efficacy of Data Analytics on Business and Performances:

Big data analytics helps companies use their data and discover fresh possibilities, leading to better decision-making, improved operational efficiency, increased profits, and greater customer satisfaction. Business can use big data analytics to access and analyse vast amounts of data, enabling them to make strategic decisions based on patterns and trends that might not be clear through other means. This approach can reduce risks and increase the likelihood of success by providing businesses with valuable insights that inform their decision-making. Big data analytics enables business to gain deeper insights into their customers and their requirements. By analysing data on customer behaviour, feedback, and performances, businesses can relate more customized products and services, enhance customer service, and boost overall customer satisfaction. Additionally, big data analytics can help businesses optimize their operations by analysing data on the supply chain management, production processes, and other operational aspects, allowing them to find arears for improvement and act to minimize waste and increase efficiency [4]. Big data analytics can aid businesses in optimising their marketing strategies by allowing them to analyse data on customer behaviour, demographics, preferences, and create more targeted and effective marketing campaigns for different segments of their target audience.

Furthermore, big data analytics can give a competitive advantage to businesses by helping them in finding opportunities and potential threats within their industry. By analysing data on customer behaviour, market trends, and competitors, businesses can remain ahead of the competition and make data-driven decisions that set them apart from their rivals [2].

2.2 Impact of Big Data on organisation selected:

Walmart, which has a network of 10,500 stores and employs over 2.3 million workers, generated an annual revenue of approximately $559 million [3]. Big data analytics has had a significant impact on Walmart, the world's largest retailer. With the help of Big data Walmart can improve its inventory & supply chain management. Big data is utilising by Walmart to monitor stock levels, recognise patterns in customer demand, and predict future demand. This analysis of sales data and other pertinent information enables Walmart to enhance inventory levels, minimize waste, and increase product availability in their stores. Furthermore, big data

analytics is used by Walmart to streamline its supply chain operations, starting from sourcing and procurement to logistics and distribution. By studying data on supplier performance, inventory levels, and transportation routes, Walmart can increase efficiency, lower costs, and ensure that products are delivered to stores and customers in a timely manner. Through big data analytics, Walmart is able to customize its marketing campaigns and promotions based on the purchasing behaviour and preferences of its customers. This approach allows Walmart to more effectively focus its marketing efforts and provide a more individualized shopping experience for its customers. Walmart utilizes customer data analysis to recognise purchasing patterns and preferences, which allows the company to develop new products or exchange existing ones. This strategy enables Walmart to increase its sales revenue and maintain a competitive edge over its rivals. Walmart relies on big data analytics to detect and prevent fraudulent activities, including credit card fraud and return fraud. By scrutinizing transactional data and other pertinent information, Walmart is capable of identifying any suspicious activities and taking prompt action to prevent fraudulent activities. Walmart has been utilising big data to enhance its e-commerce platform by offering customised product recommendations and tailored promotions based on customer's shopping history. This, along with other data applications has enabled Walmart to make informed decisions and optimise its operations, leading to improved efficiency and profitability.

3. PART - B

3.1 Data Briefing

The Walmart sales data is a collection of sales data from 45 different stores located in United States spans the period of three years 2020, 2021, and 2022. This dataset will be used for how big data analytics can give retailers a competitive advantage. Additionally, the data has been collected from the most reliable and efficient website Kaggle.com (Zulamir Hassani,2021). Kaggle is an online platform that offers a vast collection of datasets obtained from various sources, including public and commercial organisations, academic institutions, non-profits and businesses[6].

According to Santaella Colón's review from 2019, the Walmart sales dataset that has been chosen for analysis in this case is based on yearly sales during the period of 5th February,2020 to 26th October,2022 [5]. The eight columns of Walmart data include the number of stores spread across various regions, weekly sales with dates, holiday flags indicating whether a special holiday week is in effect, the average temperature in the area where the store is located, the cost of fuel, the region's Consumer price Index, and the unemployment rate.

3.1 Data Cleansing & Preparation

Data cleansing, referred to as data scrubbing, is a process of detecting and rectifying errors present in the raw data. This is crucial because the raw data often includes irrelevant and non-meaningful parts that needs to be eliminated before carrying out any analysis. The primary objective of data cleansing is to guarantee that the data used for analysis is reliable, consistent, complete and accurate. To examine big data using multiple techniques, many businesses uses data cleansing procedures. Data cleansing is a time-consuming procedure, but it is thought to be the most effective technique to find and fix problems in big data sets.

In order to obtain a clear and accurate understanding of the data, it is necessary to perform data cleansing process. There is a wealth of information related to different countries, years, stores, prices, profits, and other relevant factors that need to be analysed and cleaned in order to obtain a clear vision of the data. Here, I have selected Walmart dataset, which contains information of 45 stores' weekly sales along with Holiday flag, Temperature, Fuel price, CPI, Unemployment rate in the United States in three years period from 2020 to 2022 [Appendix 1].

To obtain a clear view of the selected dataset, I arranged the dates in chronological order, starting from oldest to newest. Additionally, I filtered out the top hundred sales from the overall sales in order to focus on the most significant data points and improve the clarity of the analysis [Appendix 2].

3.3 Key Metrics and Relationships:

The following Graph depicts the key metrics of the Walmart dataset such as weekly sales related to different years. Not only that but the presentation also allows for the identification of other potential connections between other metrics such as seasonal temperature, unemployment rates, and fuel prices in the corresponding regions.

3.3.1 Weekly Sales by Walmart

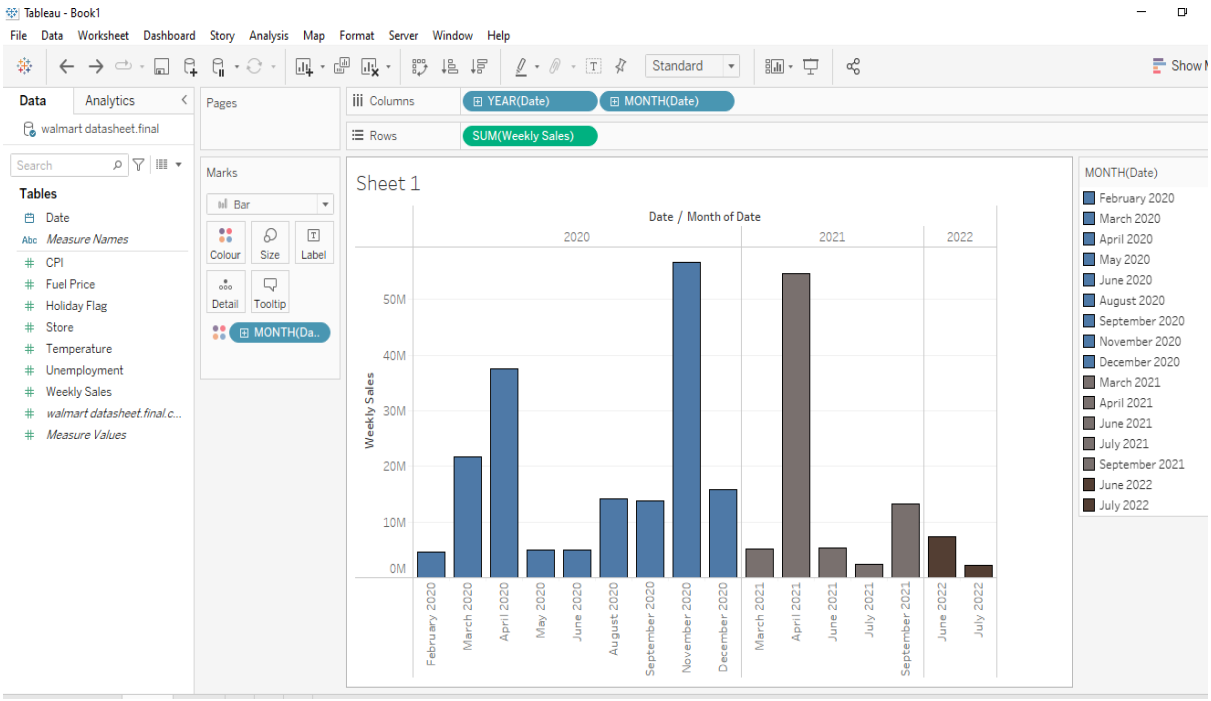


Figure 1 Weekly sales by Walmart (source-Self created)

The given bar chart displays the weekly sales of Walmart, presented annually with a monthly breakdown. The data shows that Walmart achieved its highest weekly sales of over 50 million in November 2020. However, in the year 2021, the highest sales were recorded in April. Following the peak in 2020, Walmart's sales have exhibited a declining trend, with sales ranging between 5 million to 15 million in the year 2021 and 2022.

Reasons for Walmart's decreasing sales:

- E-commerce: The rise of online shopping has caused a decrease in the number of customers physically visiting brick-and-mortar store like Walmart, as more people choosing to shop online instead [7].
- Changing Consumer's Preferences: There is a trend among Consumers to become more health- conscious and environmentally aware, which has caused a shift towards organic and sustainable products, which Walmart may not have much of in stock.
- Competition: Walmart encounters strong competition from other retailers like Amazon, Costco, and Target, who provide comparable products at competitive rates.
- Economic & Political factors: Due to Economic downturns, Consumer's spending has declined. Additionally, modifications in Government policies and regulations, especially in areas like labour laws and trade policies, can also have a negative impact on Walmart's sales[13].

3.3.2 Walmart's weekly sales compared with temperature

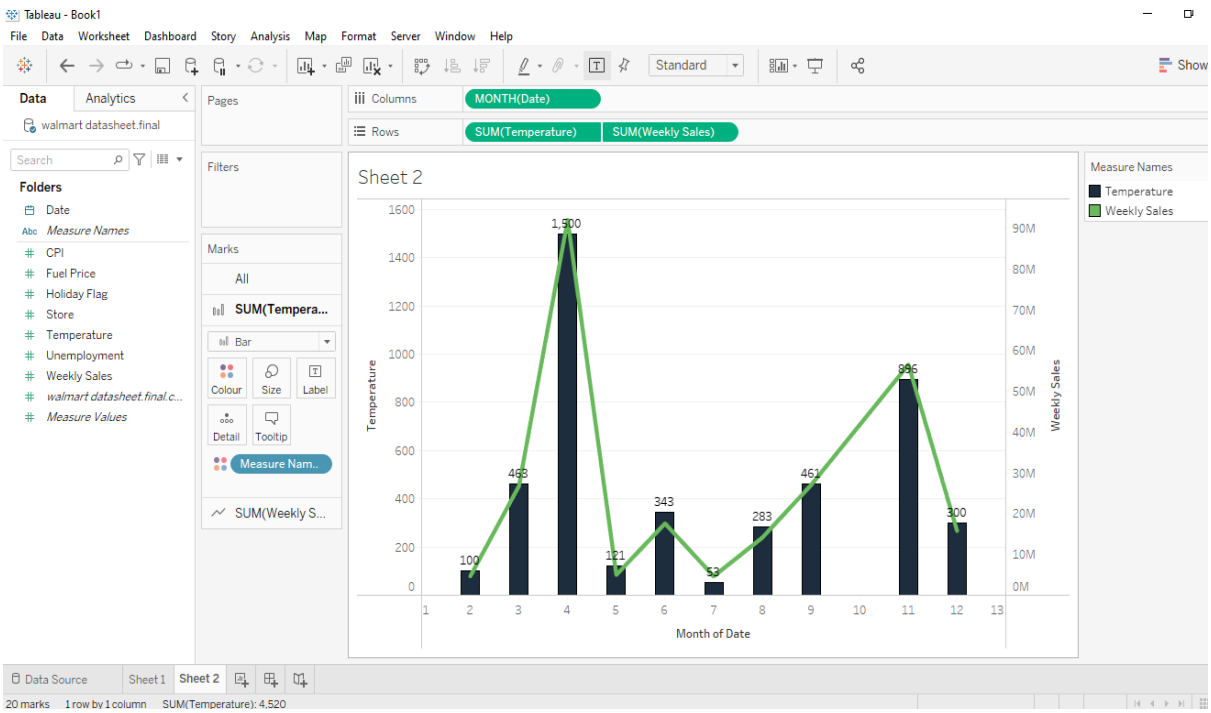


Figure 2 Weekly sales compared with temperature (source-Self created)

The given diagram compares the weekly sales of a particular region with the temperature on the day of selling. The data reveals that there is a correlation between the temperature and the sales, as a decrease in temperature leads to a decline in sales, whereas an increase in temperature leads to an increase in sales. Because when the temperature is high, people tend to

spend more time outdoors and are more likely to engage in activities like shopping. During hot weather, people may be more likely to purchase products such as cool drinks, summer clothing, and outdoor gear, which could lead to an increase in Walmart's sales. This is evident from the fact that the highest sales were recorded in the month of April, which is when the temperature tends to be higher. Additionally, the Spring break in the United States, which takes place in mid-April, also contributes to high sales during this time [9]. After April, the second-highest sales were recorded in the month of November, with a sales figure of 55 million. On the other hand, when temperature is low, people may prefer to stay indoors, resulting in decreased foot traffic (Bloesch, Justin, and François Gourio. 2015).

3.3.3 Comparison of Consumer Price Index (CPI) & Fuel Price

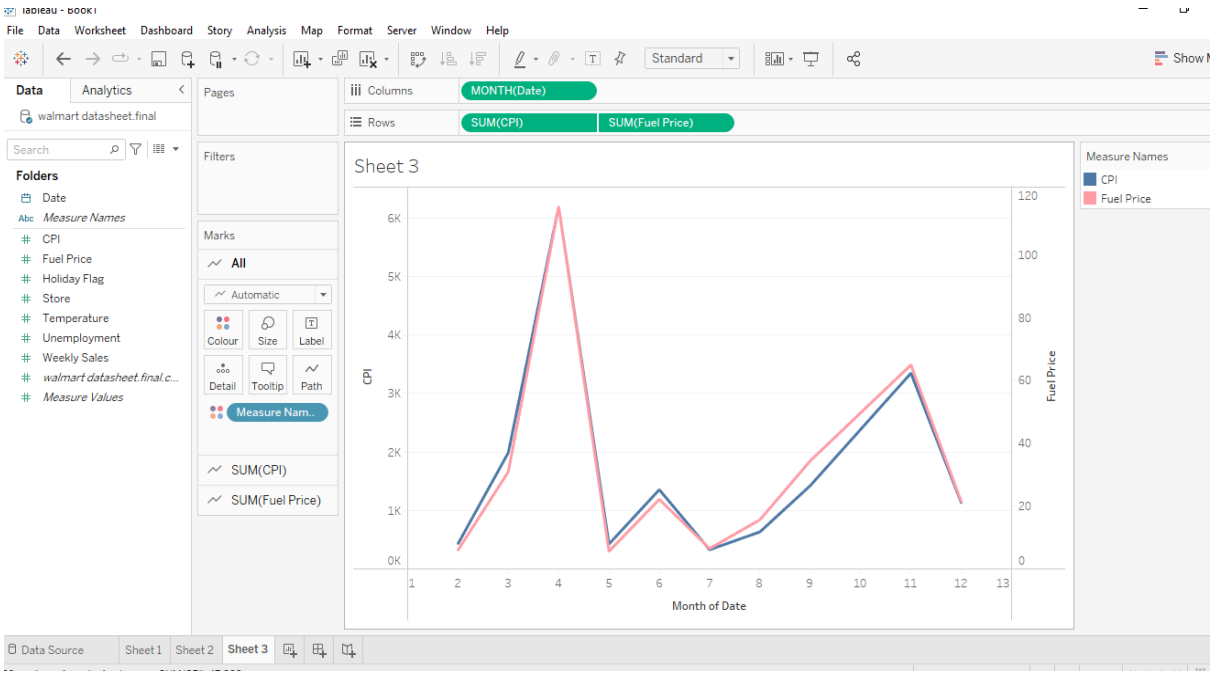


Figure 3 Comparison of CPI & Fuel Price (source-Self created)

Based on the provided line chart, it can be observed that the Consumer Price Index (CPI) and fuel prices are interrelated – a rise in fuel prices leads to an increase in the CPI and vice versa. The CPI measures the change in the current prices of goods in the market basket in a particular period compared to a base period (Andrew Loo, 2023)[10]. Since fuel prices are included in the calculation of CPI, any fluctuations in fuel prices can affect the overall CPI figure, whether they go up or down. In the line chart, the CPI reaches its highest point at 6k when fuel prices exceed 100 US dollars, and then it decreases in July when CPI was below 1k and fuel prices were below 20 US dollars.

4. Strategic Insights:

In today's dynamic and competitive business landscape, a strategic insight is a valuable asset for any organisations. Through analysis of data, strategic insights can provide organisations with the information they need to make informed decisions, innovate more efficiently, and maintain a competitive edge. By harnessing the power of strategic insights, organisations can navigate changing market conditions and stay ahead of their competition. In this report, strategic insight will demonstrate how data was utilised and highlight key takeaways that can be derived from visualisations presented within a report.

With the accumulation of data from 2020 to 2022, Walmart's sales have been impacted by various factors, including the increasing trend of digital shopping. Other factors that have affected Walmart's sales include seasonal temperature changes, fluctuations in the Consumer Price Index and Fuel Price, and changes in the employment rate. Based on the data, it can be inferred that higher employment rates and stable seasonal weather conditions can lead to increased sales. To visualize this dataset and get a clear idea, Tableau software was utilized.

5. Recommendations

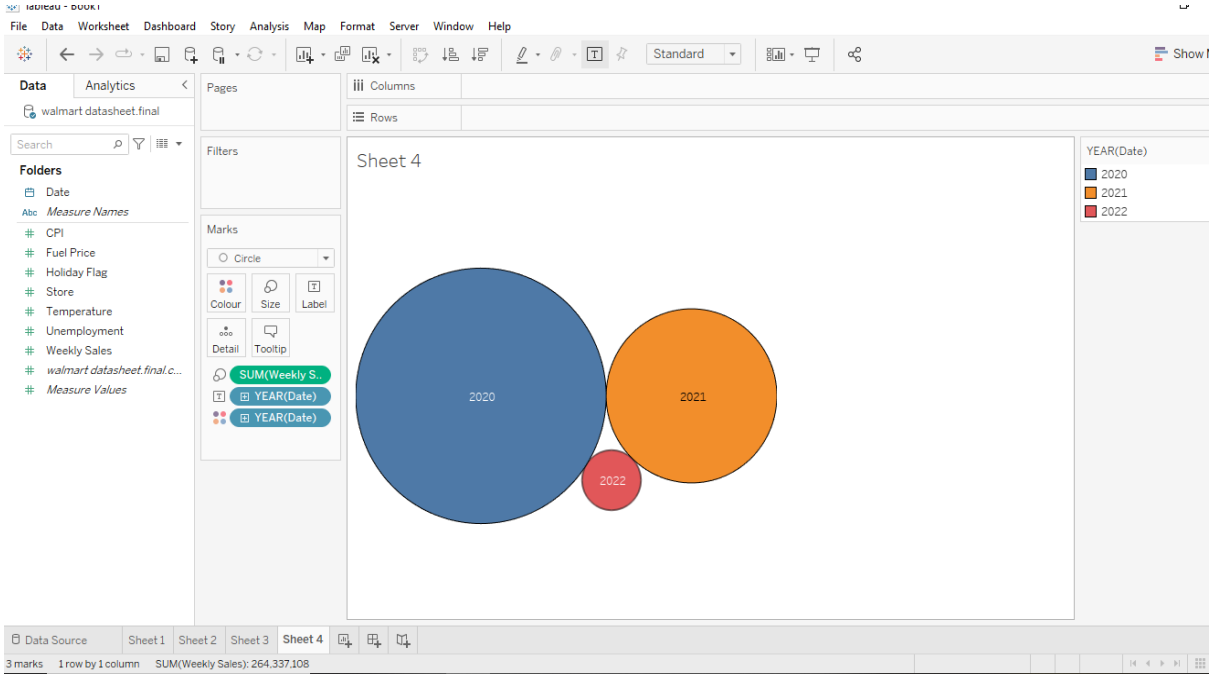
One of the most effective ways for Walmart to increase its sales by expanding e-commerce business to reach out more customers who prefer to shop online. This will help to ensure a positive customer experience both online and in-store. Additionally, collaborating with social media influencers can help to promote Walmart's products to a wider audience, especially among younger customers who are active on social media platforms. By adopting these strategies, Walmart can boost its sales and stay competitive in the constantly evolving retail market.

6. Conclusion

The report explains how Big Data analytics is a crucial aspect of modern business industries, used for tasks like forecasting, error detection, data cleansing, and visualisation. The data is usually presented in a software like Tableau, which allows for clear graphical representation. By analysing the data, it is evident that Walmart has experienced a downward trend in sales for the years 2020,2021, and 2022. This decline in sales is not only affected by Walmart's internal factors, but also by external factors such as temperature, Consumer Price Index, and fuel prices. Any changes in these external factors can impact Walmart's sales.

7. Appendices:

Appendix 1



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