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FURNITURE RETAIL: IKEA

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Introduction

IKEA is a home furnishings company founded in Sweden, in 1943, by Ingvar Kamprad, who began selling only wallets, pens, watches, picture frames and jewellery and now IKEA has become one of the most well-known home furnishing brands in the world. IKEA also provides millions of customers with economical household goods from more than 400 stores around the world. IKEA's mission is to improve everyday life for as many people as possible by providing a huge selection of well-designed, useful home furnishings at extremely affordable prices. As there are many people who can afford a beautiful and functional home, IKEA constantly takes challenges to produce more without compromising on quality. This enables more consumers to choose IKEA as their choice to purchase products and services. IKEA is also constantly looking for new and better ways forward because they believe that whatever they do today, they can do better tomorrow.

As IKEA expands widely across the world, the issue comes up when the large amount of data generated every minute. The volume of data produced in-minute becomes bigger and more complex, by simply processing the huge volume of big data without proper data management would not be helpful to the company. Moreover, all the data cannot be ignored by the company as it will create a gaps that results in incorrect communications and observation and poses a huge challenge in business analytics. IKEA's weak market presence in Asia would be its second issue. It is undoubtedly challenging to enter into a new market, particularly when it becomes necessary to meet the demands of clients from a different cultural background. For instance, the size of the furniture was IKEA's biggest complaint in Japan. The standardised size that worked so well for Northern European homes did not at all fit Japanese apartments. This demonstrates that unless a thorough analysis of the market is carried out, an organisation is highly likely to encounter misunderstanding the customer demand.

Getting big insights by analysing business and customers make fact-based decisions. Enable them to know the trends before they are trending. Developing a deep understanding of consumer behaviour and people's lives at home. Turning all that knowledge into a better everyday life for IKEA customers. To summarise, this project aims to automate the collection of data for analysis by delivering enhanced business intelligence that fuel insights for marketing, sales and operations at the same time ensure to increase the data quality, consistency and security along its secure data pipeline.

Data analytics is the key to unlocking the useful insights hidden in the diverse range of data that businesses produce. Data analytics may help a company with everything from tailoring a marketing message for a specific client to recognising and reducing business hazards. Here are five advantages of using data analytics. Ultimately companies can use data analytics to guide business decisions and minimise financial losses. Predictive analytics can suggest what could happen in response to changes to the business, and prescriptive analytics can indicate how the business should react to these changes.

IKEA is one of the companies that are eager to explore data and help them to grow and stay relevant in today's era of information. One feature that sets it apart from the competition is its utilisation of qualitative and psychographic data to understand its customers better and delve deeper to develop personalised experiences for its customers.The design of IKEA's showroom is heavily influenced by qualitative data. IKEA offers walk-in rooms and flats that are fully furnished and have room proportions inscribed on the walls, in contrast to the majority of furniture showrooms.

IKEA can make sure that the rooms and apartments represent how clients actually live by using qualitative data. Customers from the same demographic areas frequently have vastly different values. Here is where psychographic information is crucial. In one instance, psychographic data showed that Pittsburgh consumers reacted far more favourably to advertisements stressing IKEA's affordable prices than to advertisements emphasising other attributes. IKEA used this data to create highly personalised, price-focused messages for clients in Pittsburgh. If IKEA had only based its decisions on demographic information, it would not have known how price-sensitive Pittsburgh is.

Real-time analysis of consumer purchasing patterns is necessary to optimise stock levels across multiple in-store and online channels in order to reduce the demand and supply gap, which is a bottleneck for retailers globally. To do this, IKEA developed the ground-breaking Demand Sensing technology, an AI-based technology that optimises stock levels to guarantee consistency in its customers' shopping experiences.

The technology uses up to 200 data sources for each product in order to more intelligently and accurately forecast demand in the future. The algorithm takes into account a variety of influencing factors, such as consumer preferences during festivals, the effect of seasonal changes on shopping patterns, and weather forecasts, among others. It can even spot a spike in in-store traffic during the month, such as the day after people get paid.

Methodology

Methodology

1. Business Requirement

   a. Executive Summary
      IKEA is seeking for an improvement in the data mining and warehousing management system to meet the demand in chain supply, boost the revenue, improve customer relationship and build a strong data-driven company from enhancement of their analytics and prediction skills for better decision making.

      We proposed that IKEA will have this system launched within the second quarter and will evaluate systems, implement the system, and provide adequate training to managers and employees by June 1, 2023.

      There are a number of requirements we're looking to satisfy, including career path mapping, reporting and analytics, and goal management. A number of stakeholders will be involved in the selection and implementation of this system, including a project manager, human resources, department heads, executives, managers, and employees.

   b. Project Objectives
      i. Automate the collection, aggregation and analysis of data.
      ii. Deliver enhanced business intelligence that fuel insight for marketing, sales and operation.
      iii. Increased data quality, consistency and security along its secure data pipeline.

   c. Requirements
      i. Platform Function
         The tools need to provide users with interactive visualisation, easy directory and customization for any changes.

      ii. Performance Requirement and Scalability
         High scalability is important due to the rapidly unexpected workload the system will handle due to the high volume of data per milliseconds.

      iii. Data Analysis and Visualization
         Data visualization makes complex analysis easy to understand for non technical people using interactive dashboard to gain more insights.

      iv. OLAP

OLAP is needed to perform multidimensional analysis for large, layered dataset to extrapolate prediction and uncover the relationship between data.

v. Decision Service and Integration

Financial Management, Regulatory Compliance Monitoring, Threat/Fraud Detection and Consulting Services are examples of decision service needed to maximize the insights from the data we collected and much better when the tools support data integration to incorporate with many sources.

2. Data Mining and Warehousing Process
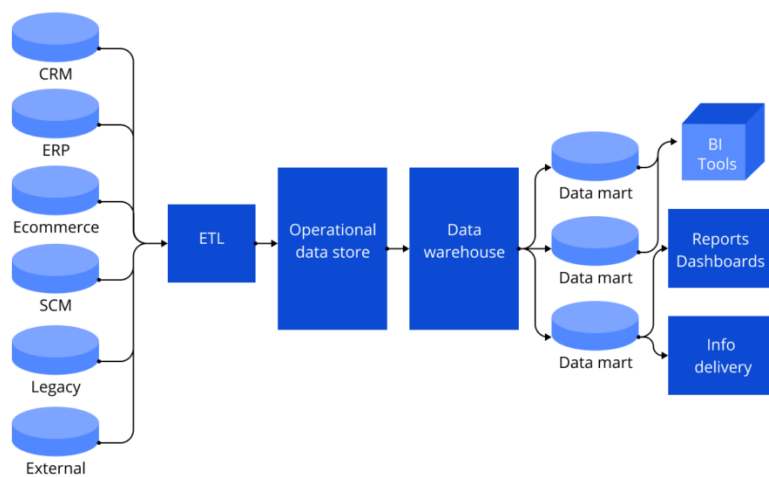
i. Understanding Data Domain

In this project, we understand that the data domain is related to retail details where the products will be the IKEA's product, customer details, payment details, warehouse details and monitoring details from the store itself.

ii. Choosing Data Source

IKEA had physical stores and online stores. The data for the sales come from both sources where all the payments, transactions and customer details were gathered. Besides, the data also came from the Supply Chain Management software, Customer Relation data and Enterprise Resource Planning software.

iii. Determine the Ingestion Strategy

For better performance of the pipeline for our data warehousing and processing, we opt for a stream incremental load strategy where they use a selective method to move data from one system to another as it is faster, consistent and secured.

iv. Design the Data Processing Plan

The data preprocessing framework that will perform the actual transformation of the data and support incremental data stream incremental load is Apache Spark. The framework also will apply all the business logic such as duplication logic, filtration, data validation, join operation, group data by operation and whatever it needs to transform the data for the business analytics.

v. Setup Storage For Pipeline Output

Data warehouses only hold processed data that has been used for a specific purpose. One of the benefits of a data warehouse is that storage space is not wasted on data that may not be used. Data lake stores raw data that can sometimes have a specific future use and sometimes just for hoarding. Hence, data is less organized and filtered in the data lake. For this project, we choose Amazon Redshift as our data warehouse based on its simplicity and Amazon S3 as our data lake due to agility.

vi. Plan The Data Workflow

Data workflow will be monitored by Apache Airflow. The advantage of using it over other workflow management tools is that Airflow allows us to schedule and monitor workflows, not just author them. This outstanding feature enables enterprises to take their pipelines to the next level.

vii. Monitoring & Governance Tool

Grafana can be used to monitor this infrastructure and log analytics, predominantly to improve the system's operational efficiency. Dashboards make tracking users and events easy as it automates the collection, management, and viewing of data.
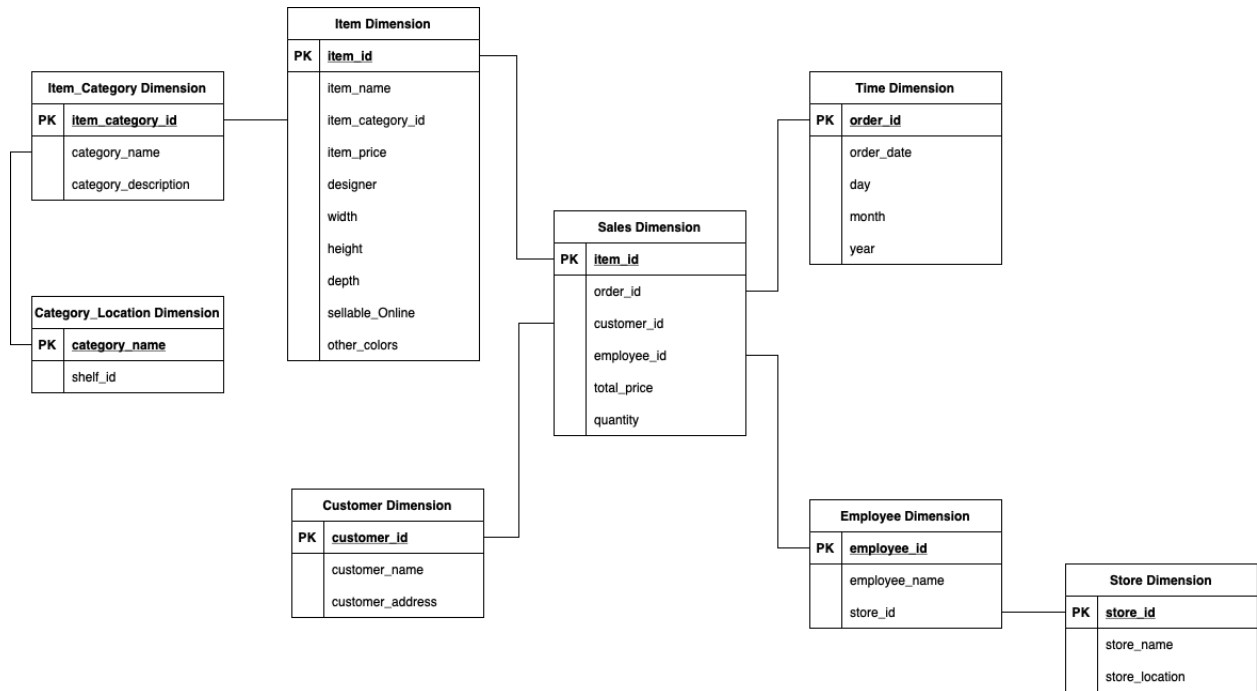
Design

Data Warehouse

Figure 1: Snowflake Schema of IKEA Data Warehouse

Link Data Warehouse Schema:
https://drive.google.com/file/d/1MGOnmrPjuUqFiDNKV6r_JpV2TzM55X3z/view?usp=sharing

The above figure is designed based on our observations of IKEA operations and is also referred to a dataset collected from Kaggle. The dataset consists of scraped data from IKEA Saudi Arabia website for the furniture category (Kallam, 2020).

Generally, we know that IKEA is a large furniture based retailer worldwide, where they sell furniture for people to build by themselves. Hence, the data warehousing design for IKEA operations can be designed simply based on their operations physically and virtually. This schema uses snowflake schema design, which we believe is the most suitable to cover the overall operations in IKEA. The designed IKEA data warehousing schema involves eight different dimensions namely Item, Sales, Time, Item_Category, Category_Location, Customer, Employee, and Store dimensions.

Proposed Report and Analysis

With the data stored in the data warehouse, we can provide reports and analysis to the end-user which are the stakeholders, managers and also customers through dashboards and other reporting tools. For retail and furniture businesses like IKEA, there is a wide range of data they can utilize for ad-hoc reports, day-to-day inventory query reports or annual financial reports.

   a) **Inventory Reports**

        For example, we can track how many items in a certain store inventory sorted by categories as shown in figure 1 below. This sample inventory dataset is scraped from IKEA Saudi Arabia website in 2020. From the chart, we can see that "tables & desks" has the most number of items, followed by "bookcases & shelving units" and "chairs". This shows that those categories have higher demand for furniture in IKEA and more quality designs should be taken into focus to attract more sales.
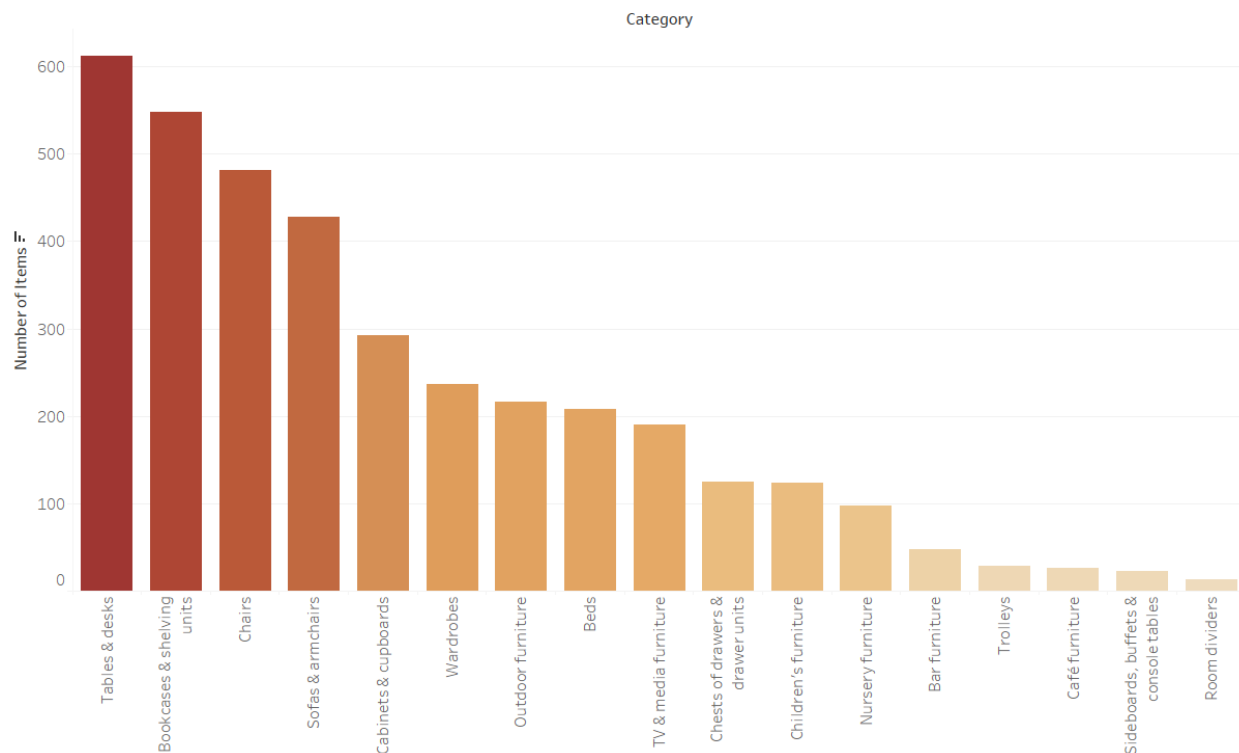

Figure 1: Number of Items in Each Category

b) Analytical Report

Moving on, we can perform some analysis to gain insights from our data warehouse for the end-users. In figure 2 below, we are trying to find whether the volume of the furniture has any correlation with its prices. Does bigger furniture reflect higher prices? And from the chart below, it is indeed showing a positive linear trend meaning bigger furniture will probably have higher prices. Other than that, we can also find out the price distribution or average prices of furniture by its categories. This is to find out what kind of furniture has higher prices on average. In figure 3, boxplots of prices by categories tells us that "sofas & armchairs", "wardrobes" and "beds" are the top 3 priciest categories of furniture which means bringing more numbers to sales in IKEA. Focusing on these categories in sales marketing such as offering discounts, price optimization, and more showcases would turn out good in profits.

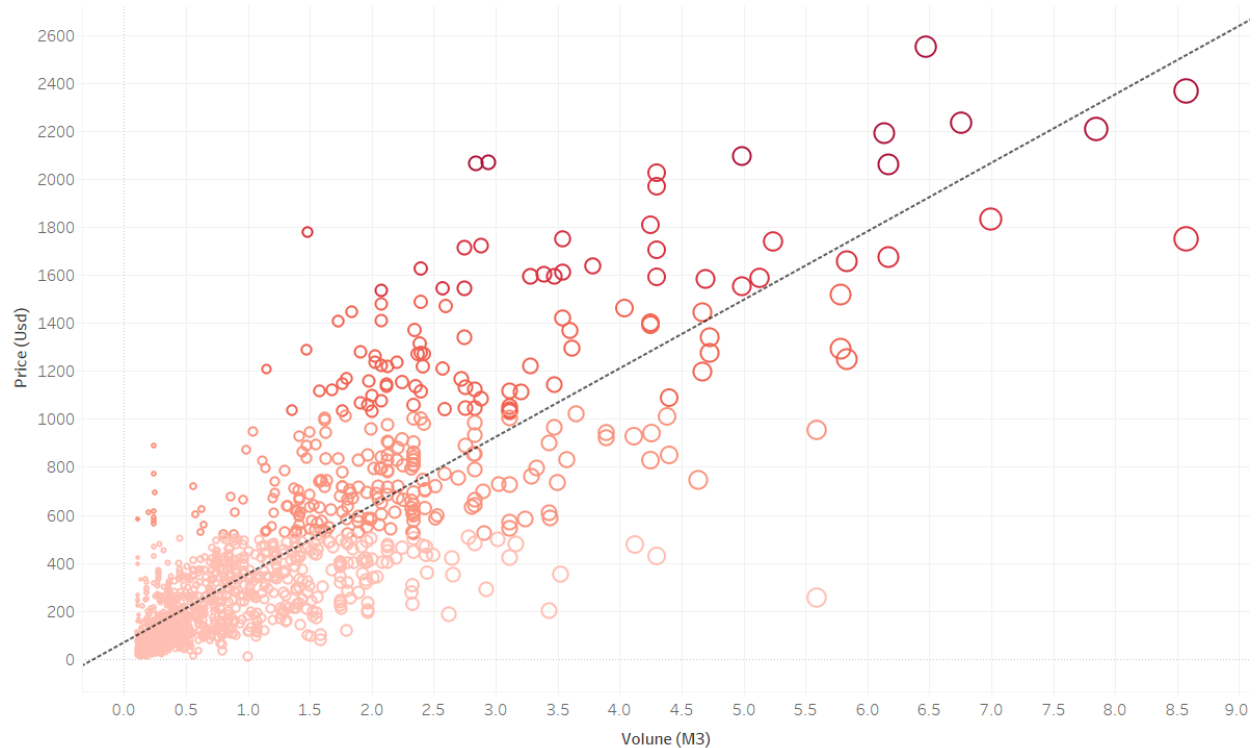
Figure 2: Price of furniture (USD) against volume (m3)
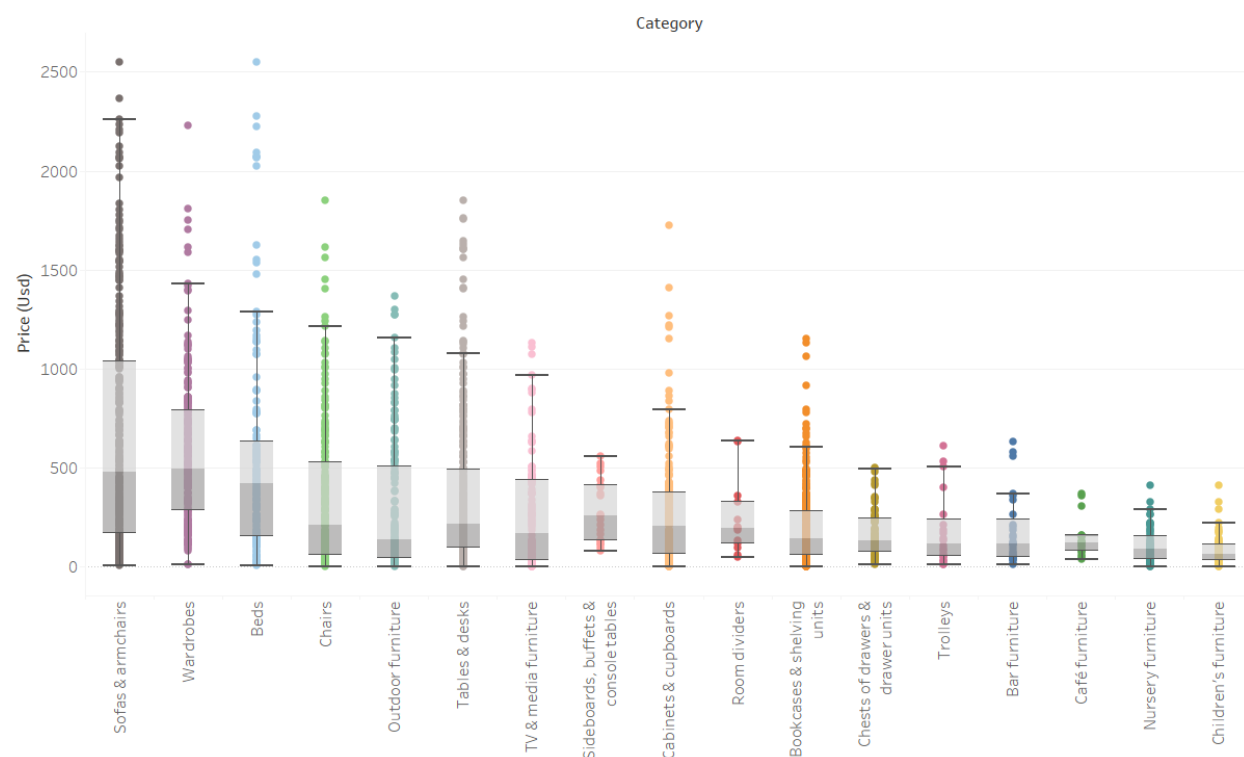
Figure 3: Prices distribution by Categories

c) Financial Reports

In addition to that, making business related reports is one of the vital outcomes from our data warehousing. To see whether the business is performing well or not and relates it with current issues and finding out why it turns out like that. In figure 4, 5, 6, the data is extracted from IKEA financial reports from 2016 to 2022. In figure 4, the retail sales of IKEA dropped from EUR 41.3 billion to EUR 39.6 billion in 2019-2020 due to COVID-19 outbreak which is highly affecting business worldwide. 2020 has been a tough year for IKEA. During the pandemic, 75% of IKEA stores closed for seven weeks on average. Despite that, many stores still continue to provide online orders. When restriction orders got less restricted and most stores reopened, customers returned and in 2021 IKEA stores welcomed 775 million visitors (Figure 6) that is below 2019 (1 billion visits) which is pre-pandemic.

In 2022, IKEA retail operations were less affected by SOPs to prevent the virus. Unlike in 2020 and 2021, most IKEA stores remained open without (severe) restrictions and store visitation rose (Figure 6) compared to the two previous years. Total retail sales for 2022 achieved EUR 44.6 billion (EUR 41.9 billion in 2021). This includes sales of IKEA products, food and services to customers. Compared to 2021, retail sales grew back by 6.5%. Despite a positive trend in retail sales during pandemic (2020-2022), the net profit is showing the opposite trends. This is due to multiple reasons which are supply chain disruptions that led to a substantial drop in the availability of products, raw material and commodity prices continued to rise, as well as costs related to transportation and logistics and the war in Ukraine has also affected the IKEA business and customers.

In short, by studying and analyzing the reports provided through data warehouses, we can get insights from trends and patterns of our company progress, achievement and also problems. We can see the net profit of IKEA is not doing so well in post-pandemic and from there we find out what are the possible causes of the problems and tries to think up solutions and decisions to improve the financial states of IKEA or its performance.

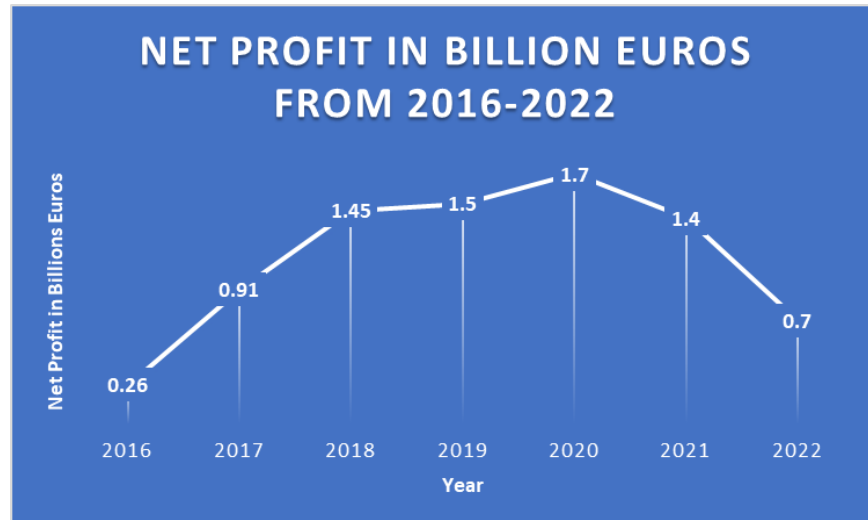*Figure 4: Retail Sales of IKEA (2016-2022)*

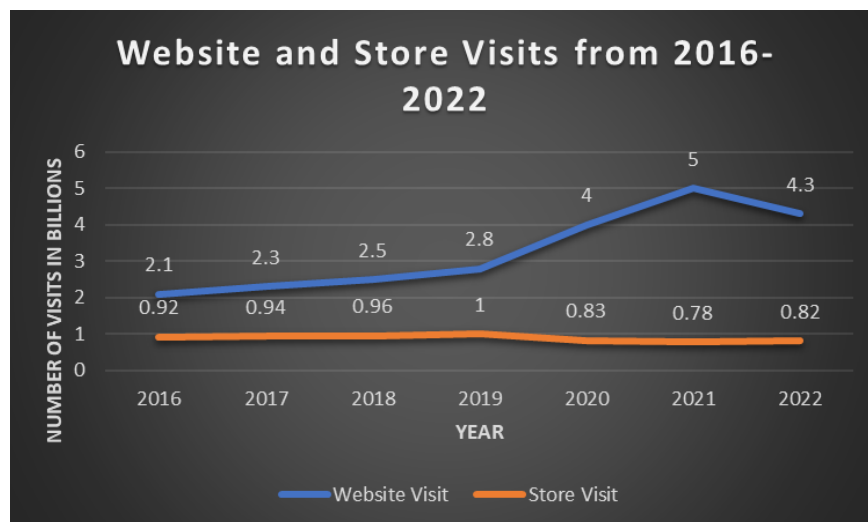*Figure 5: Net Profits of IKEA (2016-2022)*

Figure 6: IKEA Website and Store Visits (2016-2022)

Conclusion

As IKEA has moved towards becoming a data-driven company, data warehouses perform as a powerful tool particularly in managing data that support business intelligence. We also conclude that by understanding the data domain, choosing data sources, determining the ingestion strategy, designing data processing plan, setup storage for pipeline output, planning the data workflow and monitoring are the processes in planning and building a data warehouse. Additionally, data warehouse aids in providing end users with financial, analytical, and inventory reports, which are all beneficial to the company. This approach really gives a big impact on IKEA's ability to maintain chain supply, boosting their revenue, and understanding the customer behaviour. With the advanced technology of data infrastructure, IKEA was able to shift from experience-driven to entirely data-based decision-making.

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