

Proposing Value-based Pricing Strategy for Business-to-Business Data Exchange in eBusiness

Prof. Sunantha Krishnan, Gianna Drego, Ishmeet Kaur, Mushira Shaikh

Department of Information Technology Don Bosco Institute of Technology University of Mumbai, Maharashtra, India

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Abstract — In a world of high computation capabilities and technologies boom, with everyone hooked to online shopping during the lockdown, it enabled the business models to gather volumes of customers' activities-related data. After capturing data, business giants or tier I companies, namely Amazon, Google, Microsoft, and Twitter, identified promotional advertisers like Grammarly, Netflix, Amazon Prime, Zoom and etc., The pattern of such customer data showed the history of visited sites or products seen or purchased including dislikes during off and on season periods or month or day that creates new business avenues for tier II companies. This has paved further to boost the economy of tier I companies, to identify collaborative businesses partners to sell such customer analytics through a value-based pricing strategy. This system firstly proposes a model on how to identify such potential business collaborators for tier I companies, tested using google analytics and Power BI technologies. Secondly, it proposes three different strategies of value-based pricing that will create business avenues for tier II companies through a personalized set of business propositions, and lastly, it provides a comparative study of the analytical tools to further propose the right technology tool to observe the key performance indicators (KPI) or to derive a performance insight of business solutions.

Keywords — Data Exchange, Customer analytics, Business Avenues, Value-based pricing strategy, Key Performance Indicator.

I. INTRODUCTION

Today's business environment demands collaboration in various business solutions, which is derived by focusing on the perspective of customers. The system is modeled to identify i. Perspective Customer ii. To arrive at a perspective price for a potential customer by tracking key performance indicators, namely the time spent on viewing a product, frequency of the visit to view the same product, the rating provided for the product, the number of forwarding clicks, clicking pattern, link breaking patterns, feedback, likes, and ratings. The Value-Based Price (VBP) strategy is a winning strategy for businesses to collaborate and to exchange the customer analytics from tier I companies like Amazon and Google to exchange data or migrate data to tier II companies like Netflix, Grammarly,

Insurance, Mutual fund companies, and so on. This project summary the comparison between google analytics and the Power BI tool and gives suggestions on which tool to apply to capture the appropriate insights that create business openings for tier II companies or helps to identify weak areas and to provide personalized, precise business propositions or recommendations to each and every individual customer.

The lockdown has pinned each person to the online high-end business solution, product, and service companies to collaborate with small-scale businesses in no time to adapt to new technology and computational capabilities to promote a focus towards customers' personalized online market, offer, and recommendation. Pricing with or without some discounts was the most challenging aspect of marketing. In the business-to-business world, buyers demand more valued products, and they expect to be able to negotiate the price. This can be done by Dynamic pricing strategies. The pricing strategy must be adjusted to the value the customer perceives the product; this data is exchanged between collaborators such that these businesses can carry out e-commerce boosting by fixing the value-based pricing of various products. Value-based pricing is a pricing strategy, which sets prices customers are willing to pay based on the perceived value of a product or service. The key to value-based pricing success is the recognition that the price the customer is willing to pay depends on the customer's value requirements.

II. EXISTING SYSTEMS

Assc et al. [1] concluded that electronic data interchange meets customer requirements, improves customer service, and gains a competitive global market advantage only to a certain level. This system does not consider value-based pricing and only considers value-added pricing without analyzing customer patterns [1]

Wickboldt et al. [2] provide an overview of existing pricing approaches like cost-based pricing, competition-based pricing, and value-based pricing to design a framework in order to automatically determine a fair market value and conclude that Value-Based Pricing is the right approach to find a Fair Market Value.

Engine et al. gives an insight into the Key Performance Indicators (KPI) that is measured to determine the



scalability of any E-Commerce business. KPIs are Ways & Means to maintain a healthy website in terms of high conversion rate and lifetime customers. The Cost of Acquiring Customer or CAC is the cost associated with every customer you bring to your site. CAC accounts for the marketing costs like creating content, social posts, paid ads, SEO, and other aspects required to get a customer to buy on your site. For a successful eCommerce website, CAC should be as low as possible and should decrease over time. Conversion rate determines the percentage of people who come to your site and end up making a purchase [3].

Jackisch et al. [4] dictate that the world Class Pricing Framework to implement effective value-based pricing for measurable, long-term success. the results derived are for generating pricing automation the system, there should be four vital elements considered. Define your pricing strategy and align it with your business strategy. A value-based pricing strategy is the best pricing strategy for most companies today. This paper discusses the finding of a pricing opportunity in competitive B2B markets. How to successfully implement a 1% price increase for 11.1% profit growth. The results drawn was a better B2B pricing can result in growing revenues without much volume loss. Micro-segmentation (crossing customer segments against the product segments) is the primary approach. The highest margins should be in the top left, and the lowest margins should be at the bottom right.

III. EXISTING STRATEGY OF VBP

A. Value-added pricing

Currently, most businesses use a value-added pricing strategy to sell their products. Value-added is the difference between the price of a product or service and the cost of producing it, i.e., a product is sold to every customer at the same price. You can target only a limited number of customers who can afford your product. There are a limited number of customers in a market who can afford the high prices, thus limiting sales.

B. Market-centric pricing

A market-centric pricing method is used in which price is based on the current market conditions. This method compares similar products being offered on the market and sets the price accordingly. Even the most extensive market research can't always accurately predict what the future holds in terms of customer demands.

C. Analytics of customer for recommendation

Analytics of customers is used for recommendation. Large amounts of information on customers' behavior, activities, or preferences are collected in order to predict what users will like based on the similarity with other users. For example, Amazon will recommend many products from different categories based on what you are browsing and pull those products in front of you, which you are likely to buy. The issue with these analytics of a customer is they think they know you. Because of data and product dependency, they don't. Facebook algorithms, for example, have been shown to poorly reflect a user's actual

preferences.

IV. PROPOSED SYSTEM

Our focus was to develop a business model to perform customer analytics based on the proposed key performance indicator to capture the customer perceived price

V. SYSTEM ARCHITECTURE phase 1 & phase II

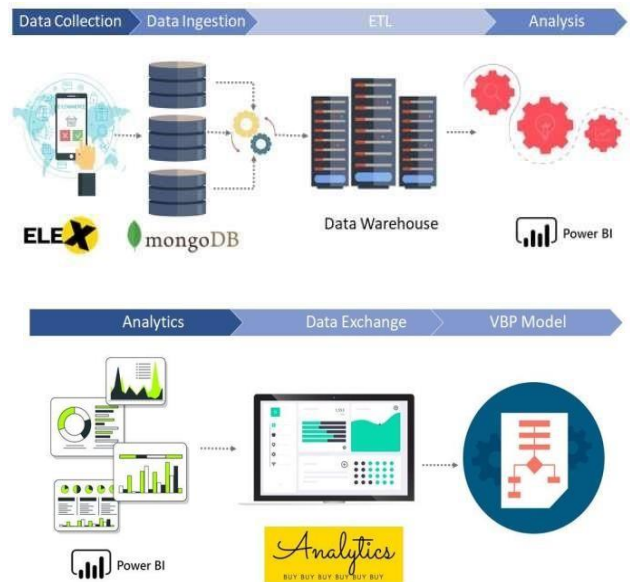


Fig. 1 System a. Phase 1 b. Phase II

A. Data Collection process using Google data Store

E-Commerce Website: using a self-hosted website, the system to track certain KPI's.

a) Recording User Data using Node.js, MongoDB:

The KPI was recorded for all the online customers with the help of APIs created in Node.js. This data is stored in our database (MongoDB). The KPIs that were considered were as follows clickstream pattern of the user and user's saved products, Page hits, page views, session details, user's searches, active users, user's location, product reviews, ratings, and product views.

b) APIs in Node.js:

Node.js is an open-source, cross-platform, JavaScript runtime environment that executes JavaScript code outside a web browser designed and developed APIs in Node.js and Express framework that collected user's activity on the e-commerce website and stored in the MongoDB database.

c) Storing and accessing data (MongoDB):

Storing and accessing customer data is done through MongoDB. MongoDB is a document-oriented NoSQL database used for high-volume data storage. As shown in Fig 8, the stored user information and activity of various users as in different collections, namely Activity_log, Search, User info, Wishlist, Session.

Analytics						
DATABASE SIZE: NANB		INDEX SIZE: NANB		TOTAL COLLECTIONS: 12		CREATE COLLECTION
Collection Name	Documents	Documents Size	Documents Avg	Indexes	Index Size	Index Avg
Activity_log	603	64.97KB	111B	1	52KB	52KB
Search	260	20.81KB	82B	1	44KB	44KB
User_info	564	111.51KB	203B	1	52KB	52KB
Wishlist	404	34.18KB	87B	1	44KB	44KB
clickstream	8870	1.55MB	164B	1	112KB	112KB
page_view	327	37KB	116B	1	20KB	20KB
product_review	632	100.33KB	163B	1	52KB	52KB
sessions	30	8.62KB	295B	2	76KB	38KB

Fig. 2 Snippet of Recorded Database

B. ETL Process and Analytics with Microsoft Power BI

a) Generate Analytics:

In this step, we export raw unstructured data, which was collected in the previous step, and transform the data into a structured format by the process of ETL (Extraction, Transformation, and Load) in Power BI. Power BI helps us manage the huge amount of user data that was collected. After transforming and loading the data, we perform analysis on this data with the help of charts and various reports. The results of the analysis are then stored in the form of charts and analytical reports.

An ER diagram shows the relationship among entity sets. An entity set is a group of similar entities, and these entities can have attributes.

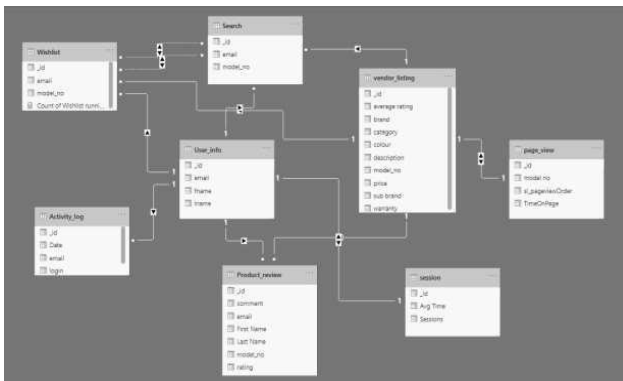


Fig. 3 ER Diagram

The ER diagram is shown above consists of 8 tables, namely Vendor listing, User info, Wishlist, Activity log, Search, Product Review, Session, and Page view. The Vendor listing table is the Master table, and all the other 7 tables are Transaction tables.

Master Table – This table consists of permanent data, whereas the Transaction tables keep updating. The Vendor listing table consists of all the information regarding each product that is displayed on the E-commerce website. Model no is the primary key in this table. This table has one too many relationships with Search, Product review, Wishlist tables referenced by model no, and one-to-one relationships with page view referenced by model no.

Transaction Tables User Info – Consists of details of each registered user on the website. _id is the primary key where each user is identified by a unique id. User info has one too many relationships with Wishlist, Activity log, Search, Product review tables, and one-to-one relationship with Session and Vendor listing table.

Activity log – Consists of all the login dates and times of each user on the website. This table is connected to the User info table via _id, which is the primary key Search – All the products searched by each user on the website get stored in this table. It is connected to User info, Wishlist, and vendor listing table with one-to-many relationships. It has many to many relationships with the Search table. It is also connected to the user info table.

Session – All the session durations and average time spent by each user on the website are stored in this table every time the user login.

Wishlist – The product saved by each user in their Wishlist is recorded in this table.

Page view – Time spent on each product by each user is recorded in this table. It has one to one relationship with the vendor-listing table.

b) Powerbase:

Power BI is a business analytics service by Microsoft. It aims to provide interactive visualizations and business intelligence capabilities with an interface simple enough for end-users to create their own reports and dashboards.

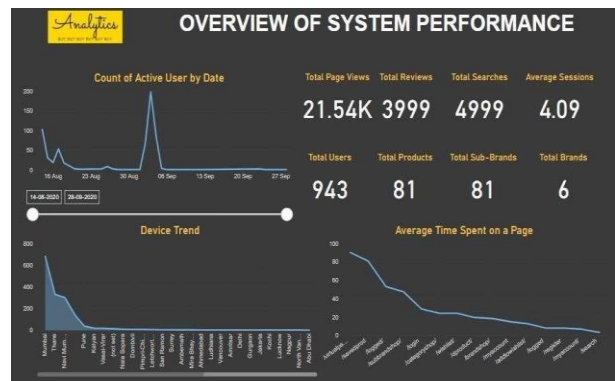


Fig. 4 Powerbase Dashboard

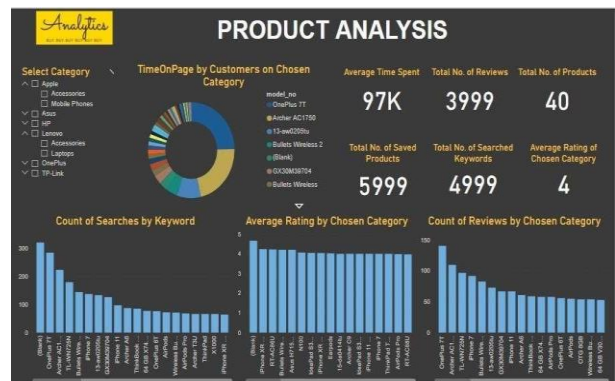


Fig. 5 Powerbase Product Analysis

C. B2B Sales Website

This website will cater to B2B companies. The website will contain customers' data that are to be sold to the third company. The data, which was analyzed and transformed, will be presented in various formats such as graphs and tables to attract Third-party companies. Each business will have to log in to our website, and their browsing behavior will, in turn, be used for calculating the value-based price. The data displayed on this website can be accessed by certain businesses that want to know their customers, customer types, and customers' interest in their product/s. Using the analytics reports and charts, the business can view their product trends and get insights.

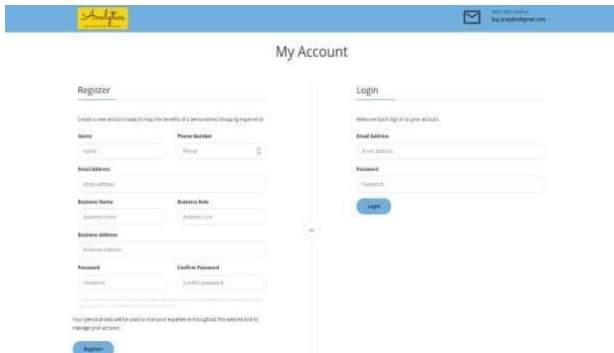


Fig. 6 B2B sales website login and register page



Fig. 7 B2B sales website integrated with Powerbase report



Fig. 8 B2B sales website dashboard

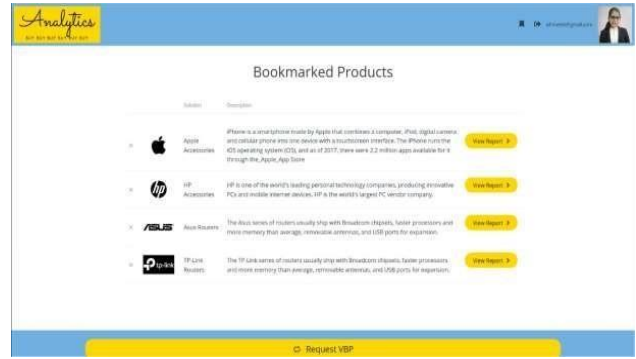


Fig. 9 B2B sales website bookmarked products

D. Proposing Value-Based Pricing Strategy

a) Observing Business Viewing Patterns:

When a business registers on the B2B sales website, we will observe the business based on how interested they are in knowing more about their customers and customer insights. We will be able to provide them with the necessary information they require on their customers, which will improve their product sales thus increasing profits. The KPIs that will be considered for each business is the Clickstream pattern of the User. User's Saved Products, User's Page hits, User's Pageviews, Session details, User's Searches, User's requirements/preferences

b) Value-Based Pricing and Its Strategy:



Fig. 10 Value-Based Pricing Strategy

- Pricing goods based on (consumer) value means setting the price based on the buyers' perceptions of value rather than on the seller's cost.
- Customer perceived value is the notion that the success of a product or service is largely
- based on whether customers believe it can satisfy their wants and needs. This is also many times done in comparison with its peers.
- The targeted value and pricing begin with analyzing consumer needs and value perceptions, and the price is set to match the perceived value. It's important to remember that "good value" is not the same as "low price".
- "Don't consider the cost, but the value" When its customs to B2B marketing and selling content, "data-driven decisions" has become a business imperative and key B2B competency.
- The targeted value and price drive decisions about what costs can be incurred and the resulting product design.

c) Feed data into VBP algorithm:

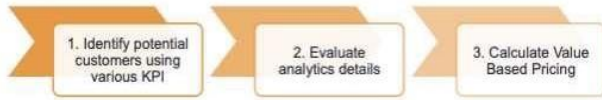


Fig 11: VBP Algorithm

The results of the analysis will then be fed into a value-based pricing algorithm. For many companies, the traditional way to set prices has been some form of cost-plus pricing. In other words, they calculate their costs, slap on a margin, and there they have a price. One of the key concepts in pricing is price discrimination. It means that identical or largely similar goods are priced differently by the same provider depending on the customers' willingness to pay (WTP). Value-based pricing, on the other hand, is based on recognizing the value of the service and sharing the gains created is used by all involved parties. The Value-Based pricing algorithm will be carefully programmed to calculate customized prices on products considering all the above steps and factors.

d) Proposing VBP

$$\text{Value - Based Price} = (\text{Fixed Price}) + (\text{Variable Price}) + (\text{Customer Perceived Price})$$

E. Parameters considered for Proposing VBP

a) Fixed Price: Resource costs:

Power BI, Web Hosting, R&D, Equipment costs, Energy consumption, Deploy, Operation Cost

b) Variable Cost:

Engineering costs, Marketing Costs, development costs, and others.

c) Customer Perceived Price:

Average Rating, No. of Ratings, Page duration, Clickstream, Page hits, saved product period, Product same, No. of Past orders, Product Quantity, Exit page, Search, Total session duration, and Variable sessions

F. Classification of Customers

a) Based on Tiers: Tier 1, Tier 2, and Tier 3

b) Based on Buying Capacity: High Level, Moderate Level, and Low Level

Formula I

$$\text{Value - Based Price} = (\text{Fixed Price} * 50\%) + (\text{Variable Price} * 25\%) + (\text{Customer Perceived Price} * 25\%)$$

Formula II

$$\text{Value - Based Price} = (\text{Fixed Price} * 50\%) + (\text{Variable Price} * 25\%) + (\text{Customer Perceived Price} * 25\%)$$

IV. IMPLEMENTATION

A. Connecting to MongoDB

a) Step 1 – Create an Atlas Account.

First, you'll need to register for an account on the MongoDB Atlas landing page. The registration form only needs you to provide basic information like name, email, and company and for you to create a password. No credit card info is required. Once you register, Atlas automatically creates a default organization and project where you can deploy your first cluster

b) Step 2 – Whitelist Your Connection IP Address

You will then be prompted to set up your Internet Protocol (IP) and whitelist your IP address. This is important as it ensures that only you can access the cluster in the cloud from your IP address. You also have the option of allowing access from anywhere, though this means that anyone can have Network access to your cluster. This is a potential security risk if your password and other credentials leak.

c) Step 3 – Create a MongoDB User for Your Cluster

Next, you'll need to create a MongoDB user to access your cluster. Simply enter the new username and password. You'll then have the option of selecting user privileges, including admin, read/write access, or read-only access.

d) Step 4 – Connect to Your Cluster

Now that you've created a user, it's time to connect to your cluster. You'll be prompted to select a connection method, either connecting with Mongo Shell, your own application, or MongoDB Compass, MongoDB's GUI. In this example, we'll connect using MongoDB Compass.

Once you've downloaded and opened MongoDB Compass, you'll be prompted to paste a connection string from your clipboard and then connect to your cluster.

e) Step 5 – Insert and View Data in Your Cluster

Now that you're connected to your cluster, you can now insert and interact with sample data on your cluster using Data Explorer.

Data Explorer allows you to view, create, and drop databases, collections, and indexes in your cluster. In addition, you can insert, edit, and delete documents, as well as create and run aggregation pipelines to process your data.

B. Powerbase Charts

The tool delivers insights that can transform data into spectacular visuals very quickly scanned through a wide range of data sources with minimal efforts to make informed decisions increasing the footfall of customers, and declining revenues are some of the biggest concerns for retailers engaging right strategy at the right time without delaying. Most visited places in the shop/mall study reviews of the customers. Then the retailer will have to study its power BI report. The report includes all the relevant data, such as reviews, recommendations, and

ratings. It also enables retailers to get information about the most visited categories and individual review tracked with this tool to maximize profits all these data sources in one place, allowing you to make the right decisions at the right time, understand customer sentiment, visualize shopper preferences, and interactions, and identify opportunities to better serve eventually maximizing revenue explore and monitor make sense of it allow them to understand growth, margin, and spend patterns shed light better understand the current situation and future needs of the entire organization key stakeholders.

a) Time on the page by customers on the chosen category

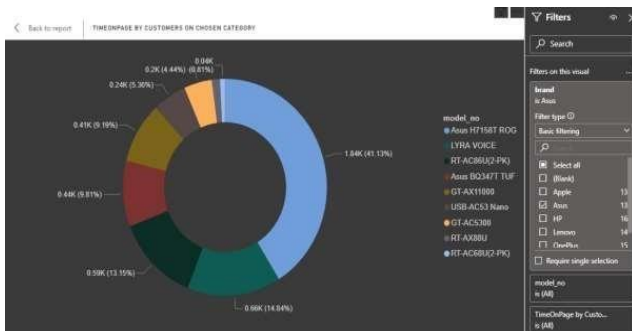


Fig. 12 Time on the page by customers on the chosen category

The doughnut chart visual with the attribute “Time on Page” as value and “model no.” as legend is used to show the relationship between the time spent on a particular product to the total time spent by customers. It shows the product of the selected category and their corresponding portion of time spent on that particular product page. This gives an insight to the user about the most popular product not only on the website, but it also compares the time spent hence the popularity of various products of a particular brand. By Calculating the time spent on a product of a group of bounced or churned users, you may find a clue on how to improve user interaction and understand what made them stop buying a product.

b) Count of searches by keyword

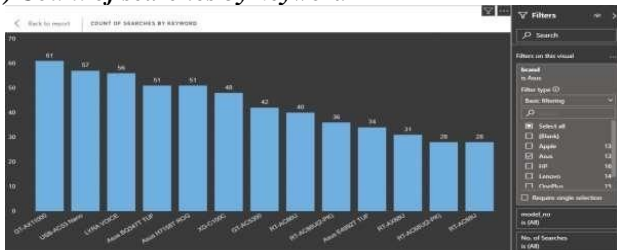


Fig. 13 Count of searches by keyword

As your digital and traditional marketing efforts pay off with increased brand awareness, you’ll see more searches for your brand name or products as a result. Search by Keyword is an indicator of how well your brand is performing. The user can search for a product or a category, or a brand. The number of times a product model number is searched can be found out using this chart, and it will also give a comparative study of the various keywords searched by the customers. A bar chart with “Count of

Searches” as value and “Model No” as Legend is used to implement this KPI.

c) Average rating by the chosen category

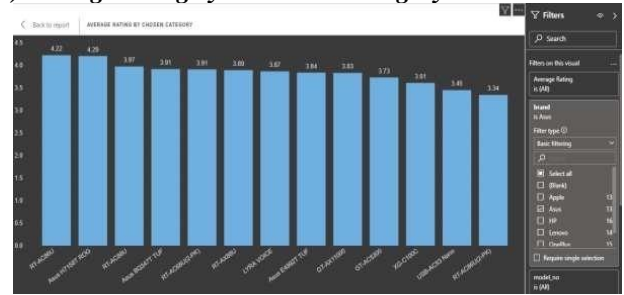


Fig. 14 Average rating by the chosen category

This chart gives an overview of the ratings of the different products under the category selected by the user. It gives an insight into the liking of the product by a customer. It also shows how well a product is doing in the market. By watching the ratings and reviews, brands can see what their potential customers are seeing and reading about their products. A bar chart with “Average Rating” as value and “Model No” as Legend is used to implement this KPI.

d) Count of reviews by the chosen category

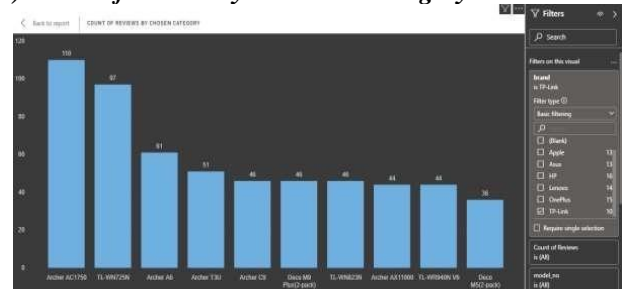


Fig. 15 Count of reviews by the chosen category

Not just the average rating but also the count of reviews plays an important role. The only social proof that a potential customer has while looking at a product is the number of quality reviews the brand/product has. There is no other way for a potential buyer to see if other people are buying the product. The more the number of reviews, the more diverse the results and hence more accurate the average result. Also, a higher count of reviews shows the demand for the product in the market. A bar chart with “Count of Searches” as value and “Model No” as Legend is used to implement this KPI.

e) Count of an active user by date

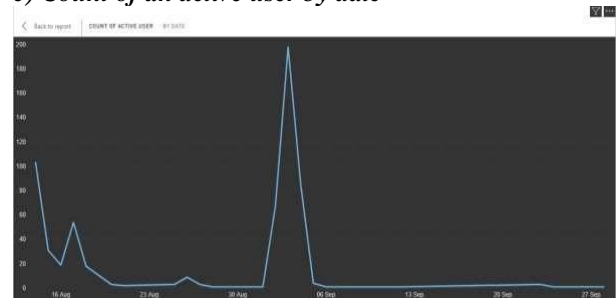


Fig. 16 Count of an active user by date

The site's customer retention rate shows how many active returning customers one has during a given time period. This graph shows the count of active users on per daily basis. This is shown by a line chart "Count of users" as values and "Date" as legend as it displays the pattern or trend over a period of time. Basic line charts are a great tool to see and compare the volume trend across time series.

f) Device Trend

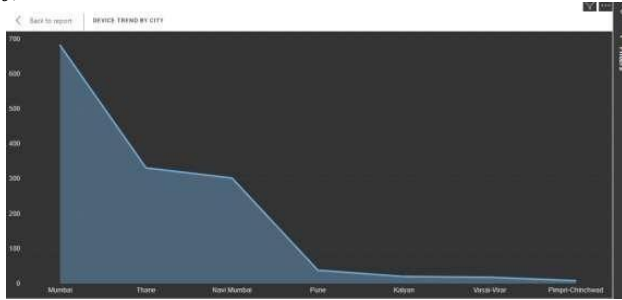


Fig. 17 Device Trend

This area graph shows from which location the customers are from. This is shown by an area with "Count of users" as values and "City" as legend as it displays the pattern or trend over a geographical location.

g) Average time spent on a page

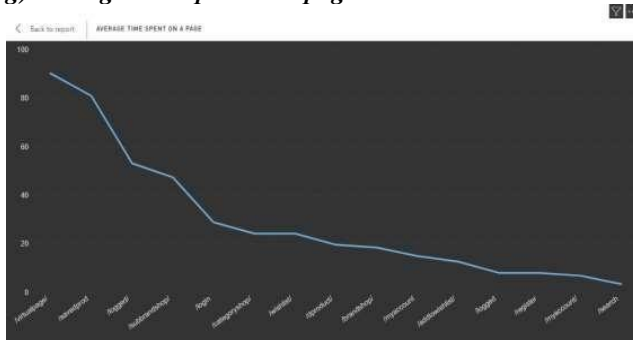


Fig. 18 Average time spent on a page

This shows the average time spent on a particular page like the product page, the list of the products page, dashboard, search page, login page, or the saved products page. This is shown by a line chart "Time Spent" as values and "Page" as legend as it displays the pattern or trend across various pages.

C. Connecting to Node.js

Tracking (KPI) with Node.js Session management can be done in node.js by using the express-session module. It helps in saving the data in the key-value form. Fig 36 shows the session tracking code snippet which has been implemented.

```
const session = require('express-session');
//Express session
app.use(session({
  secret: 'IshMuGia',
  resave: false,
  saveUninitialized: false,
  store: new MongoStore({ mongooseConnection: mongoose.connection })
}));
```

Fig. 19 Session Tracking

Connecting the website to MongoDB via Node.js

Below is the code snippet to connect Node.js to MongoDB via mongoose

```
const mongoose = require('mongoose');
const MongoStore = require('connect-mongo')(session);
// DB Config
const db = require('./config/keys').MongoURI;
//Connect to Mongo
mongoose.connect(db, { useUnifiedTopology: true,
  useNewUrlParser: true, useFindAndModify: false })
  .then(() => console.log("DB connected"))
  .catch(err => console.log(err));
```

Fig. 20 Database Connection

V. CONCLUSION

We used reference sentences from various papers to check our implementation. The results are as follows. The suggestions by our system not only match the reference output but also give some very interesting suggestions that are equally valid. Has helped us to identify a better analytics tool, as given below.

Difference between Power BI and Google Analytics

Power BI and Google analytics are general analytics tools. Google Analytics collects data from the website, whereas Power BI only works with the data fed into it. Power BI allows the users to create interactive visualizations, dashboards, and reports on their own. Power BI also has business intelligence capabilities with a simple interface making it easy for the end-users to use. Google Analytics, on the other hand, is super complex and has a confusing UX/UI.

The drawback with the Power BI desktop is that you can't share anything with your peers. In order to do that, you need to publish the reports on the web, but then these reports will become publicly available.

The drawback with the Power BI desktop is that you can't share anything with your peers. In order to do that, you need to publish the reports on the web, but then these reports will become publicly available.

Google analytics also takes care of the privacy of our users' data. The dashboards created, the website performance stats, the visuals, etc., won't be available to any users outside the organization. Whereas Google Analytics is tracking users, it keeps the identity of the users anonymous by using transaction IDs and user IDs. You can't collect personally identifiable information using Google analytics. However, there are ways to collect personal information in Google Analytics - so you need to consider how you are going to keep people's information safe.

Google Analytics does not provide an option to perform ETL on data, unlike Power BI, which has inbuilt data ingestion for ETL. Power BI helps users get data insights with the help of visualization, whereas Google analytics requires Google data studio for visual analysis of data. Power BI helps you gain meaningful insights with its data visualizations. It has built-in AI capabilities, tight Excel integration, prebuilt custom data connectors. Google Analytics can also be integrated with Power BI. Immediately after connecting GA and Power BI. You gain

insights into the usage of your site in the last 6 months. Using the Google Analytics API, this content pack provides a dashboard, report, and dataset to allow you to monitor and explore the data.

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