

# PROJECT

## "Ecommerce Consumer Behavior Analysis"

Analysis of Consumer Behavior in E-commerce



June 2025

**CODERHOUSE**

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## 1. Overview of the Dataset and Business Context



E-commerce has become one of the leading purchasing channels for consumers worldwide. In this dynamic context, understanding online customer behavior is essential for companies to design effective marketing strategies, optimize their operations, and offer personalized experiences that foster loyalty.

In a market that is constantly changing due to technological, economic, and social changes, having data that helps understand consumer behavior is key to business survival and growth.

Based on this reality, the project uses a dataset focused on e-commerce consumer behavior, which provides detailed information on consumer behavior in an online shopping environment.

## 2. Dataset



This project uses a standardized dataset titled Ecommerce Consumer Behavior Analysis.

**Overview:**

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The dataset collects information on the purchasing behavior and digital interaction of e-commerce store customers. It includes demographic data, purchasing habits, payment methods, channels used, interaction with advertising campaigns, sensitivity to discounts, and other relevant variables to understand consumption patterns.

## **Content:**

More than 15 columns of information, including data such as::

- Unique customer identification
- Age, gender, location, educational level, occupation
- Purchase transactions: amount, category, channel, payment method
- Digital variables: social media influence, ad engagement, research time, satisfaction

## **Data:**

The data contained in the Dataset provides information to understand:

- How customers buy,
- What products customers prefer,
- When they tend to make purchases and
- Factors that influence their loyalty.

The file was obtained **from the public dataset platform Kaggle.com**, a global reference site for data analysts and scientists that provides a foundation for research, competition, and real-world project development.

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## **Preparation:**

The original file underwent a normalization process to follow best practices in relational data modeling. Duplicates were removed, missing values were replaced with nulls where appropriate, and bridge tables were created to represent many-to-many relationships where necessary.

## **Format:**

The dataset is in spreadsheet format (.xlsx), with each table on a separate sheet. Each sheet is clearly named for easy identification.

## **Access to complete files:**

The complete dataset files can be downloaded from the following links:

 [Original Dataset](#) – Ecommerce Consumer Behavior Analysis

 [Normalized Dataset](#) – Ecommerce Consumer Behavior Analysis

## **Why was this dataset selected?**

This dataset was selected due to its rich variety of variables, which allow for in-depth analysis of multiple dimensions of customer behavior.

The topic is not only timely and strategically relevant for organizations, but also offers a valuable academic and professional learning opportunity. It supports the development of analytical skills applied to marketing, and provides valuable insights into the behavior of digital consumers in a constantly evolving environment in a constantly changing environment.

The topic interests me because it connects the world of data analysis with the reality of digital marketing, an area that constantly needs to renew itself to adapt to new forms of online consumption and competition.

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Furthermore, it fits perfectly with the project's objectives, since:

1. It provides sufficient data to perform statistical analysis, graphics and segmentation.
2. It allows the identification of patterns and trends that support strategic decisions in marketing and sales that are useful for making strategic decisions in marketing and sales.
3. It is representative of a real-life case that companies that sell online face daily.

## 3. Hypothesis, Objective and Scope of the project

 **Hypothesis:** Customers with higher loyalty and greater digital engagement tend to make more purchases, often concentrated on specific days of the week.

This analysis will allow:

- Detect purchasing patterns based on loyalty and digital interaction.
- Identify times of highest purchasing volume.
- Establish criteria to personalize marketing campaigns and optimize business strategies.



 **Objective:** Analyze patterns to assess the relationship between loyalty, digital engagement, and both purchase volume and weekly distribution.

### Secondary objectives

- **Identify the demographic profile of the most loyal customers:** Analyze the predominant age, gender, and location of your most loyal customers

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- **Determine the purchasing behavior of loyal customers versus less loyal ones:** Compare product categories, payment methods, and preferred channels by loyalty level.
- **Evaluate the influence of digital interactions on loyalty and purchases:** Observe how variables such as ad and social media engagement relate to loyalty and purchase volume.
- **Identify the days of the week with the highest purchasing activity by loyalty level, establishing temporal patterns** that allow us to understand whether loyalty concentrates purchases on specific days.



## Project Scope:

The analysis will focus on:

- Evaluate the behavior of loyal customers with strong digital engagement.
- Analyze purchasing trends based on time periods.
- Propose personalization strategies for digital marketing campaigns.
- We will work with a dataset of more than 1000 records and 15 columns.

## 4. Analysis Application Level and End User

**Application Level:** Tactical–Strategic This analysis will support campaign personalization and help optimize retention and loyalty strategies and the optimization of customer retention and loyalty strategies.

**End Users:** Digital marketing, CRM, business strategy, and data analytics teams in e-commerce companies, as well as key stakeholders from e-commerce companies and stakeholders.



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## 5. Glossary

This section aims to explain the technical terms used in the dashboard, making it easier for anyone to understand, regardless of their level of experience in data analysis.

- ✓ **Clients:** Record of those customers who made at least one purchase or interacted digitally with the store. Each customer is identified by a unique ID.
- ✓ **Shopping:** Transactions of goods or services made by customers in a given period.
- ✓ **Total Purchases:** Sum of the total monetary amount of all recorded purchases.
- ✓ **Purchase Quantity:** Total number of purchase transactions recorded.
- ✓ **Average Ticket:** Average spending per transaction, calculated as Total Purchases divided by Purchase Quantity (Total Purchases divided by Purchase Quantity).
- ✓ **Average Age:** Average age of customers in the database.
- ✓ **Payment Method:** The method used by customers to complete their purchases (e.g., credit card, PayPal, cash).
- ✓ **Purchase Channel:** The channel through which the purchase was made: physical store, online, or hybrid.
- ✓ **Product Category:** General classification of products purchased by customers.
- ✓ **Engagement with Ads:** Level of customer interaction with digital advertising campaigns.
- ✓ **Discount Sensitivity:** Customers' propensity level to react to promotions and discounts.
- ✓ **Social Media Influence:** The degree to which social media content and opinions influence customer purchasing decisions.
- ✓ **Research Time:** Time customers spend researching a product before deciding to purchase it.
- ✓ **Customer Satisfaction:** Subjective measurement of the customer's level of satisfaction with the product or service purchased.

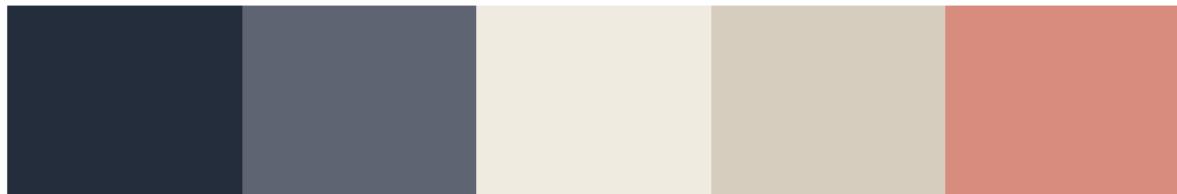
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## 6. Color Palette

The dashboard design follows a color palette based on the main background illustration/logo. This ensures visual consistency, a professional aesthetic, and improved readability. This palette ensures visual consistency, a professional aesthetic, and facilitates



#272D40

#626673

#F2EDE4

#D9CEC1

#D98E7E

reading and interpretation of the data.

### 🎨 Main colors used:

The following table details the main colors selected for the board design. Each color was chosen based on its harmony with the project's thematic illustration and its ability to convey a clear and professional reading, based on the main illustration.

Each color's hexadecimal code and its specific use within the dashboard interface are listed below.

Color	Code	Hex	Use
-------	------	-----	-----

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#272D40	Dark blue	Button background, titles
#626673	Blue-gray	Secondary texts, borders
#F2EDE4	Light beige	Background of the pages
#D9CEC1	Sand	Secondary backgrounds
#D98E7E	Coral	Emphasized indicators

## Auxiliary colors:

Complementary auxiliary colors were used in some graphics.

- Gradient colors (pink → green) were used in category purchases to improve readability of higher amounts.
- In payment methods, different colors were used to visually distinguish each category.

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## 7. Versioning table

Version	Date of submission	Description
V00	08/05/2025 17:50 hs	- Definition of the theme and objectives following SMART methodology - Statement of the analysis hypothesis - Selection and preparation of the dataset (file with more than 15 columns) - Initial documentation in PDF: description, hypothesis and scope - Basic dataset normalization
V01	25/05/2025 12:23 hs	- Preparation of the Entity-Relationship Diagram (initial ERD) - Detailed description of each table in the model: primary keys, foreign keys and columns - Definition of the project scope, end user and level of analysis - Identification of relationships and adjustments to the relational model - Supplementary documentation in PDF
V02	30/06/2025 19:31 hs	- Initial development of the dashboard in Power BI - Creation of analysis pages, cover, global storytelling → detail - Implementation of a complete relational model in Power BI - Creating a calendar table from Power Query - Creation of a table of calculated measures, with at least 5 KPIs - Detailed documentation of transformations and calculated measures - Visualization improvements: use of cards for KPIs, navigation buttons, and filter cleaning
Version Final	16/07/2025	- Correction of the DER following the conceptual notation - Connecting the calendar table to the relational model - Inclusion of date/time of last update on the cover page - Creation of a "Glossary" section for technical terms - Improved page design: optimized visual hierarchy, consistent color palette, prioritization of graphics - Creation of version board - Final documentation with screenshots of each page, explanation of analysis, measurements, DER, and future lines of analysis.

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## 8. Diagrams

Two key diagrams are included in the documentation to illustrate the data structure and flow of the Power BI model. These diagrams provide insight into the organization of the tables, the relationships between them, and the underlying logic of the analysis developed.



### Entity-Relationship Diagram (ERD)

The Entity-Relationship Diagram (ERD) illustrates the conceptual entities that make up the data model and how they relate to each other.

It outlines key analytical entities—such as customers, purchases, and digital interactions—along with their attributes and logical relationships.

This diagram is useful for understanding the nature of the data, the normalization applied and existing dependencies, and serves as a conceptual foundation for the technical implementation that follows.

It includes the following main entities:

- Fact table: Purchases, which contains purchase transactions.
- Secondary fact table: Interactions, which collects digital interactions.
- Dimension table: Clients, which describes the sociodemographic characteristics of clients.
- Additional dimension tables: Payment Method, Purchase Category, Purchase Channel, Location, Gender, Occupation, Education Level, among others, which allow for enriching the analysis.

Each table is represented as a rectangular entity, with its key fields labeled (PK/FK) and relationships shown with diamonds and cardinalities and the relationships are displayed

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using diamonds with the corresponding cardinalities.

## **Relational Model**

The Relational Model shows the final structure of the data model implemented in Power BI. It details the physical tables that make up the dataset, the primary and foreign keys used to link them, and the type of relationships established between them (one-to-many or one-to-one).

This diagram shows how the conceptual ERD was adapted into a practical model and optimized for analytical exploitation on the dashboard.

🔗 See detailed diagrams:

Both diagrams are available in high resolution at the links below:

🌐 [View Entity-Relationship Diagram](#)

🌐 [View Relational Model Diagram](#)

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## 9. List of tables and description

### Board Clients

Column	Data type	Description
<b>Customer_ID (PK)</b>	INT	Unique customer identifier
Age	INT	Age
Gender_ID (FK)	INT	Relationship with Gender
Income_Level_ID (FK)	INT	Relationship with Income Level
Marital_Status_ID (FK)	INT	Relationship with Marital Status
Education_Level_ID (FK)	INT	Relationship with Education Level
Occupation_ID (FK)	INT	Relationship with Occupation
Location_ID (FK)	INT	Relationship with Location

### Board: Gender

Column	Data type	Description
<b>Gender_ID (PK)</b>	INT	Unique gender identifier
Gender	VARCHAR	Gender

### Board: Income Level

Column	Data type	Description
<b>Income_Level_ID (PK)</b>	INT	Income Level Unique Identifier
Income_Level	VARCHAR	Income level

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**Board:** Marital Status

Column	Data type	Description
Marital_Status_ID (PK)	INT	Unique Marital Status Identifier
Marital_Status	VARCHAR	Marital status

**Board:** Education Level

Column	Data type	Description
Education_Level_ID (PK)	INT	Education Level Unique Identifier
Education_Level	VARCHAR	Educational level

**Board:** Occupation

Column	Data type	Description
Occupation_ID (PK)	INT	Unique Occupation Identifier
Occupation	VARCHAR	Occupation

**Board:** Location

Column	Data type	Description
Location_ID (PK)	INT	Unique Location Identifier
Location	VARCHAR	Geographic location: City
Country_ID (FK)	VARCHAR	Relationship with Country

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## Board: Country

Column	Data type	Description
<b>Country_ID (PK)</b>	INT	Unique Country Identifier
Country	VARCHAR	Geographic location: Country
Region_ID	VARCHAR	Relationship with Region

## Board: Region

Column	Data type	Description
<b>Region_ID (PK)</b>	VARCHAR	Unique Region Identifier
Region	VARCHAR	Geographic location: Region

## Board: Purchases

Column	Data type	Description
<b>Purchase_ID (PK)</b>	INT	Purchase identification number
<b>Customer_ID (FK)</b>	INT	Relationship with Clients
<b>Purchase_Category_ID (FK)</b>	INT	Relationship with Purchase_Categories
Purchase_Amount	MONEY	Purchase amount
Frequency_of_Purchase	INT	Purchase frequency
<b>Purchase_Channel_ID (FK)</b>	INT	Relationship with Purchase Channel
Brand_Loyalty	INT	Level of brand loyalty
Return_Rate	FLOAT	Return rate
<b>Payment_Method_ID (FK)</b>	INT	Relationship with Payment Method
Time_of_Purchase	DATETIME	Date and time of purchase

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Discount_Used	BOOLEAN	If you used discount
Customer_Loyalty_Program_Member	BOOLEAN	Loyalty program member

## Board: Purchase Category

Column	Data type	Description
Purchase_Category_ID (PK)	INT	Purchase Category unique identifier
Purchase_Category	VARCHAR	Purchase category

## Board: Purchase Channel

Column	Data type	Description
Purchase_Channel_ID (PK)	INT	Purchase Channel Unique Identifier
Purchase_Channel	VARCHAR	Purchase channel

## Board: Payment Method

Column	Data type	Description
Payment_Method_ID (PK)	INT	Payment Method Unique Identifier
Payment_Method	VARCHAR	Payment method

## Board: Interactions

Column	Data type	Description
Interaction_ID (PK)	INT	Unique identifier of the interaction
Customer_ID (FK)	INT	Relationship with Clients

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Product_Rating	INT	Product rating
Time_Spent_on_Product_Research(hours)	FLOAT	Time in product research
<b>Social_Media_Influence_ID (FK)</b>	INT	Relationship with Social Media Influence (Level of social media influence)
<b>Discount_Sensitivity_ID (FK)</b>	INT	Relationship with Discount Sensitivity
Customer_Satisfaction	INT	Customer satisfaction
<b>Engagement_with_Ads_ID (FK)</b>	INT	Relationship with Engagement with Ads
<b>Device_Used_ID (FK)</b>	INT	Relationship with Device Used
<b>Purchase_Intent_ID (FK)</b>	INT	Relationship with Purchase Intent
<b>Shipping_Preference_ID (FK)</b>	INT	Relationship with Shipping Preference (Loyalty Program Member)
Time_to_Decision	FLOAT	Time from research to purchase decision

## Board: Social Media Influence

Column	Data type	Description
<b>Social_Media_Influence_ID (PK)</b>	INT	Unique Social Media Influence Identifier
Social_Media_Influence	VARCHAR	Social media influence

## Board: Discount Sensitivity

Column	Data type	Description
<b>Discount_Sensitivity_ID (PK)</b>	INT	Unique Discount Sensitivity Identifier
Discount_Sensitivity	VARCHAR	Discount sensitivity

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**Board:** Engagement with Ads

Column	Data type	Description
Engagement_with_Ads_ID (PK)	INT	Unique Engagement with Ads Identifier
Engagement_with_Ads	VARCHAR	Interaction with ads

**Board:** Device Used

Column	Data type	Description
Device_Used_ID (PK)	INT	Unique Device Used Identifier
Device_Used	VARCHAR	Device used to purchase

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## Board: Shipping Preference

Column	Data type	Description
Shipping_Preference_ID (PK)	INT	Unique Shipping Preference Identifier
Shipping_Preference	VARCHAR	Customer Shipping Preferences

## Board: Purchase Intent

Column	Data type	Description
Purchase_Intent_ID (PK)	INT	Unique Purchase Intent Identifier
Purchase_Intent	VARCHAR	Purchase intention

## 10. Relationship between tables

### Clients

- 1:N with Purchases  
*A customer can make many purchases, but each purchase belongs to only one customer.*
- 1:N with Interactions.  
*A customer can have multiple recorded digital interactions, each linked to them..*

### **Customer Reference Tables**

Each of the following customer fields was normalized using foreign keys, establishing a 1:N relationship:

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- 1:N with Gender  
*One gender can be associated with multiple customers.*
- 1:N with Income Level, Marital Status, Education Level, Occupation, and Location.  
*Each value can apply to multiple customers.*

## Purchases

- 1:N with Purchase Category.  
*Each purchase is classified under one category, and each category can be linked to multiple purchases.*
- 1:N with Purchase Channel.  
*A purchase is made through a channel, and a channel can be associated with many purchases.*
- 1:N with Payment Method.  
*Each purchase is paid for with one method, which can be repeated across multiple purchases.*

## Interactions

- 1:N with Social Media Influences
- 1:N with Discount Sensitivity
- 1:N with Engagement with Ads
- 1:N with Purchase Device (Device Used)
- 1:N with Shipping Preference
- 1:N with Purchase Intent

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## 11. Primary Keys (PK) and Foreign Keys (FK)

### Primary Keys and their references

Primary Key	Board	Description
Customer_ID	Clients	Unique identifier for each customer
Gender_ID	Gender	Unique gender identifier
Income_Level_ID	Income Level	Unique income level identifier
Marital_Status_ID	Marital Status	Unique marital status identifier
Education_Level_ID	Education Level	Unique educational level identifier
Occupation_ID	Occupation	Unique occupation identifier
Location_ID	Location	Unique location identifier: city
Country_ID	Country	Unique location identifier: country
Region_ID	Region	Unique location identifier: region
Purchase_ID	Purchases	Unique identifier for each purchase
Purchase_Category_ID	Purchase Category	Unique purchase category identifier
Purchase_Channel_ID	Purchase Channel	Unique purchase channel identifier
Payment_Method_ID	Payment Method	Unique payment method identifier
Interaction_ID	Interactions	Unique identifier of each interaction
Social_Media_Influence_ID	Social Media Influence	Unique influence level identifier
Discount_Sensitivity_ID	Discount Sensitivity	Unique discount sensitivity identifier
Engagement_with_Ads_ID	Engagement with Ads	Unique ad interaction identifier
Device_Used_ID	Device Used	Unique device identifier used
Shipping_Preference_ID	Shipping Preference	Unique shipping preference identifier
Purchase_Intent_ID	Purchase Intent	Unique purchase intent identifier

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## Foreign Keys and their references

Foreign Key	Table of Origin	Table Reference
Gender_ID	Clients	Gender
Income_Level_ID	Clients	Income Level
Marital_Status_ID	Clients	Marital Status
Education_Level_ID	Clients	Education Level
Occupation_ID	Clients	Occupation
Location_ID	Clients	Location
Customer_ID	Purchases	Clients
Purchase_Category_ID	Purchases	Purchase Category
Purchase_Channel_ID	Purchases	Purchase Channel
Payment_Method_ID	Purchases	Payment Method
Customer_ID	Interactions	Clients
Social_Media_Influence_ID	Interactions	Social Media Influence
Discount_Sensitivity	Interactions	Discount Sensitivity
Engagement_with_Ads_ID	Interactions	Engagement with Ads
Device_Used_ID	Interactions	Device Used
Shipping_Preference_ID	Interactions	Shipping Preference
Purchase_Intent_ID	Interactions	Purchase Intent

## 12. Power BI dashboard

The dashboard developed in Power BI is an interactive tool aimed at analyzing e-commerce consumer behavior.

It follows a storytelling approach, starting with a comprehensive overview and delving into specific aspects that allow for validating the proposed hypothesis.

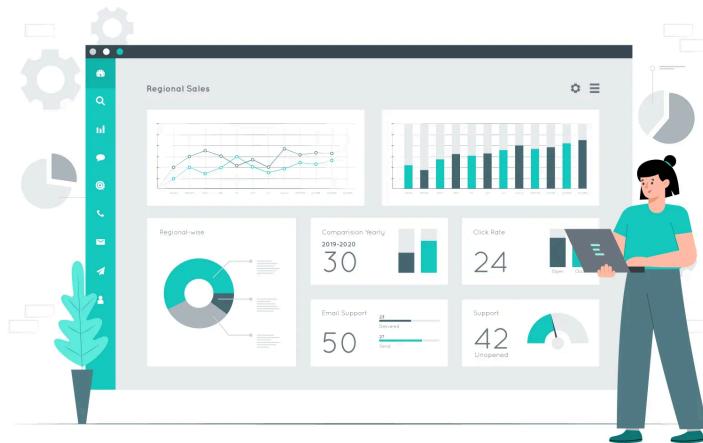
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The dashboard features intuitive menus, consistent filters, and a cohesive visual design for both tactical and strategic users.

The various proposed tabs guide the user through the main axes of the analysis:



⌚ Cover page: project introduction and navigation

⌚ Customer Profile: demographic breakdown

⌚ Purchasing Behavior: transaction trends and patterns

⌚ Digital Interactions: engagement, ad impact, and discount sensitivity

The mockup validates the visual storytelling and usability, ensuring the structure aligns with the project's objectives and defined scope.

The following sections detail the characteristics of each page, the indicators presented, and the design decisions made.

💡 All pages include top-level filters and follow a cohesive design based on the cover's visual identity, with a clear storytelling structure: from global to detailed views.

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📁 Page 1 –Front page

The screenshot shows the front page of a dashboard titled "Ecommerce Consumer Behavior Analysis". At the top left is a circular icon with a stylized illustration of a person and a checkmark. To its right is a large, semi-transparent circular watermark containing the title. Below the title is a subtitle in Spanish: "Análisis de tendencias de consumo, comportamiento de compra e interacciones digitales para la toma de decisiones estratégicas". On the left side, there is a vertical sidebar with four navigation buttons: "PORTADA" (highlighted in orange), "Perfil del Cliente", "Comportamiento de Compra", and "Interacciones Digitales". At the bottom right, there is text indicating the project was created by the "Equipo de Análisis de Datos" and directed by "Melina Lucero Antonietti" on "Julio 2025".

## Aim:

Introduce the topic and purpose of the dashboard, presenting the hypothesis and main objectives of the analysis. Facilitate navigation to the analysis sections.

## Content:

- Project title
- Brief description of the objectives of the analysis
- Navigation buttons
- Date/time of last update

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## 📁 Page 2 –Customer Profile



### Aim:

Characterize customer demographics (age, gender, location) and their distribution to understand the user base on which loyalty and digital engagement will be assessed.

### Content:

- Global indicators: total customers and total purchases
- Distribution of customers by gender and age
- Relationship between age and purchase volume

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## 📁 Page 3 – Purchasing Behavior



### Objective:

Identify purchasing patterns by category, payment method, and day of the week, highlighting key moments when customers concentrate their purchases.

### Content:

- Purchases by day of the week (with a focus on higher volume days)
- Preferred payment categories and methods
- Distribution by purchasing channels

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## 📁 Page 4 – Digital Interactions



### Objective:

Analyze the relationship between loyalty levels, digital engagement, and purchase volume, validating the positive influence of these factors.

### Content:

- Total purchases segmented by loyalty level
- Social media influence and ad engagement
- Comparison between engagement and total purchases
- Distribution of interaction levels

## 13. Transformations Applied in the Data Model (Power BI)

Below are the transformations applied to each table in the Power BI data model.

### Table: Customers

- Power BI applied automatic data type detection.
- "Customer\_ID" was recognized as text and "Age" as an integer.
- Headers were automatically promoted.
- Added a conditional column to categorize LoyaltyLevel based on the Brand\_Loyalty field.

### Table: Gender

- No manual transformations were performed.
- Power BI correctly recognized the data types ("Gender\_ID" as integer and "Gender" as text).
- Headers were automatically promoted.
- A conditional column was added to categorize genders into Male, Female, and Other LGBTQ+, facilitating aggregate analysis.
- Column names have been changed for standardization.

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## Table: Income Level

- Auto-detected data types ("Income\_Level\_ID" as integer and "Income\_Level" as text).
- Headlines powered by Power BI.
- No additional manual shifting.

## Table: Marital Status

- Power BI automatically applied header promotion.
- Correctly detected data types ("Marital\_Status\_ID" as integer and "Marital\_Status" as text).
- No additional transformations were made.

## Table: Education Level

- Automatically promoted headers.
- Data types interpreted correctly.
- No additional transformations were applied.

## Table: Occupation

- No manual modifications.
- Correctly recognized data types ("Occupation\_ID" as integer, "Occupation" as text).

## Table: Location

- Headers automatically promoted by Power BI.

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- "Location\_ID" interpreted as an integer and "Location" as text.
- No additional cleaning was performed.

## **Table: Purchase**

- Unnecessary columns have been removed.
- Automatic type conversion by Power BI has been validated.
- The "Time\_of\_Purchase" column was retained as a date type for linking to the calendar table.
- Added a conditional column to calculate LevelEngagement, combining multiple indicators into a single label.
- A measure was created for loyal customers and % of loyal customers.

## **Table: Purchase Category**

- Headers and data types correctly detected. Empty rows removed.
- Subcategories have been added to allow detailed viewing in tooltip2.
- Automatic data type change.

## **Table: Purchase Channel**

- No manual shifting.
- Power BI promoted headers and correctly detected data types.

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## Table: Payment Method

- Automatically recognized data types ("Payment\_Method\_ID" as integer, "Payment\_Method" as text).
- Values were replaced to standardize payment method names to the project language (Spanish), through several steps of "Replaced value".
- Empty and unnecessary rows were removed and headers were promoted.
- Automatic data type change based on column content.

## Table: Interactions

- Unnecessary columns have been removed.
- Power BI successfully assigned data types.
- No null values or inconsistencies were identified.

## Table: Social Media Influence

- Data types correctly detected.
- Values for uniformity have been replaced (High, Low, Medium, None → High, Low, Medium, None).

## Table: Discount Sensitivity

- Automatically promoted headers.
- Data types interpreted without the need for transformation.

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## Table: Engagement with Ads

- Values were replaced to homogenize categories (High to High, Low to Low, etc.).
- Auxiliary columns were added to establish a logical order in the chart legend (Engagement\_Orden).
- Headers have been promoted and data types have been changed.

## Table: Device Used

- Table used without additional transformations.
- Data types interpreted correctly.

## Table: Shipping Preference

- Automatically promoted headers.
- No changes or cleanings were applied.

## Table: Purchase Intent

- Data correctly interpreted by Power BI.
- No additional transformations applied.

## Table: Time\_of\_Purchase\_HorarioLocal

- Table created specifically to standardize the date format in local time.
- Removed the remaining columns, keeping only "Time\_of\_Purchase".
- The data type was set to "date".

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## Table: Dynamic Calendar

- Calendar table generated manually using the DAX function "CALENDAR".
- Added auxiliary columns: Year, Semester, Quarter, Month, Year-Month, Month Name, Day, Day of the Week, and Month Abbreviation.
- The columns were ordered appropriately for temporal analysis.
- Relacionada con "Purchases[Time\_of\_Purchase]".
- Added a calculated column to return the name of the day of the week in Spanish.  
Purpose: To support daily analysis in the local language.

## Table: Region

- Steps applied: Source, navigation, null and space filtering, bottom row removal, automatic type change, promoted headers.
- Relevant transformation: No. Only basic cleaning and automatic type change.

## Table: Country

- Steps applied: Source, navigation, null and space filtering, bottom row removal, automatic type change, promoted headers.
- Relevant transformation: No. Only basic cleaning and automatic type change.

## Table: Location

- The location was normalized, creating two additional tables: Country and Region, to separate geographic levels.

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- ✓ Foreign keys in Clients have been adjusted to correctly point to the new hierarchy.

## Tables: Location, Region, Country

- ✓ The keys from all three tables were used to create a logical hierarchy: Region > Country > Locality in the Location table or through an auxiliary table. Purpose: to enable hierarchical filtering.

## Tooltips

- ✓ Two Tooltip type pages were created:
- ✓ Tooltip to break down customers by individual age within ranges.
- ✓ Tooltip 2 to expand shopping categories with subcategories.

## 14. Mcalculated measures and KPI visualization

The following are the details of the mcalculated measures applied with DAX language, these are found in the virtual table called "Measures", following good modeling practices.

The measures developed were the following:

Measure	DAX Formula	Use
Number of Clients	Number of Customers = DISTINCTCOUNT(Clients[Customer_ID])	Total unique customers
Purchase Quantity	Purchase Quantity = COUNTROWS('Table 8 (Purchases)')	Total purchases made
Average Age	Average Age = AVERAGE(Clients[Age])	Average age of customers

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Average Ticket	Ticket Promedio = AVERAGE('Table 8 (Purchases)'[Purchase_Amount])	Average value per purchase
Total Purchases	Total Compras = SUM('Table 8 (Purchases)'[Purchase_Amount])	Total amount in dollars of purchases (Location: Measurements Table)
Loyal Customers	Clientes Leales = IF(SELECTEDVALUE(Clients[Brand_Loyalty])>=4, "Leal", "No Leal")	Classify a customer as loyal or disloyal (Location: Measurements Table)
Percentage of Loyal Customers	PerCenCienCustomientesLoales = DIVIDE([ClientesLoales_Total], [Cantidad Clientes])	Percentage of loyal customers (Location: Measurements Table)
ClientesLeales_Total	ClientesLeales_Total = CALCULATE(COUNTROWS(Clients), Clients[Brand_Loyalty]>=4)	Total number of loyal customers (Location: Measurements Table)
Average Interaction	Promedio_Interaccion = AVERAGEX ('Interactions', 'Interactions'[Engagement_with_Ads] + 'Interactions'[Social_Media_Influence] + 'Interactions'[Time_Spent_on_Product_Research] + 'Interactions'[Customer_Satisfaction] ) / 4 )	Average of digital interaction indicators (Location: Measurements Table)
Nivel Engagement	Engagement_Level = IF ( [Average_Interaction] >= 3, "High", "Low" )	Classify the average digital customer interaction as High or Low (Location: Measurements Table)
Day with the most purchases	Max_Purchases_Day = CALCULATE ( SELECTEDVALUE ( CalendarioDinamico[Nombre_Dia_Semana] ), TOPN ( 1, SUMMARIZE ( 'Purchases', CalendarioDinamico[Nombre_Dia_Semana], "TotalCompras", [Total Compras] ), [TotalCompras], DESC ) )	Returns the name of the day of the week with the highest purchase volume (Location: Measurements Table)
DayWeekShopping_ES	WeekDayPurchase_ES = SWITCH( WEEKDAY(DATEVALUE('Purchase'[Time_of_Purchase])), 1, "Monday", 2, "Tuesday", 3, "Wednesday", 4, "Thursday", 5, "Friday", 6, "Saturday", 7, "Sunday" )	Returns the name of the day of the week in Spanish (Location: Purchase Table)

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Loyalty_Desc	Lealtad_Desc = SWITCH( TRUE(), Purchase[Brand_Loyalty] = 1, "1-Baja", Purchase[Brand_Loyalty] = 2, "2-Media-Baja", Purchase[Brand_Loyalty] = 3, "3-Media", Purchase[Brand_Loyalty] = 4, "4-Media-Alta", Purchase[Brand_Loyalty] = 5, "5-Alta", "Sin dato" )	Classify loyalty in a readable description (Location: Purchase Table)
OrderDayWeek	OrdenDiaSemana = WEEKDAY(DATEVALUE('Purchase'[Time_of_Purchase]), 2)	Returns the numeric order of the day to sort views (Location: Purchase Table)
MacroCategoria	MacroCategoria = SWITCH( TRUE(), 'Purchase Categories'[Purchase_Category] IN { "Gardening & Outdoors", "Home Appliances", "Furniture" }, "Hogar", 'Purchase Categories'[Purchase_Category] IN { "Food & Beverages", "Groceries" }, "Consumo", 'Purchase Categories'[Purchase_Category] IN { "Clothing", "Beauty & Personal Care", "Jewelry & Accessories" }, "Moda & Cuidado", 'Purchase Categories'[Purchase_Category] IN { "Baby Products", "Toys & Games" }, "Niños & Juguetes", 'Purchase Categories'[Purchase_Category] IN { "Books", "Arts & Crafts" }, "Educación & Cultura", 'Purchase Categories'[Purchase_Category] IN { "Travel & Leisure (Flights, Hotels, etc.)", "Hotels", "Packages" }, "Viajes & Servicios", 'Purchase Categories'[Purchase_Category] IN { "Electronics", "Software & Apps", "Mobile Accessories" }, "Tecnología", 'Purchase Categories'[Purchase_Category] = "Animal Feed", "Mascotas", 'Purchase Categories'[Purchase_Category] = "Health Care", "Salud", 'Purchase Categories'[Purchase_Category] = "Health Supplements", "Salud", 'Purchase Categories'[Purchase_Category] = "Office Supplies", "Otros", "Otros" )	Group detailed categories into general categories for viewing (Location: Purchase_Category Table)

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## Configured hierarchies

In addition to the measures implemented in the measures table, hierarchies were set up in the dimension tables to facilitate multi-level analysis in visualizations.

These hierarchies allow the user to drill down into the data intuitively, breaking down key indicators from general to specific levels directly into the dashboard charts.

Hierarchy	Board	Levels included
RankAgeHierarchy	Clients	Age Range → Age
MacroCategory Hierarchy	Purchase Categories	Macro Category → Detailed Category

## 15. Conclusion: Validation of hypotheses and project objectives

This section summarizes the main findings obtained from the analysis of e-commerce customer behavior, aligned with the defined objectives and the proposed hypothesis.

Key metrics were analyzed across three dimensions—customer profile, purchasing behavior, and digital interactions—with filters applied by loyalty level to identify patterns and validate the hypothesis. Specific findings are presented below for each dashboard page, followed by an overall, integrative conclusion.

## Conclusions per page

### Customer Profile

1. Customers with intermediate levels of loyalty (level 3) concentrate the highest total volume of purchases.

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2. Although the highest levels (level 5) show more constant and predictable behavior in their habits.
3. Most of the loyal customers belong to the age range **36–45 years**, with a balanced gender distribution between female and male.

👉 **Conclusion:** *Loyal customers are predominant in number, but those at the mid-level generate the highest total spending.*

## Purchasing Behavior

1. Busiest days vary by loyalty level: the most loyal customers (level 5) concentrate their purchases on Tuesdays and Sundays.
2. Loyal level 4 customers prefer Mondays and Thursdays, although the difference with other days is not marked, except on weekends when activity is lower.
3. Medium-loyalty customers (level 3), who are the ones who buy the most, do so mostly on Tuesdays, Thursdays, Fridays, and Sundays, with small differences between these days.
4. Furthermore, the most loyal customers prefer mixed channels and digital payment methods like PayPal and credit, while the least loyal customers prefer online and cash.

👉 **Conclusion:** *Loyal customers buy more on certain days and have more defined habits across channels and payment methods.*

## Digital Interactions

1. The influence of social media and advertising is greatest among less loyal customers (levels 1 and 2).
2. Mid-tier customers (tier 3) exhibit the highest digital engagement correlated with higher purchase volume.
3. The most loyal customers (levels 4 and 5) appear less dependent on digital interaction and more consistent in their habits.

👉 **Conclusion** *The most digitally engaged customers are those at the intermediate level, while the most loyal customers are consistent but less influenced by advertising.*

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## General conclusions

The analysis partially supports the proposed hypothesis.

## Hypothesis

*"Loyal customers with greater digital engagement buy more and concentrate their purchases on certain days of the week."*

 Yes, loyal customers concentrate their purchases on certain days of the week and have defined habits across channels, payment methods, and categories.

 However, the greatest economic volume does not always come from the most loyal customers, but from those at the intermediate level, who are also the most influenced by digital interactions.

 **Loyal customers demonstrate consistency and loyalty in their habits, while intermediate customers combine high digital interaction with higher purchase volume.**

## Conclusion of the Objectives

## Main objective

Analyze patterns to relate loyalty and digital engagement with purchase volume and distribution by day of the week.

### **Main objective conclusion:**

The analysis confirmed that customer loyalty and their level of digital engagement are indeed associated with the concentration of purchases on certain days of the week and with defined patterns of channels and payment methods. However, the greatest economic volume is generated by customers with intermediate loyalty, who are also the most digitally active, while the most loyal customers have more consistent habits but lower total spending.

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## Secondary objectives and conclusions

- ✓ **Identify the demographic profile of the most loyal customers:** The most loyal customers are mostly in the 36–45 age range, with a balanced gender distribution, confirming that they are a defined and stable segment.
- ✓ **Determine the purchasing behavior of loyal customers versus less loyal ones:** The most loyal customers shop on specific days (Tuesdays and Sundays), use mixed channels, and prefer digital methods, while the least loyal customers show more dispersed patterns and greater use of cash and physical stores.
- ✓ **Evaluate the influence of digital interactions on loyalty and purchases:** Intermediate customers are those who interact most digitally and make the largest purchase volume, while the most loyal customers rely less on digital interaction, although they maintain stable habits.
- ✓ **Identify the days of the week with the highest purchasing activity according to loyalty level:** It was confirmed that the most loyal customers prefer to shop on Tuesdays and Sundays, while those with less loyalty spread their purchases over several days with less concentration.

## 📌 Key findings

- Loyal customers at the intermediate level (level 3) concentrate a higher volume of purchases.
- Ad engagement and social media influence are positively related to total purchase amount.
- Most customers prefer online or mixed purchases over exclusively in-store purchases.
- Customers with lower loyalty report greater influence from social media in their purchasing decisions, while the most loyal customers rely less on this channel.
- Days with the highest purchase volume are not consistent across levels; depending on the loyalty level, the days of the week that generate the most sales change.
- Most clients are concentrated in the 36–45 age range, with a slight female predominance.

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## 🚀 Future lines

- ✓ **More detailed analysis of categories and subcategories:** Explore the relationship between loyalty levels and specific product categories to design more effective sales strategies by segment.
- ✓ **Predictive loyalty model:** Develop predictive models with machine learning to anticipate which customers are most likely to become loyal or abandon the brand.
- ✓ **Evaluate specific digital marketing campaigns:** Measure the impact of specific campaigns (email, social media, discounts) on each loyalty segment to optimize advertising investments.
- ✓ **Encourage loyalty and digital engagement programs:** Leverage the positive correlation with purchases to boost sales.

## Closing the analysis

This dashboard allows any user, regardless of their technical level, to clearly understand key trends in consumer behavior. The results confirm that customer loyalty and their level of digital engagement are decisive factors in the quantity and value of purchases made, as well as in their preference for certain days of the week.

The analysis supports strategic and tactical decisions aimed at strengthening loyalty programs, increasing the effectiveness of digital campaigns, and optimizing resource allocation on peak business days.

In this way, the project achieves its initial objectives, laying the groundwork for future initiatives to analyze and continuously improve customer experience.