Universidad
de Alcalá

FACULTY OF ECONOMICS, BUSINESS AND TOURISM
DEPARTMENT OF ECONOMICS AND MANAGEMENT

POSICIONAMIENTO — Perceptual Mapping Lab

Teaching Guide and Technical Manual
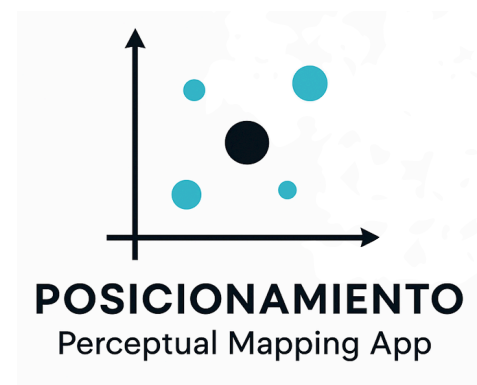
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POSICIONAMIENTO
Perceptual Mapping App

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FOREWORD

This manual was created to provide a modern, accessible, and methodologically rigorous resource for teaching perceptual analysis in marketing.

The increasing digitalisation of learning environments demands materials that combine conceptual clarity, statistical soundness, and a firmly applied focus.

Within this framework, POSICIONAMIENTO – Perceptual Mapping Lab offers an innovative contribution: a lightweight, interactive tool that integrates theory, hands-on analysis, and visual interpretation into a single teaching resource.

The manual presents a complete didactic sequence—from the conceptual foundations of positioning to the advanced interpretation of perceptual maps generated through PCA.

It includes simplified examples, full case studies, reflection exercises, evaluation rubrics, and an instructor guide that supports effective classroom use.

Its purpose is to serve as a reference for courses in market analysis, consumer behaviour, and product strategy, strengthening the development of teaching innovation at the University of Alcalá.

ACKNOWLEDGMENTS

AUTHORS' NOTE

This manual is intended as a living resource.

The POSICIONAMIENTO application will continue to evolve, incorporating new features, improved visualisations, and additional modules that will further expand applied learning opportunities.

The authors invite instructors and students to share feedback, suggestions, and classroom use cases to contribute to the ongoing development of a broader ecosystem of teaching tools in marketing.

Introduction

The POSICIONAMIENTO application is part of the academic project UAH Marketing Lab – Interactive Marketing Applications Cycle, developed at the University of Alcalá. Its purpose is to enable students and researchers to generate perceptual maps using multivariate methods, primarily PCA, to visualise brands, attributes, and consumer preferences.

This document presents the technical foundations, statistical methods, and illustrative examples required for full comprehension.

Furthermore, this application constitutes the first module of a forthcoming suite of seventeen educational tools, currently under development, designed to form an integrated ecosystem of interactive marketing learning applications. Each tool will address a specific analytical competence —segmentation, preference modelling, positioning, competitive dynamics, consumer behaviour, AI martech, and ethics —providing students with a coherent, applied, and interconnected learning experience.

POSICIONAMIENTO launches this cycle as the conceptual and methodological cornerstone upon which the subsequent applications will be built.

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Instructor Quick Action Guide

This guide provides a clear structure for instructors who want to use the POSICIONAMIENTO application in class, combining theory, applied analytics, and strategic discussion.

Current link to the application (as of 24/11/2025) - https://poetic-arithmetic-a9c8ad.netlify.app/

1. Learning objectives

By the end of the session, students will be able to:

• Understand perceptual positioning and its relevance in marketing.

• Perform a basic PCA applied to brands and attributes.

• Interpret 2D perceptual maps and biplots.

• Analyse attribute vectors and distances to the IDEAL point.

• Develop evidence-based strategic recommendations.

• Think critically about attribute selection (relevant, redundant, missing).

• Compare PCA-derived axes with real consumer perceptions.

2. Recommended duration

• Theoretical explanation: 20–30 min

• Survey preparation or execution (optional): 10 min

• Data loading and PCA generation: 15–20 min

• Group work and interpretation: 20–30 min

• Debrief and discussion: 15 min

• Hence, the total timing of the POSICIONAMIENTO workshop is expected to be 75–90 minutes

Note: The session can be adjusted to 45–60 minutes by using a pre-built dataset and omitting the survey step.

3. Suggested workflow (group or individual)

1. Each group selects 3–5 brands in a chosen category.

2. They define 6–8 relevant attributes (in Spanish and English).

3. Enter the data into the application.

4. Generate the PCA map and analyse brand dispersion.

5. Activate/deactivate attribute vectors to highlight patterns.

6. Analyse distances to the IDEAL point and correlations between attributes.

7. Formulate strategic conclusions (repositioning, segmentation, product improvements).

8. Prepare a short presentation or visual summary.

4. Pedagogical recommendations

Encourage debate by comparing PCA axes to real-world market perceptions.

*   Promote critical questions:

    *   Which attributes are missing?

    *   Which ones are redundant?

    *   What happens if we remove an extreme brand?

*   Reinforce visual interpretation:

    *   Vector length and direction

    *   Brand clusters

    *   Empty perceptual spaces

*   Use the map to connect with marketing decisions:

    *   price, targeting, communication, and product strategy.

- Encourage students to generate their own datasets to increase realism.

5. Assessment Criteria (for positioning analysis assignments)

The assignment will be evaluated according to the following criteria:

Criterion	Excellent (10)	Good (8)	Pass (6)	Insufficient
Attribute selection	Relevant, non-redundant attributes	Minor redundancy	Acceptable attributes	Irrelevant or duplicated attributes
Axis identification (PCA)	Correct interpretation based on PCA loadings	Reasonably correct	Intuitive but not demonstrated	Incorrect
Map interpretation	Clear, strategic, coherent	Partially correct	Superficial	Incorrect
Analysis (vectors, distances, IDEAL)	Precise, well-supported conclusions	Adequate	Basic	Incorrect or missing
Strategic recommendations	Viable and well-justified	Appropriate	Simple	Unfounded

It is advisable to conduct a pilot test of the PCA analysis with a small group of students before full implementation in the course. This initial trial will help evaluate how easily students understand the perceptual map, how intuitively they interact with the application, and whether the cognitive load of the exercise is appropriate. The insights gathered during this pilot phase will allow instructors to adjust the activity, refine instructions, and optimise the learning experience before broader use in class.

1.   Fundamentals of Positioning and Perceptual Maps

1.1. What is Brand Positioning?

Brand **positioning** (Figure 1.1) is how consumers perceive a brand relative to its competitors (Barnes & Kitchen, 1995; Santesmases Mestre, 2012; Tahir et al., 2024). It is not only what the company communicates, but the mental image the consumer builds based on experience, expectations, and market signals (Aaker, 1996; Kotler & Keller, 2016; He et al., 2020).
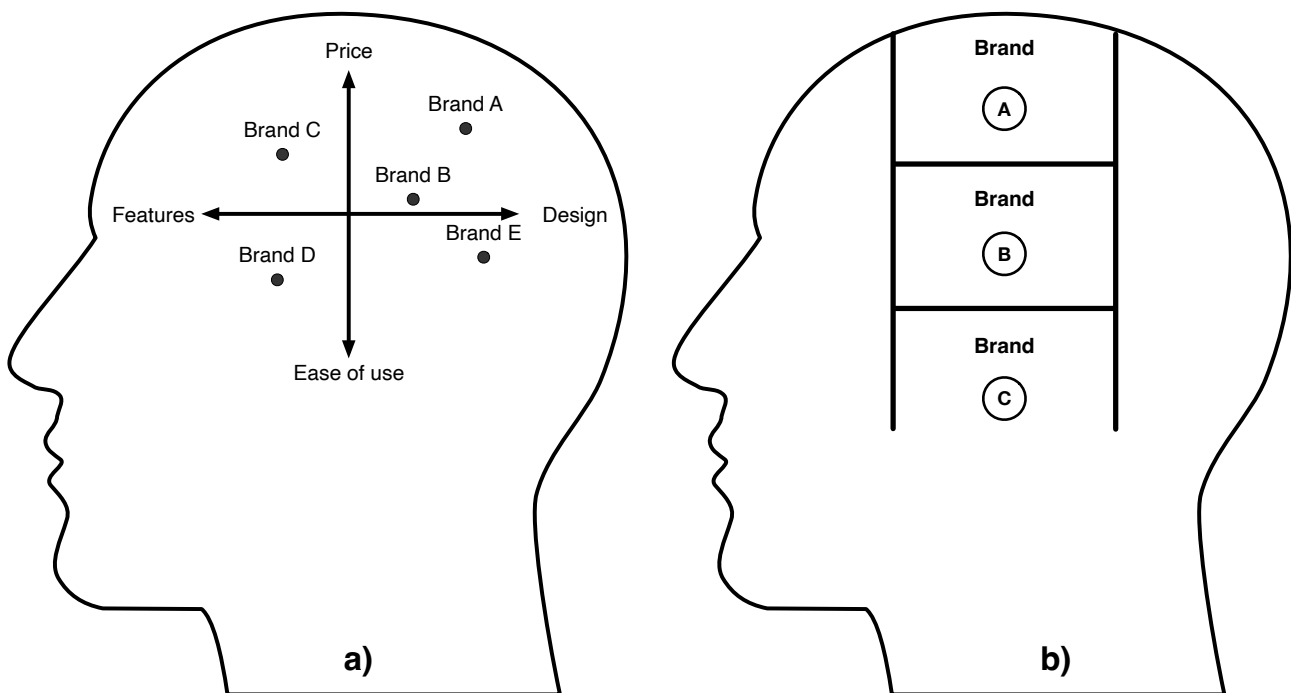
Figure 1.1.a). Perceptual map of brand positioning based on key attributes.
b). Perceptual map of brand positioning based on key attributes.

Strategic positioning addresses three essential questions (Kraujalienė & Kromalcas, 2022):

1. Who are we? (brand identity)

2. What do we offer? (value proposition)

3. Why are we different? (competitive advantage)

Positioning is therefore the foundation of differentiation and consumer choice (Santesmases Mestre, 2012; Keller, 2013).

The visual representations found in Figure 1.1. demonstrate how positioning operates inside the consumer's mind: on one hand, as a perceptual space where brands occupy relative positions (a), and on the other, as a hierarchical structure of recall that shapes preference and the final choice (b) (Ries & Trout, 1981; 2001).

1.2. What Is a Perceptual Map?

A perceptual map is a two-dimensional visual representation showing how consumers perceive brands based on relevant attributes (Gupta et al., 2021). It allows marketers and students to visualise:

- similarities and differences between brands,

- the relative importance of attributes,

- competitive clusters and empty spaces in the market,

- ideal points or preference vectors.

In marketing practice, perceptual maps help transform complex datasets into clear, intuitive visual insights (Diwan, 2004).

1.3. What Are Perceptual Maps Used For?

Perceptual maps are widely used in marketing strategy, product development, and competitive analysis (Blankson & Kalafatis, 2007; Malhotra, 2019). Specifically, they help to:

- Identify market opportunities:
    - uncovering unmet needs,

- spotting white spaces,

- detecting underserved segments.

- Compare competing brands:

    - locating overlaps or direct competition,

    - identifying strengths and weaknesses,

    - analysing relative differentiation.

- Support strategic decisions:

    - repositioning strategies,

    - product design and innovation,

    - communication and branding,

    - targeting and segmentation.

- Understand attribute relevance

Attributes commonly used in perceptual maps include:

- price–quality,

- innovation–tradition,

- aesthetics–functionality,

- naturalness–taste,

- service–value, etc.

1.4. Examples of Applications in Different Sectors

Food and beverages (e.g., juices, snacks)

Common attributes: naturalness, flavour intensity, sugar content, price, brand familiarity.

Automotive

Attributes: safety, performance, design, price, innovation.

Smartphones and electronics

Attributes: camera, battery, performance, design, ecosystem, price.

Airlines

Attributes: punctuality, comfort, service quality, price.

Retail and fashion

Attributes: style, sustainability, quality, price, exclusivity.

1.5. Why Use PCA? Didactic explanation

Many students lack a statistics background, so it is essential to explain intuitively:

What PCA does

• PCA reduces multiple attributes into two main axes (PC1 and PC2).

• These axes represent the most critical dimensions of consumer perception.

• PCA clarifies the underlying structure of the data.

PCA forms a powerful tool for understanding how consumers perceive brands and why they prefer some brands over others.

1.6. How to Interpret PCA Maps

In positioning analysis, there are two main ways to represent brands and attributes: PCA-based perceptual maps (Principal Component Analysis) and direct attribute maps. Although they may look similar visually, their logic, interpretation, and purpose are fundamentally different. This section explains clearly how to read each map type and when to use each.

1.6.1. What Is a PCA Map?

A PCA map is a mathematically derived representation based on the dataset.

The goal of PCA is to:

- reduce many attributes into two main axes (PC1 and PC2),

- maximise the explained variance,

- and show relationships between brands and attributes in a simplified space.

How coordinates are interpreted

- PC1 and PC2 are not attributes themselves but linear combinations of several attributes.

- Their direction and meaning depend entirely on the dataset and can rotate, invert, or combine factors.

- To interpret a PCA map correctly, one must examine the attribute vectors (arrows).

How attribute vectors are read:

- The direction of a vector shows where the attribute increases.

- The length indicates the amount of variance the attribute explains.

- The angle between vectors reflects correlations:

  - close vectors → correlated attributes,

  - opposing vectors → opposite attributes,

- perpendicular vectors → independent attributes.

How brand positions are interpreted:

- A brand located near an attribute vector has a high perceived score on that attribute.

- Brands that are close to each other are perceived similarly.

- Brands far apart represent differentiated perceptions.

1.6.2. What Is a Direct Attribute Map?

A direct map uses explicit attributes defined by the analyst as axes.

For example:

X-axis → Naturalness

Y-axis → Flavour intensity

This type of map is deterministic, not statistical. **Although the application does not generate direct attribute maps, they are included here to help students understand how PCA maps relate to simpler, attribute-based visualisations.**

How it is interpreted:

- A brand further to the right → higher naturalness.

- A brand higher on the graph → stronger flavour intensity.

- No hidden components or mathematical transformations are involved.

- It is a literal representation of attribute values, ideal for simple explanations.

1.6.3. Key Differences Between PCA Maps and Direct Maps

Aspect	PCA Map	Direct Attribute Map
Axes	Principal Components (PC1, PC2)	Actual attributes
Nature	Mathematical, data-driven	Literal, predefined
Correlations	Shown through vector angles	Not represented
Complexity	Higher, requires interpretation	Simple to read
Best for	Real survey analysis	Basic teaching, quick illustrations

1.6.4. Practical Example

Example 1 — Packaged Juices (Figure 1.2)

PCA Map (as in the app):

• PC1 may represent a combination of Naturalness and flavour intensity.

• PC2 may represent secondary variations (e.g., aroma).

• Interpretation requires checking the attribute vectors.
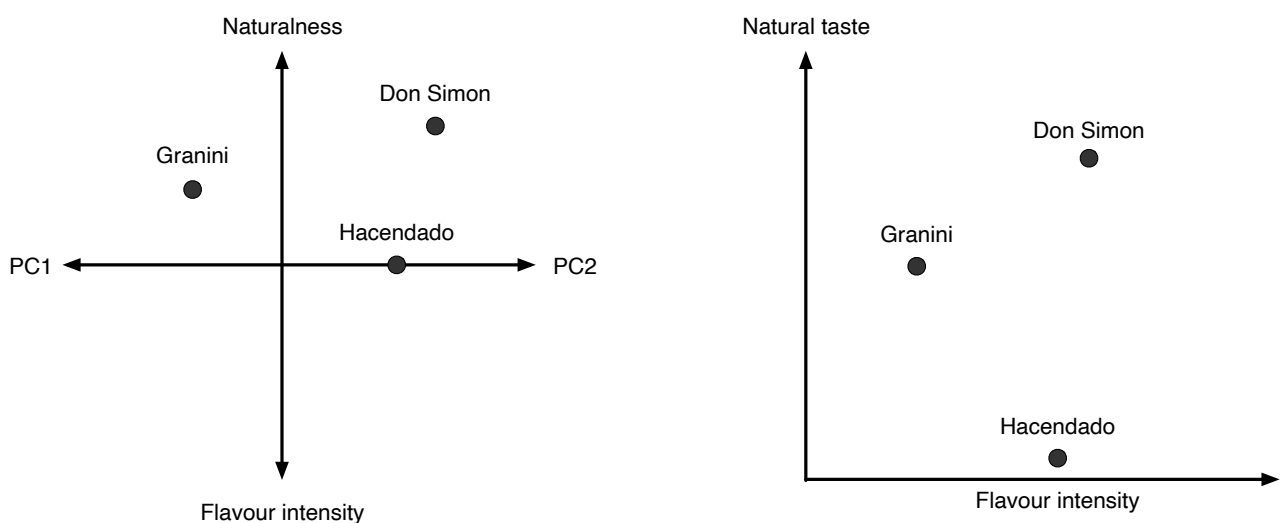
Figure 1.2. Perception map of packaged juices

Direct Map:

- X = Naturalness

- Y = Flavour intensity

- Each brand is positioned directly based on its attribute values.

Example 2 — Smartphone Sector (Figure 1.3)
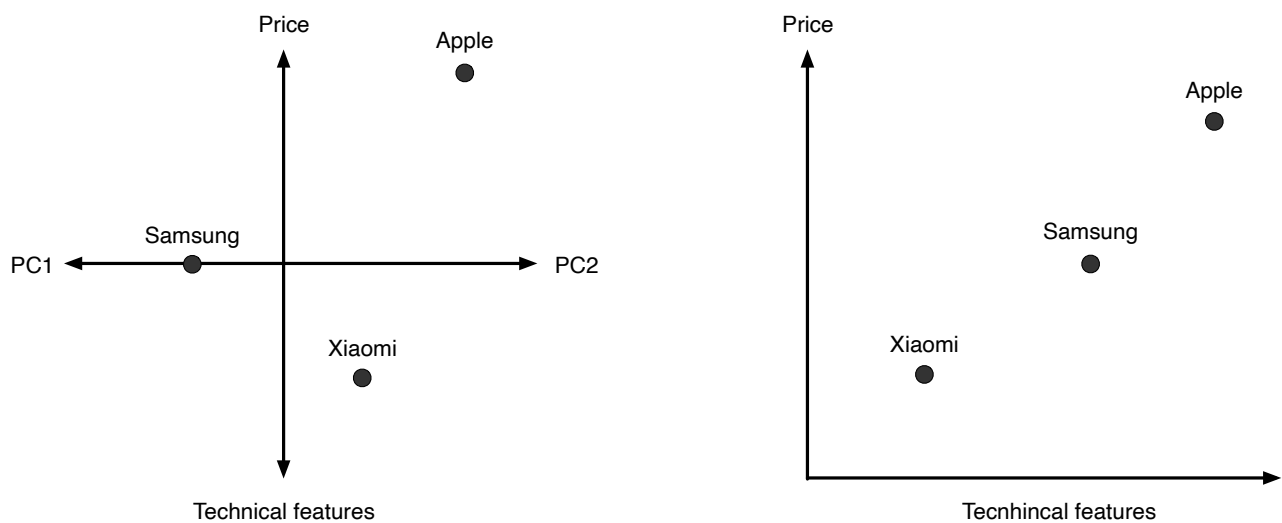
Figure 1.3. Perception map of smartphones

Axes:

- PC1 → Technical Performance

- PC2 → Price

Typical positioning:

- Apple → high performance, high price.

- Xiaomi → good performance, low price.

- Samsung → intermediate performance and mid-range price.

Example 3 — Automotive Sector (Figure 1.4)

Axes:

- PC1 → Technical Performance

- PC2 → Innovation
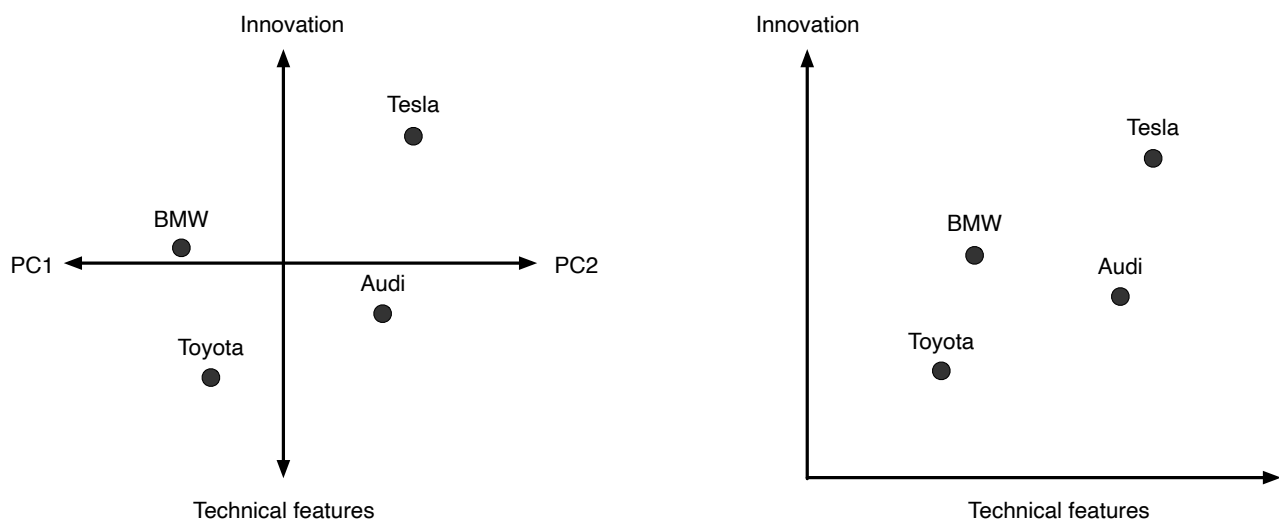
Figure 1.4. Perception map of automotive brands

Typical positioning:

- Tesla → very high innovation, high technical performance.

- BMW → medium to high performance, innovation above medium.

- Audi → high performance, medium innovation

- Toyota → reliability, moderate innovation, balanced performance.

Example 4 — Airline Sector (Figure 1.5)

Axes:

- PC1 → Service Quality

- PC2 → Price
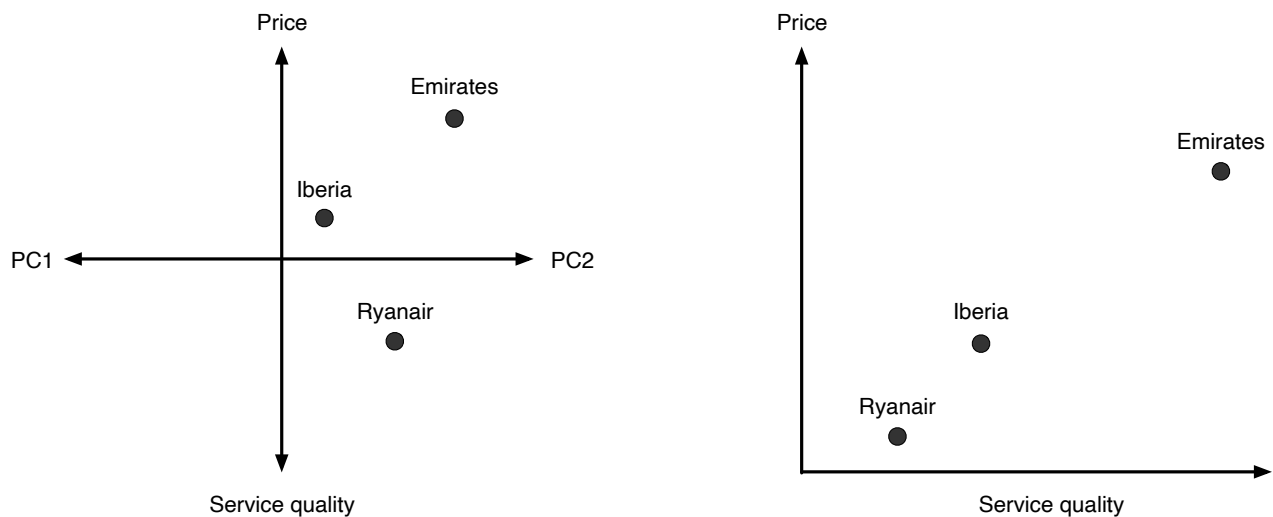
Figure 1.5. Perception map of airlines

Typical positioning:

- Emirates → high service quality, high price.

- Iberia → medium to high service quality, medium price.

- Ryanair → low price, limited service quality.

1.6.5. PCA Use in the Classroom?

Use PCA for:

- real survey data analysis,

- advanced interpretation,

- introducing multivariate methods.

2. Didactic Introduction to PCA

Before presenting the mathematical details, it is important to understand intuitively how the algorithms used in the POSICIONAMIENTO application work (Figure 2.1) and why they are useful in marketing analysis.
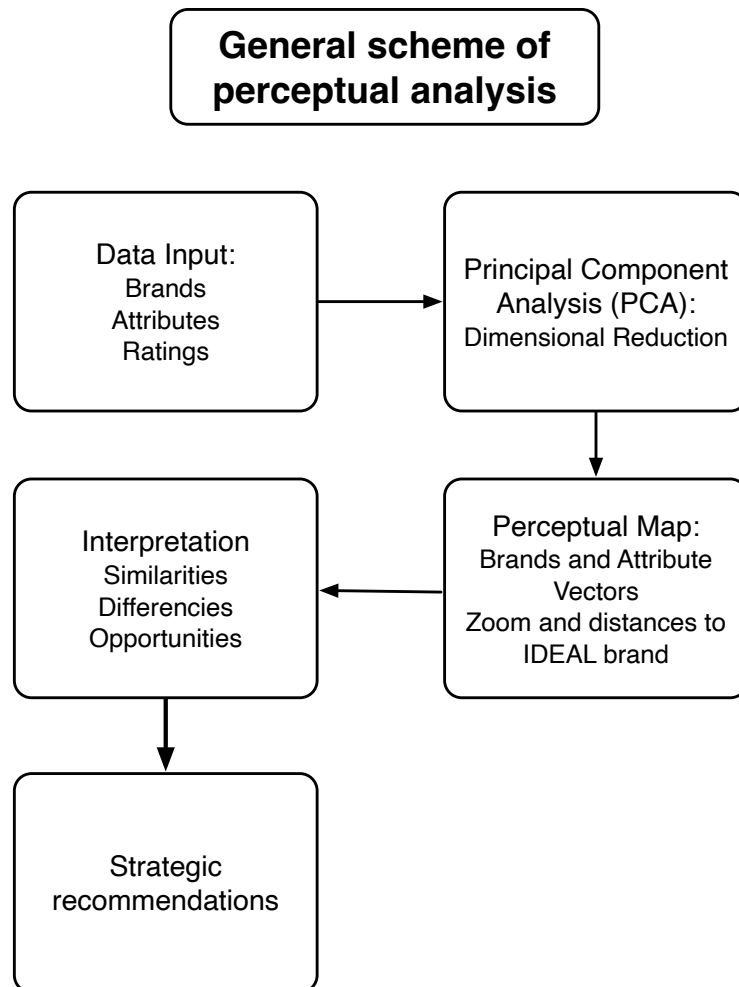
Figure 2.1. The process of perceptual analysis

2.1. What does PCA do in simple terms?

Principal Component Analysis (PCA) is used to reduce many attributes into only two main dimensions, allowing complex information to be visualised in a simple perceptual map (Wind, 1982; Hair et al., 2019).

• Core idea

PCA identifies the two axes (PC1 and PC2) that best summarise how consumers perceive the brands according to the evaluated attributes.

- Why is PCA necessary?

Because:

- Attributes are often correlated (e.g., flavour intensity and sweetness).

- Visualising 6–8 attributes simultaneously in a 2D space would be impossible.

- PCA transforms these attributes into two major "directions" of perception, which can later be interpreted through the attribute vectors.

- How to read PCA results without applying mathematics

- PC1 is the axis that explains the largest share of the differences between brands.

- PC2 explains the next most relevant portion of the variance.

- The attribute arrows show the meaning of each axis.

- Brands appear in positions that best reflect their actual evaluation profiles.

PCA does not invent data; it simply organises it to make perception differences visible.

2.2. Why are these methods useful in a marketing classroom?

Because they enable students to:

- visualise real perceptions and preferences,

- understand how markets are structured,

- make data-based strategic decisions (repositioning, segmentation, branding),

- learn multivariate techniques in an intuitive, accessible way.

Students do not need to understand mathematics to interpret the map

The technical section that follows is valuable for advanced learners, but for most students, it is enough to understand the principle:

"PCA draws the perceptual map."

3.   Algorithms used

3.1. Principal Component Analysis (PCA)

Given matrix X:

$$\tilde{X} = X - \bar{X}$$

Variance:

$$\sigma^2 = \frac{1}{N} \sum (x_i - \mu)^2$$

Decomposition:

$$X = TP^T$$

Two principal components are used to create the 2D map.

4.   Application overview

4.1. Main features

The tool allows the user to:

- Enter product/brand attributes.

- Load data from a survey (preferences, evaluations, ratings).

- Automatically calculate PCA.

- Visualise the perceptual map in 2D.

- Export results and figures.

The structure is designed for use in university teaching and in research projects.

4.2. Export/Import JSON file

The application includes an "Export JSON" button, which allows the user to download the entire data structure used by the application in JSON format.

This file contains:

- the attribute matrix,

- calculation metadata,

- PCA scores,

- loadings,

- preference vectors,

- selected configuration parameters.

This format is especially useful for:

- reproducing the analysis in R, Python or MATLAB,

- integrating it into other academic systems,

- saving complex configurations.

5. Quick user guide

5.1. Preparing the Data
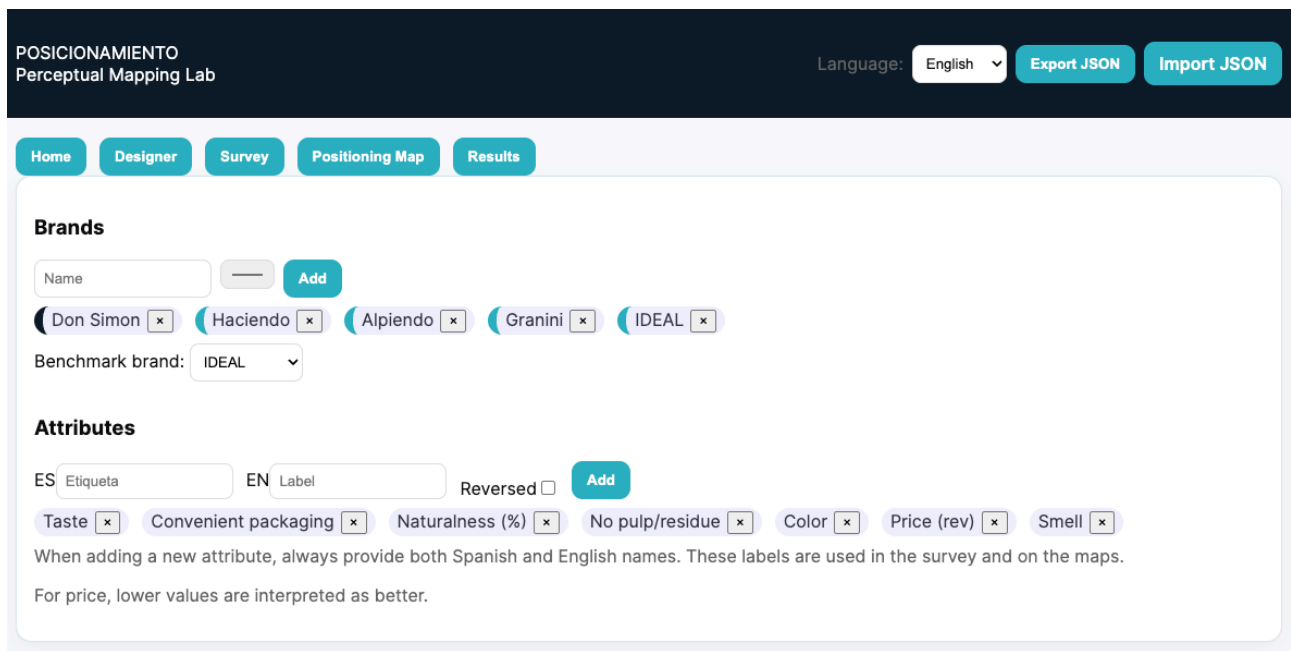
Before using the application, ensure that you have the following elements ready:

- A set of brands to be compared (ideally 3–6).

- Make sure you also include the IDEAL trademark, perceived as the market's «best» for reference in the positioning analysis. Also, any other inserted brand can be assigned as a reference. In such a case, the IDEAL brand may be redundant.

- A list of attributes evaluated by consumers (typically 6–8 attributes).

- Rating data obtained from a survey, using Likert scales or semantic differentials.

Typical examples of attributes may include, but are not limited to: Price, Flavour, Naturalness, Packaging, Colour, Aroma.

Ensure that:

- All brands have been evaluated on all selected attributes.

- The attribute list does not contain duplicates or irrelevant items.

Figure 5.1. Designer screen for entering brand names and product attributes

5.2. Entering Brands and Attributes into the Application

On the «Designer» screen (Figure 5.1):

- Enter the brand names in the corresponding fields.

- Add the attribute list that will be used in the analysis.

- You are supposed to enter attribute names in two prompts, English and Spanish, simultaneously. For instance, ES: Precio → EN: Price; ES: Sabor → EN: Flavour; ES: Naturalidad → EN: Naturalness. Otherwise, the application will not add the attribute to the analysis list.

- Verify that the spelling and order of the attributes are correct, as they will appear later on the perceptual map.

Recommendation: Use attributes that are relevant, non-redundant, and easy for students to interpret.

Figure 5.2. Survey screen

5.3. Uploading the Evaluation Data

The application allows two modes of input (Figure 5.2):

- Manual entry of rating data directly into the interface. Make sure you push the «Submit response» button if you use this approach to enter evaluation data.

- Importing a JSON file previously exported from a survey tool (e.g., previous sessions of Posicionamiento (this application), Google Forms or Typeform), if available. The application includes a button in the upper-left corner to perform this operation.

Before proceeding, confirm that:

- No fields are empty.

- All attributes contain numeric values for every brand.

This ensures that PCA can be performed without errors.

5.4. Generating the Perceptual Map (PCA Output)

Once the data have been entered or imported, run the PCA calculation using the corresponding button.

The application will:

- compute the first two principal components (PC1 and PC2),

- generate a two-dimensional perceptual map,

- plot the brands according to their perceptual similarity,

- allow the user to activate or deactivate attribute vectors.

At this stage, the map visually depicts how consumers perceive the brands relative to one another.

5.5. Exploring the Map: Vectors, Distances and Interactive Tools

This is one of the core analytical features of the application (Figure 5.3).

The map is interactive and can be explored using several interactive controls, as explicated below.

5.5.1. Showing or hiding attribute vectors

A panel on the right-hand side displays a list of all available attributes. For each attribute:

- Checking the box will display its vector on the map.

- Unchecking the box will hide the vector, reducing visual clutter.
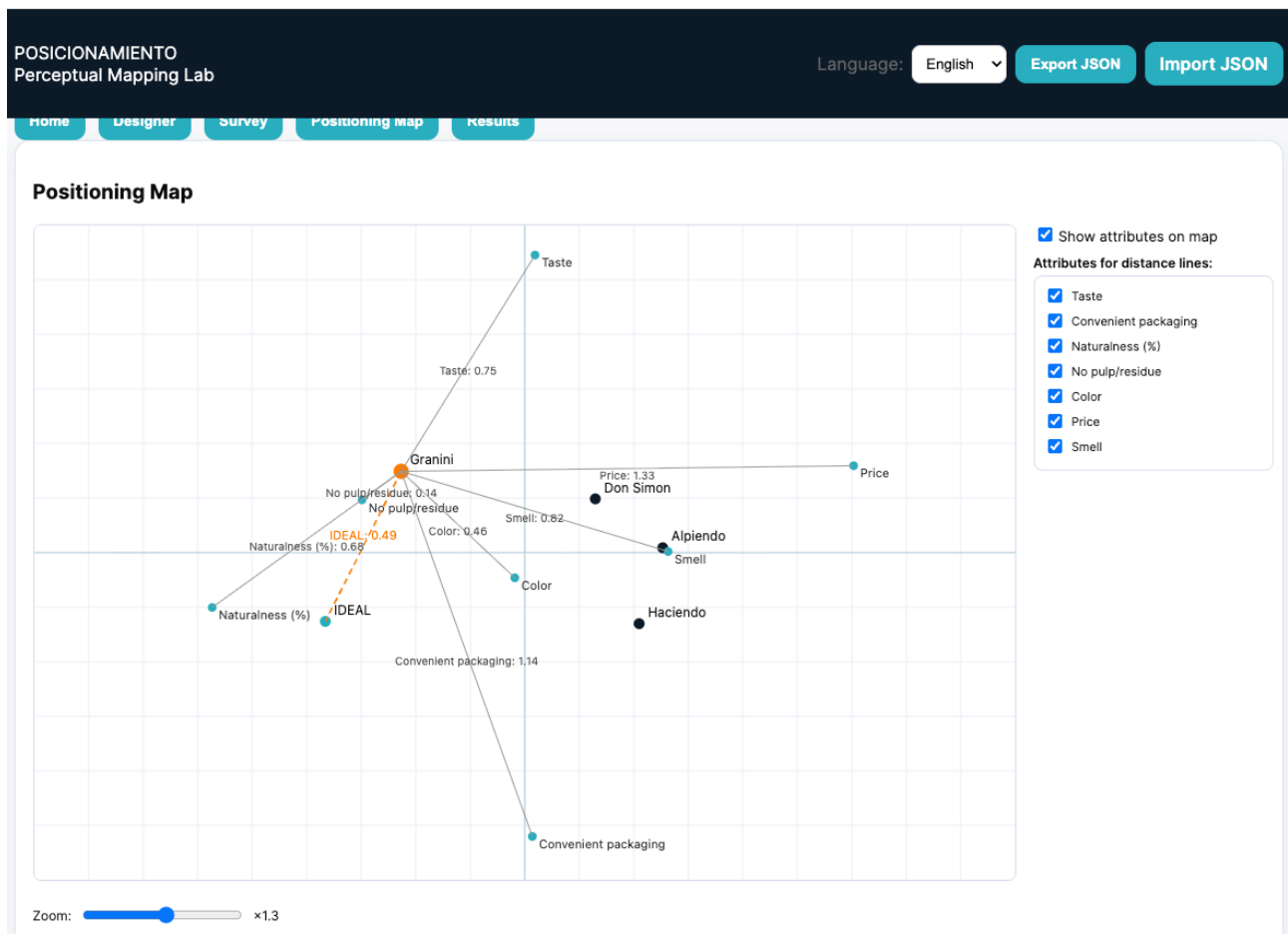
Figure 5.3. Positioning map with vectors visualising distances between the selected and IDEAL brands, as well as distances from the chosen brands to the means of attributes evaluation

This allows the user to focus selectively on specific attributes without overwhelming the display.

5.5.2. Viewing distances between brands and the IDEAL point

When the user places the cursor over any brand on the map, the application automatically shows:

- the distance from that brand to the IDEAL point,

- and the distances from the brand to the selected (visible) attribute vectors.

Interpretation:

A shorter distance indicates stronger alignment between the brand and the attribute (or the IDEAL point).

5.5.3. Interpreting the direction and meaning of vectors

Attribute vectors provide essential information:

- The direction of each vector indicates the direction in which the corresponding attribute increases.

- The proximity of a brand to a vector indicates a higher perceived level of that attribute.

- The angle between vectors shows correlations:

- Similar directions → positive correlation

- Opposite directions → negative correlation

- Perpendicular vectors → independence between attributes

This facilitates strategic analysis based on consumer perception.

5.5.4. Using the map zoom

The Zoom (up to the ×2.0 scale) slider allows users to:

- zoom in on clusters of brands that appear close to each other,

- examine vector orientation more precisely,

- adjust the visual scale for presentations or large screens.

The zoom function improves clarity, particularly when brands or vectors overlap.

5.6. Interpreting the Perceptual Map

Once the vectors and brand positions are visible:

• Brands located close to each other are perceived as similar.

• Brands positioned near an attribute vector exhibit high perceived values of that attribute.

• Brands close to the IDEAL point are generally the most aligned with consumer expectations.

• Empty regions of the map may indicate opportunities for repositioning or market gaps.

This interpretation step is essential for transforming perceptual outputs into actionable marketing insight.

5.7. Exporting Results

The application offers several export options (Figure 5.4):

• PDF export of the perceptual map in high resolution, suitable for teaching materials, presentations, and academic reports.

• JSON export containing the full dataset and analysis metadata, useful for advanced analysis in R, Python, or MATLAB.

• Screenshots of the map for documentation or sharing with students.

These options facilitate the inclusion of results in assignments, research projects, or classroom exercises.
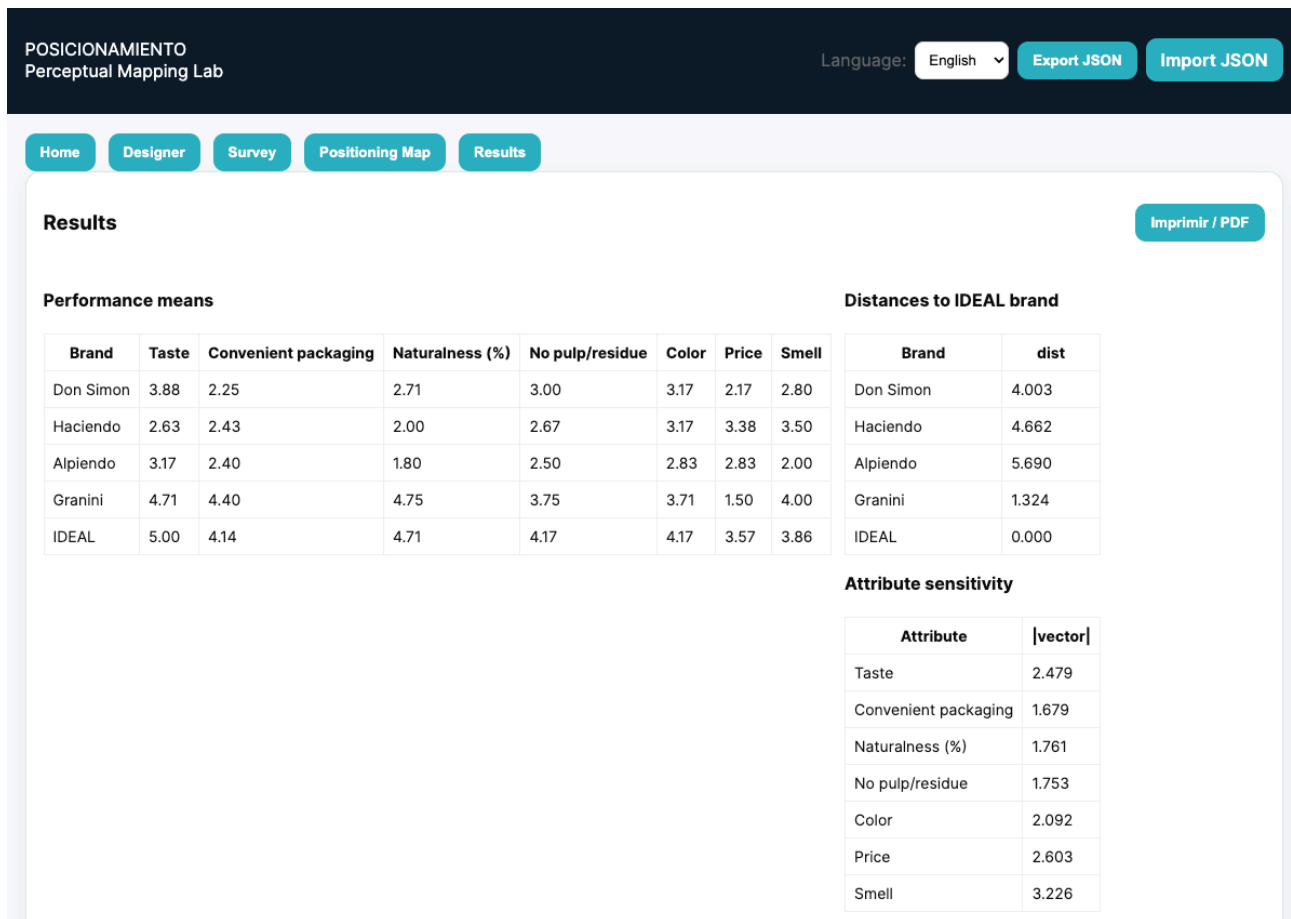
Figure 5.4. Results screen exhibiting the numerical outcomes of the positioning analysis

6. Case examples

6.1 Illustrative Example of Correct Perceptual Maps

Good example (correct) (Figure 6.1)

• Well-defined attributes (4–5).

• Sufficient variance between brands.

• Clear differences across attributes.

Figure 6.1. Correctly generated perceptual map

6.2. Illustrative Example of Incorrect Perceptual Map

Figure 6.2. Incorrectly generated perceptual map

Poor example (incorrect) (Figure 6.2)

• Redundant attributes.

• Identical scores across brands.

• Lack of correlation.

7.   Full Case Studies

7.1. Case Study 1 — Hospitality Sector

Introduction

The hotel sector is particularly suitable for perceptual positioning analysis, as consumers evaluate multiple attributes simultaneously: price, location, service level, comfort, design, brand reputation, among others (Kotler et al., 2014).

This case study analyses the positioning of five fictitious hotels in the same city, with the aim of visualising the market's competitive structure and identifying strategic implications.

The purpose of the exercise is to understand how attributes influence each establishment's overall perception and how brands cluster by their strengths and weaknesses.

7.1.1. Hospitality Brands

This case examines five hypothetical hotels (based on common patterns in the sector):

• UrbanStay (modern, central, mid-range price)

• Royal Garden (premium, classic, high service level)

• BudgetInn (budget, basic, functional)

• VistaMar (vacation-oriented, strong design)

• BusinessHub (business-oriented, efficient)

Six key attributes were selected as relevant for customer decision-making:

• Price

• Location

• Comfort

• Service

• Design

• General reputation and ratings

Values are based on simulated evaluations on a 1–5 scale, consistent with typical market perceptions.

7.1.3. Dataset Used (attribute × brand matrix)

(The figures are simulated but coherent for PCA analysis.)

Attribute	UrbanStay	Royal	BudgetInn	VistaMar	BusinessH	IDEAL
Price	3	5	1	4	4	4
Location	5	4	3	3	5	5
Comfort	4	5	2	5	4	5
Service	4	5	2	4	5	5
Design	4	5	1	5	3	5
Reputation	4	5	2	4	4	5
Preference	4	4	2	4	5	5

Table 7.1. Data on consumer perception of hospitality brands

Based strictly on the perceptual map generated by the software, the brands are positioned as follows (Figure 7.1):

- **BudgetInn**.

  - Located in the lower-right area.

  - Although it is a low-priced hotel, PCA places it correctly because its scores form a pattern of low quality, clustering in PC1 based on the factor structure.

  - Its low position on PC2 reflects lower service, weaker design, and lower reputation.

- **Royal Garden**.

  - Positioned in the central-upper quadrant.

  - It does not appear as far from the rest as expected because Price, Service, and Reputation do not generate enough variance relative to the other attributes.

  - Although it is a high-quality hotel, its proximity to UrbanStay and BusinessHub suggests direct competition in overall perception, without any differentiating attributes.

Figure 7.1. PCA map of the hotels positioning

- **UrbanStay**

  - Found in the lower-right quadrant.

  - It appears very close to BusinessHub.

  - PCA reveals that UrbanStay is perceived as modern, well-located, and balanced, but not as premium as VistaMar.

  - Its proximity to IDEAL indicates strong overall value competitiveness.

- **BusinessHub**

  - Very close to UrbanStay, slightly lower.

  - It aligns strongly with the Service vector and partially with Reputation.

  - According to the real PCA map, this is the closest hotel to the IDEAL point, which matches its preference score (5/5).

  - PCA identifies it as the most efficient and balanced option in the market.

- **VistaMar**

  - Located in the upper-right corner, aligned with the Comfort vector and partially with Price.

  - It represents a high-quality hotel with strong design.

  - PCA clearly separates it from the UrbanStay/BusinessHub cluster, indicating a more aspirational positioning.

- **IDEAL**

  - Positioned slightly to the left of the central cluster.

  - In the real map, it shifts slightly due to the PCA distribution.

  - Its proximity to UrbanStay and BusinessHub confirms that these two hotels are best aligned with the ideal preference pattern.

7.1.5. Interpretation of Vectors

The vectors on the map show:

- Price → upward (high influence on PC2)

- Location → down-right

- Comfort → upper-left

- Service → moderate-right

- Design → lower-left

- Reputation → mid-right

Key conclusions:

- VistaMar aligns with Comfort and Price.

- BusinessHub and UrbanStay align with Service and Reputation.

- BudgetInn is distant from all positive attributes.

- Royal Garden is moderately close to Reputation and Design, but shows no clear leadership.

7.1.7. Analysis of the IDEAL Point

The IDEAL point is located:

- close to UrbanStay

- close to BusinessHub

- closest to Royal Garden

- distant from BudgetInn

- moderately distant from VistaMar

Therefore:

- The brand best positioned relative to IDEAL is BusinessHub, followed closely by UrbanStay. VistaMar and Royal Garden occupy intermediate distances. BudgetInn is the least aligned with ideal consumer preferences.

1. "High quality without extreme price" segment (clear gap)

Between UrbanStay/BusinessHub and VistaMar there is a potential space defined by:

* high quality,

* medium price,

* good location,

* strong service.

No hotel fully occupies this area.

2. Strong competitive pressure in the central cluster

Royal Garden, BusinessHub, and UrbanStay are very close competitors. They need differentiation through a specific attribute.

3. BudgetInn as an urgent repositioning case

It is isolated and distant from favourable vectors.

Opportunities exist if it improves:

* reputation

* service

* basic comfort

—all achievable with moderate investment.

7.1.10. Repositioning Proposal (example: Royal Garden)

Royal Garden appears:

- stuck in the middle zone

- without leadership in any attribute

- without clear advantage over VistaMar or BusinessHub

Suggested repositioning:

- Enhance perceived value

    - premium packages

    - personalised experiences

- Communication repositioning

    - emphasis on prestige, history, or exclusivity

- Price adjustment

    - small downward correction to avoid cannibalisation with VistaMar

7.1.11. Case Conclusions

- The real map shows a bimodal market:

    - a value cluster (UrbanStay, BusinessHub)

    - an aspirational cluster (VistaMar, Royal Garden)

- BusinessHub is the brand best positioned relative to the IDEAL point.

- BudgetInn requires repositioning or resegmentation.

- PCA provides a clear, actionable view of the competitive structure.

- The case demonstrates how to interpret a perceptual map derived from real data and translate it into strategic decisions in the hospitality sector.

Introduction

The fashion sector is particularly suitable for perceptual positioning analysis, as consumers evaluate functional aspects (quality, durability, price), emotional elements (design, identity), and experiential factors (sustainability, brand reputation) (Vilasanti da Luz, 2020; Ismail, 2021).

This case study analyses the positioning of five fictitious fashion brands, together with the IDEAL benchmark, using the PCA map generated automatically by the POSICIONAMIENTO – Perceptual Mapping Lab application.

The objective is to understand how the selected attributes influence brand perception, how the brands cluster, and which ones are closest to the ideal preference pattern.

7.2.1. Brands Scoped

The case includes five brands inspired by real market archetypes:

- Luxoria — premium, exclusive design, high price, aspirational positioning

- UrbanFit — urban, young, modern, mid-price

- EcoWear — sustainable, ethical, organic materials, simple design

- FastTrend — fast fashion, very accessible, high rotation, seasonal style

- ClassicLine — classic style, high durability, mid-high price

Six key attributes were selected for perceptual evaluation:

• Perceived quality

• Design / Style

• Durability

• Price

• Sustainability

• Reputation / Brand image

Additionally, the dataset includes:

• General preference (1–5)

"Overall, how much would you prefer this brand?"

The scale used is 1 to 5, consistent with the previous case.

7.2.3. Dataset Used (attribute × brand matrix)

Attribute	Luxoria	UrbanFit	EcoWear	FastTrend	ClassicLin	IDEAL
Quality	5	3	4	2	5	5
Design /	5	5	3	4	3	5
Durability	4	3	4	2	5	5
Price	5	3	3	1	4	3
Sustainabil	3	2	5	1	3	5
Reputation	5	3	4	2	4	5
Preference	4	4	5	3	4	5

Table 7.2. Data on consumer perception of the fashion brands

Based strictly on the real PCA map generated by the software (Figure 7.2).

The PCA output reveals a multidimensional structure where the axes do not represent traditional marketing concepts (e.g., "quality" or "price") but rather latent combinations of multiple attributes.

- **FastTrend**

  - Located in the upper-right quadrant.

  - This position reflects alignment with the Price vector and weaker alignment with quality- or sustainability-driven attributes.

  - The PCA highlights that the brand is perceived mainly through the lens of affordability and trendiness, rather than functional quality.

Figure 7.2. PCA map of fashion brands perception

- **UrbanFit**

  - Found in the lower-right area, close to the Reputation and Design vectors.

- It represents a modern, youthful brand with strong design appeal but lower emphasis on sustainability or durability.

- Its moderate distance from the IDEAL point suggests a positive, but not optimal, positioning.

- **ClassicLine**

  - Positioned in the upper-central region, very close to EcoWear.

  - This reflects strengths in durability, quality, and reputation.

  - Although its design is more conservative, the PCA places it as a solid brand with overall high perceived quality.

- **EcoWear**

  - Located in the upper-central-right zone and strongly aligned with the Sustainability vector.

  - Its closeness to ClassicLine, but with a stronger tilt towards sustainability, highlights a differentiated ethical positioning.

  - EcoWear is one of the closest brands to IDEAL, alongside ClassicLine.

- **Luxoria**

  - Positioned in the lower-left quadrant.

  - Despite its nominal high quality in the dataset, the PCA suggests Luxoria is less aligned with the attributes that explain the highest perceptual variance, particularly sustainability and price.

  - Its distance from IDEAL reflects an aspirational, rather than preference-optimal, positioning.

- **IDEAL**

  - Located slightly left of the central cluster.

  - Its proximity to ClassicLine and EcoWear indicates that consumers ideally look for:

    - solid quality

    - sustainability

    - durability

    - positive brand reputation

    - moderate price

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7.2.5. Interpretation of Vectors

The map shows the following directions:

- Price → upper-right

- Design → lower-right

- Durability → lower-left

- Quality → upper-left

- Sustainability → upper-central-left

- Reputation → central-right

Key conclusions:

- EcoWear dominates the Sustainability vector.

- ClassicLine aligns with Quality and Durability.

- UrbanFit depends heavily on Design and Reputation.

- FastTrend separates strongly toward Price.

- Luxoria is isolated and weakly aligned with the dominant perceptual attributes.

7.2.6. Analysis of the IDEAL Point

The IDEAL point is:

- very close to ClassicLine

- close to EcoWear

- moderately distant from UrbanFit

- clearly distant from FastTrend

- far from Luxoria

Therefore:

- The best-positioned brands relative to IDEAL are ClassicLine and EcoWear.

- UrbanFit occupies a mid-range position.

- FastTrend and Luxoria deviate significantly from the ideal perceptual profile.

7.2.7. Strategic Opportunities Identified

1. "Sustainable + Modern Design" segment (significant market gap)

No brand currently combines:

- high sustainability

- strong design

- mid-level price

A hybrid between UrbanFit and EcoWear would be highly competitive.

2. Luxoria requires value redefinition

Luxoria is perceptually isolated:

- not sustainable

- not strongly preferred

- not dominant in design on the PCA map

A shift toward premium sustainable fashion would reposition it favourably.

3. FastTrend faces the risk of negative perception drift

It remains distant from attributes currently valued by consumers.

Boosting durability and reputation would prevent long-term erosion.

7.2.8. Repositioning Proposal (Example of FastTrend)

Problem:

FastTrend relies too heavily on price.

The PCA shows it is disconnected from key value attributes.

- Suggested repositioning:
  - Incremental quality improvements
    - more durable fabrics
    - stricter manufacturing control
  - Accessible sustainability
    - recycled materials
    - basic certifications
  - Narrative repositioning
    - "affordable yet ethical fashion"
    - small collaborative capsule collections

This would move FastTrend into a more central, competitive position.

- The perceptual map shows two dominant poles: sustainability/durability (EcoWear, ClassicLine) and price/trendy design (FastTrend, UrbanFit).

- ClassicLine and EcoWear are the brands most aligned with IDEAL.

- Luxoria is misaligned with current perceptual trends.

- PCA reveals clear opportunities for sustainable fashion with modern design.

- This case illustrates how to interpret a real perceptual map and convert insights into strategic decisions in fashion retail.

8. Product/Brand Positioning Analysis (Text to be distributed to the students)

The objective of this assignment is to analyse the perceptual positioning of a set of competing brands within a product category, using the POSICIONAMIENTO – Perceptual Mapping Lab application. Based on the collected data, students must interpret the perceptual map, understand the structure of consumer perceptions, and propose strategic recommendations. It is recommended that the assignment be completed in teams of 3-6 students.

8.1. Selection of the category and brands

Choose a product category of interest (e.g., juices, smartphones, airlines, detergents, coffee, cosmetics, etc.).

Then:

- Select 4 or 5 competing brands within that category.

- Briefly justify your choice of category and brands.

8.2. Definition of evaluation attributes

Identify 6 to 8 attributes that you consider relevant for consumer decision-making in the chosen category.

Examples: naturalness, flavour, price, durability, packaging, design, comfort, aroma, innovation.

For each attribute:

- specify what it represents in practical terms;

- ensure that attributes are not redundant or excessively similar;

- enter the attribute name in both Spanish and English (required by the application).

8.3. Collecting and uploading the data

Gather real or simulated ratings for each brand across all attributes, using a consistent scale (Likert, semantic differential, or 1–9).

Then:

- enter the scores manually in the application, or

- upload a compatible JSON file.

Verify that:

- no cells are empty,

- all attributes contain numerical values for all brands.

This ensures that PCA can be executed correctly.

8.4. Generating the perceptual map (PCA output)

Use the application to:

- run the PCA automatically,

- generate the 2D perceptual map,

- observe the relative position of the brands,

- activate or deactivate attribute vectors as needed.

This step provides an initial view of how consumers perceive the brands.

8.5. Interactive analysis tools

Using the interactive features of the program, analyse:

- Attribute vectors — direction, length, correlations.

- Distances between brands and the IDEAL point — visible when hovering over a brand.

- Brand alignment with selected attributes — especially when specific vectors are shown or hidden.

- The effect of activating/deactivating attributes — to avoid visual overload and focus the analysis.

- Zoom controls — to examine clusters or overlapping vectors in more detail.

8.6. Interpretation of the perceptual map

Answer the following:

- What perceptual axes emerge from the PCA?

- Which brands are perceived as most similar?

- Which attributes contribute most to brand differentiation?

- Which brand is closest to the IDEAL point? Why?

- Are there empty spaces in the map that represent potential opportunities?

8.7. Strategic repositioning proposal

Select one brand of preference and:

- evaluate whether its current position is advantageous or problematic,

- propose a repositioning strategy,

- specify which attributes should be strengthened or communicated,

- explain how this movement would appear on the perceptual map.

8.8. Conclusions to be made by students

The final report or presentation should include:

- a summary of the perceptual analysis,

- the key insights obtained,

- strategic implications for the selected brands and suggestions to improve marketing strategies,

- reflections on possible limitations of the analysis.

9.   Activities, Reflection Questions, and Student Challenges

This section provides a set of activities designed to promote active learning, critical thinking, and autonomous exploration. All tasks can be completed using the POSICIONAMIENTO application and the included example datasets, or with datasets created by the students themselves.

These exercises may be used as supplementary questions to the primary assignment or treated as standalone learning activities. They are provided to practice and reinforce the concepts covered in the primary assignment (Section 8).

9.1. Practical Activities (Basic–Intermediate Level)

Activity 1 — Identifying the main axes

Observe the perceptual map generated by the application and answer:

- Which attributes seem to define the horizontal axis (PC1)?

- Which attributes seem to define the vertical axis (PC2)?

- What visual evidence supports your interpretation?

Activity 2 — Comparing brands

Select two brands that appear close to each other on the map.

- Explain why they are positioned near one another based on their attribute ratings.

- On which attributes are they similar?

- On which attributes do they differ slightly?

Activity 3 — Selective activation of attribute vectors

Activate only three relevant attributes in the right-side panel.

• Describe how the interpretation of the map changes.

• Which attributes create the largest separation between brands?

• Does any brand change significantly in perceived meaning when other vectors are hidden?

Activity 4 — Analysing the IDEAL point

Hover over several brands and examine their distances to the IDEAL point.

• Which brand is closest to the ideal point?

• Which brand is the second closest?

• What does this imply in terms of product positioning?

Activity 5 — Detecting redundant attributes

Choose two attributes whose vectors appear very close to each other.

• What does this indicate about their correlation?

• Would it be reasonable to remove one from the analysis? Why?

• What effect might this have on the PCA?

9.2. Reflection Questions (Critical Thinking)

Reflection 1 — Which attribute is missing?

Imagine you are the marketing manager.

- Which important attribute is not included in the analysis?

- How might the map change if it were added?

Reflection 2 — Consumer segments

Based on the position of the brands:

- Which segment of consumers would prefer each brand?

- What perceptual changes would be needed to reach a different segment?

Reflection 3 — Strategic interpretation

- Which brand appears to be the best positioned?

- Which brand seems to be in the weakest competitive position?

- What factors drive this conclusion?

Reflection 4 — Empty spaces in the map

- Are there areas of the map where no brand is present?

- Could these empty spaces represent an opportunity for a new product?

9.3. Advanced Challenges (Intermediate–Advanced Level)

Challenge 1 — Removing an extreme brand

Remove the brand farthest from the map's centre.

- How do PC1 and PC2 change?

- What happens to the orientation of the vectors?

- How does this affect the remaining brand groupings?

Challenge 2 — Adding a highly correlated attribute

Introduce a new attribute that is very similar to another (e.g., "Sweetness" and "Flavour").

- Rerun the PCA.

- Do you observe any distortion in the map?

- What happens to the explained variance?

- What does this suggest about the use of redundant variables?

Challenge 3 — Strategic repositioning exercise

Choose one brand and imagine that you must reposition it.

- Indicate where the brand should move on the map.

- Which attributes should be improved or emphasised?

- What marketing actions would help achieve this repositioning?

Challenge 4 — Build your own dataset

Design a short survey with 5–6 brands (real or fictitious) and 6–8 attributes.

- Collect 10–20 responses.

- Convert the dataset into JSON file format.

- Load the dataset into the application.

- Generate your own perceptual map.

- Analyse perceptions, dominant attributes, and repositioning opportunities.

10. System Metadata

The metadata describes the informational structure automatically generated by the POSICIONAMIENTO – Perceptual Mapping Lab application.

10.1. General Information

- Project name: POSICIONAMIENTO – PCA Lab

- Software version: 1.5 (26/11/2025)

- Institution: Universidad de Alcalá

- Supported languages: ES / EN

- The source code of the POSICIONAMIENTO application is not included in this manual. Instructors interested in technical collaboration or repository access may contact the authors.

10.2. Input Metadata

- Number of brands

- Number of attributes

- Type of scale (Likert, semantic differential, ranking, preference)

- Unique observation identifiers

10.3. Output Metadata

- Variance explained by each component

- Loading matrix

- Score matrix

- Brand coordinates in the PCA space

- Preference vectors (if applicable)

- Regression parameters

- Generated graphics (maps, biplots, attribute arrows)

11. Functional Architecture of the Application

The application follows a modular architecture consisting of four main components:

11.1. Interface Module

- Data input panel

- Configuration panel

- Language selector

- Visualization panel

11.2. Analytical Module

- Data normalisation

- Covariance matrix computation

- PCA (eigen decomposition algorithm)

- Error handling and validation

11.3. Visualisation Module

- 2D biplots

- Attribute projections

- Preference vector projections

- PNG/CSV exports

11.4. Management Module

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- Version control

- Metadata logging

- Export of analytical results

12. Model Assumptions and Limitations

12.1. Mathematical Assumptions (Hair et al., 2019)

- Linearity among variables

- Approximate normality of input variables

- Continuous, metric measurement of attributes

- Sufficient variance across brands

- Absence of extreme multicollinearity

12.2. Limitations

- PCA does not detect non-linear relationships

- Highly correlated attributes may produce axes that are difficult to interpret

- A 2D map loses information when Components 3 or 4 contain meaningful variance

- Inconsistent scales can distort the perceptual map

13.   Expanded Technical Appendix

This appendix presents detailed derivations, mathematical steps, and validation procedures.

13.1. Formal PCA Derivation

Given a centred data matrix X, the covariance matrix is:

$$S = \frac{1}{n-1} X^\top X$$

We seek the eigenvalues:

$$S v_i = \lambda_i v_i$$

where:

- λ_i= variance explained by component i

- v_i= eigenvector (loading vector)

Scores are computed as:

$$Z = XV$$

Approximate reconstruction:

$$\hat{X} = ZV^\top$$

13.2. Data Validation

13.2.1. Approximate normality

Recommended procedures:

- Shapiro–Wilk test

- Q–Q plot

- Skewness/Kurtosis inspection

13.2.2. Sufficient variance

We require:

$$\text{Var}(x_j) > 0$$

for each attribute.

13.2.3. Correlation structure

PCA performs best when:

$$|r_{ij}| > 0.3$$

for several attribute pairs.

13.2.4. Missing values

Recommended handling:

- Mean imputation

- Listwise deletion (if few values are missing)

13.2.5. Outlier detection

Methods:

- Mahalanobis distance

- Z-score inspection

14. Inclusion, Accessibility and Educational Accommodations

The UAH Marketing Lab – Interactive Marketing Applications Hub adheres to the principles of universal accessibility and inclusive design. The aim is to ensure that students with functional diversity, specific learning difficulties, or curricular adaptation needs can fully engage with the practical activities.

Embedded accessibility measures:

- interface compatible with screen readers;

- clear and redundant iconography (text + symbol);

- accessible language and verbal descriptions of visual content;

- no essential information conveyed solely through colour;

- minimal animations or motion effects;

- manual organised in clear, progressive steps.

For students who require additional accommodations, this material can be integrated within UAH procedures regarding:

- extended time allowances,

- personalised assistance,

- alternative accessible formats,

- guided interpretation of analytical tasks.

The goal is to ensure that all students—regardless of their needs—can benefit from the resource and demonstrate their competencies in perceptual analysis and marketing decision-making.

Conclusions

This manual provides a complete technical and conceptual foundation for understanding perceptual analysis and applying the PCA method rigorously using the POSICIONAMIENTO – Perceptual Mapping Lab application. Through accessible explanations, illustrative examples, full practical cases, and additional exercises, the document enables students to develop a solid understanding of how to interpret perceptual maps, identify market patterns, and evaluate the competitive structure of a set of brands.

Beyond the technical dimension, the manual includes methodological guidance, usage instructions, assessment criteria, and pedagogical recommendations to facilitate direct classroom implementation. This ensures that both students and instructors have a coherent, applicable resource aligned with best teaching practices in marketing analytics. The inclusion of practical cases based on simulated datasets—along with detailed explanations of axes, vectors, and distances to the IDEAL point—helps develop essential analytical competencies for strategic decision-making in real business environments.

Finally, the manual is conceived as the first component of a broader collection of teaching tools aimed at modernising marketing education through lightweight, interactive, and applied learning resources. Its modular structure and practical orientation allow for future expansion with additional applications, new cases, and advanced materials, enabling the manual to serve as a methodological reference for marketing courses at different academic levels.

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