

Market Segmentation Analysis

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Github Links of implementation:

SOUMOBRATA MANNA -

https://github.com/soumo99/ML_codes/blob/main/customer_segmentation.ipynb

Charan-

<https://github.com/Charanpoojary/Project-13-MCdonalds-data-Customer-Segmentation/blob/main/MCdonalds.ipynb>

Shreya Sharma-

[https://github.com/ShreyaSharma3005/StudyTaskProject2/blob/main/studyTask%20\(1\).ipynb](https://github.com/ShreyaSharma3005/StudyTaskProject2/blob/main/studyTask%20(1).ipynb)

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https://github.com/Sahil-deep/Mcdonalds-CaseStudy/blob/main/k_means_clustering.ipynb

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SUMMARY

Market Segmentation:

Market segmentation refers to creating segments based on different needs of the consumers and analyzing those needs.

Market segmentation consists of three layers as mentioned below:

- 1.Extracting market segments
- 2.Market segmentation analysis
- 3.Making it happen in practise



For implementing market segment analysis we follow a procedure of 10 steps which would be discussed briefly throughout this summary.

Step 1: Deciding (not) to Segment

Implications of committing to Market Segmentation :

Market Segmentation has been developed to be a key marketing strategy applied in many organizations, it is not always the best decision to pursue such a Strategy. Before investing time and resources in a market segmentation analysis, it is important to understand the implications of pursuing a market segmentation strategy. The key implication is that the organization needs to commit to the segmentation strategy on the long term. Segmenting a market is not free. There are costs of performing Research, fielding surveys, and focus groups, designing multiple packages, and designing multiple advertisements and communication messages.

Implementation Barriers

The first group of barriers relates to senior management:

- Lack of leadership
- Pro-active championing
- Commitment and involvement in market segmentation process by senior leadership.

The second group of barriers relates to organizational culture:

- Lack of market or consumer orientation
- Resistance to change and new ideas
- Lack of creative thinking
- Bad communication

Closely linked to these barriers is the lack of a formal marketing function or at least a qualified marketing expert in the organization. The higher the market diversity and the larger the organizations, the more important is a high degree of formalization. the lack of a qualified data manager and analyst in the organization can also represent major stumbling blocks.

Step-2: Specifying the Ideal Target Segment

Segment Evaluation Criteria

layer of market segmentation analysis depends primarily on user input. It is important to understand that

- For a market segmentation analysis to produce results that are useful to an Organization
- User input cannot be limited to either a briefing at the start of the process
- The development of a marketing mix at the end.

In step 2 the Organization must determine two sets of segment evaluation criteria

Knock-out Criteria

These criteria are the essential, non-negotiable features of segments and the organization would consider targeting. Knock-out criteria are used to determine if market segments resulting from the market segmentation analysis qualify to be assessed using segment attractiveness criteria. The first set of such criteria includes

- Sustainability
- Measurability
- Accessibility

Additional criteria recommended that fall into Knock-out criteria category:

- The segment must be homogenous; members of Segment must be similar to one another.
- The segment must be distinct; members of Segment must be distinctly different from members of other segments.
- The segment must be large enough; the segment must contain enough consumers to make it worthwhile to spend extra money on customizing the marketing mix for them
- The segment must be matching the strengths of the organization; the organization must have the capability to satisfy segment members' needs
- Members of the segment must be identifiable; it must be possible to spot them in the marketplace 5
- The segment must be reachable; there has to be a way to get in touch with members of the segment in order to make the customized marketing mix accessible to them.

Knock-out criteria must be understood by senior management, the segmentation team, and the advisory committee. Most of them do not require further specification, but some do. For example, while size is non-negotiable, the exact minimum viable target segment size need to be specified.

Attractiveness Criteria

These criteria are used to evaluate the relative attractiveness of the remaining market segments - those in compliance with the knock-out criteria. attractiveness criteria are not binary in nature. Segments are not assessed as either complying or not complying with attractiveness criteria. Rather, each market segment is rated; it can be more or less attractive with

respect to a specific criterion. The attractiveness across all criteria determines whether a market segment.

Implementing a Structured Process

The most popular structured approach for evaluating market segments in view of selecting them as target markets is the use of a segment evaluation plot showing segment attractiveness along one axis, and organizational competitiveness on the other axis. Factors which constitute both segment attractiveness and organizational competitiveness need to be negotiated and agreed upon. To achieve this, a large number of possible criteria has to be investigated before agreement is reached on which criteria are the most important for the organization. At the end of this step, the market segmentation team should have a list of approximately six segment attractiveness criteria. Each of these criteria should have a weight attached to it to indicate how important it is to the organization compared to the other criteria.

Step-3: Collecting Data

Segmentation Variables

Empirical data forms the basis of both common sense and data-driven market segmentation. Empirical data is used to identify or create market segments and – later in the process – describe these segments in detail. characteristic of the consumers in the sample.

Sociodemographics		Travel behaviour		Benefits sought			
gender	age	Nº of vacations	relaxation	action	culture	explore	meet people
Female	34	2	1	0	1	0	1
Female	55	3	1	0	1	0	1
Female	68	1	0	1	1	0	0
Female	34	1	0	0	1	0	0
Female	22	0	1	0	1	1	1
Female	31	3	1	0	1	1	1
Male	87	2	1	0	1	0	1
Male	55	4	0	1	0	1	1
Male	43	0	0	1	0	1	0
Male	23	0	0	1	1	0	1
Male	19	3	0	1	1	0	1
Male	64	4	0	0	0	0	0

Each row in this table represents one consumer, each variable represents one characteristic of that consumer. An entry of 1 in the data set indicates that the consumer has that characteristic. An entry of 0 indicates that the consumer does not have that characteristic segmentation variable.

All the other personal characteristics available in the data – in this case: age, the number of vacations taken, and information about five benefits people seek or do not seek when they go on vacation – serve as so-called descriptor variables. They are used to describe the segments in detail. The difference between common sense and data-driven market segmentation is that data-driven market segmentation is based not on one, but on multiple segmentation variables. These segmentation variables serve as the starting point for identifying naturally existing, or artificially creating market segments useful to the organization (as shown in below Fig).

Sociodemographics		Travel behaviour		Benefits sought			
gender	age	Nº of vacations	relaxation	action	culture	explore	meet people
Female	34	2	1	0	1	0	1
Female	55	3	1	0	1	0	1
Male	87	2	1	0	1	0	1
Female	68	1	0	1	1	0	0
Female	34	1	0	0	1	0	0
Female	22	0	1	0	1	1	1
Female	31	3	1	0	1	1	1
Male	55	4	0	1	0	1	1
Male	43	0	0	1	0	1	0
Male	23	0	0	1	1	0	1
Male	19	3	0	1	1	0	1
Male	64	4	0	0	0	0	0
descriptor variables				segmentation variables			

When common sense segments are extracted – even if the nature of the segments is known in advance – data quality is critical to both

- assigning each person in the sample to the correct market segment
- being able to correctly describe the segments

The same holds for data-driven market segmentation where data quality determines the quality of the extracted data-driven market segments, and the quality of the descriptions of the resulting segments. Good market segmentation analysis requires good empirical data.

Geographic Segmentation

Geographic information is seen as the original segmentation criterion used for the purpose of market segmentation. Typically

- when geographic segmentation is used
- the consumer's location of residence serves as the only criterion to form market segments.

The key advantage of geographic segmentation is that each consumer can easily be assigned to a geographic unit. As a consequence, it is easy to target communication messages, and select communication channels (such as local newspapers, local radio and TV stations) to reach the selected geographic segments. The key disadvantage is that living in the same country or area does not necessarily mean that people share other characteristics relevant to marketers, such as benefits they seek when purchasing a product.

Socio-Demographic Segmentation

Typical socio-demographic segmentation criteria include age, gender, income and education. Socio-demographic segments can be very useful in some industries. For example: luxury goods (associated with high income), cosmetics (associated with gender; even in times where men are targeted, the female and male segments are treated distinctly differently), baby products (associated with gender), retirement villages (associated with age), tourism resort products (associated with having small children or not).

The case with geographic segmentation, socio-demographic segmentation criteria have the advantage that segment membership can easily be determined for every consumer. In some instances, the socio-demographic criterion may also offer an explanation for specific product preferences (having children, for example, is the actual reason that families choose a family vacation village where previously, as a couple, their vacation choice may have been entirely different). But in many instances, the sociodemographic criterion is not the cause for product preferences, thus not providing sufficient market insight for optimal segmentation decisions.

Psychographic Segmentation

When people are grouped according to psychological criteria, such as their beliefs, interests, preferences, aspirations, or benefits sought when purchasing a product, the term psychographic segmentation is used.

Psychographics was intended as an umbrella term to cover all measures of the mind.

Psychographic criteria are, by nature, more complex than geographic or socio-demographic criteria because it is difficult to find a single characteristic of a person that will provide insight into the psychographic dimension of interest. As a consequence, most psychographic segmentation studies use a number of segmentation variables, for example: a number of different travel motives, a number of perceived risks when going on vacation.

Behavioral Segmentation

Another approach to segment extraction is to search directly for similarities in behavior or reported behavior. A wide range of possible behaviors can be used for this purpose, including prior experience with the product, frequency of purchase, amount spent on purchasing the product on each occasion (or across multiple purchase occasions), and information search behavior. But behavioral data is not always readily available, especially if the aim is to include in the segmentation analysis potential customers who have not previously purchased the product, rather than limiting oneself to the study of existing customers of the organization.

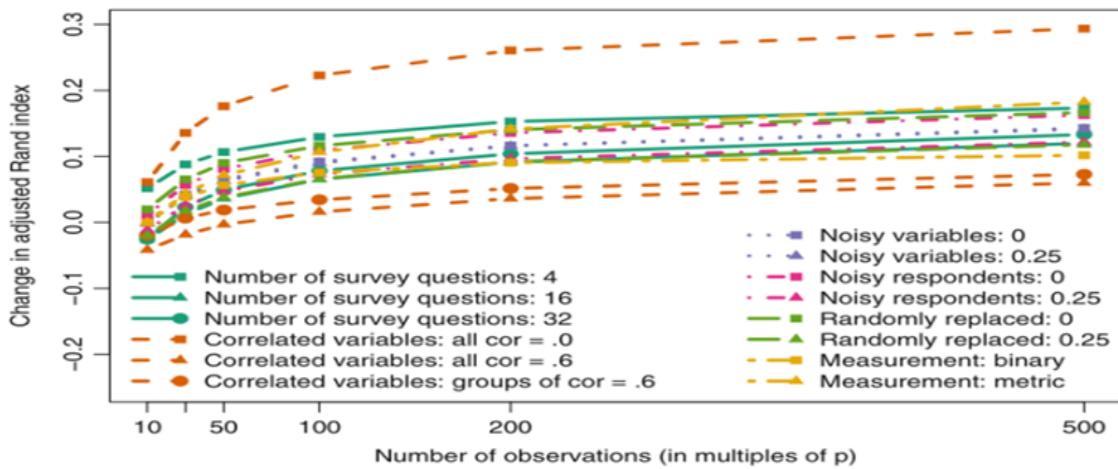
Data from Survey Studies

Most market segmentation analyses are based on survey data. Survey data is cheap and easy to collect, making it a feasible approach for any organization. But survey data

- as opposed to data obtained from observing actual behavior
- can be contaminated by a wide range of biases.

Such biases can, in turn, negatively affect the quality of solutions derived from market segmentation analysis.

- contain all necessary items;
- contain no unnecessary items;
- contain no correlated items;
- contain high-quality responses;
- be binary or metric;



Data from Internal Sources

Increasingly organizations have access to substantial amounts of internal data that can be harvested for the purpose of market segmentation analysis. Typical examples are scanner data available to grocery stores, booking data available through airline loyalty programs, and online purchase data. The strength of such data lies in the fact that they represent actual behavior of consumers, rather than statements of consumers about their behavior or intentions, known to be affected by imperfect memory, as well as a range of response biases, such as social desirability bias or other response styles. Another advantage is that such data are usually automatically generated

- if organizations are capable of storing data in a format that makes them easy to access
- no extra effort is required to collect data

Data from Experimental Studies

Another possible source of data that can form the basis of market segmentation analysis is experimental data. Experimental data can result from field or laboratory Experiments. For example, they can be the result of tests how people respond to certain advertisements. The response to the

advertisement could then be used as a segmentation criterion. Experimental data can also result from choice experiments or conjoint analyses. The aim of such studies is to present consumers with carefully developed stimuli consisting of specific levels of specific product attributes. Consumers then indicate which of the products – characterized by different combinations of attribute levels – they prefer. Conjoint studies and choice experiments result in information about the extent to which each attribute and attribute level affects choice. This information can also be used as a segmentation criterion.

Step-4: Exploring Data

A First Glimpse at Data

After data collection, exploratory data analysis cleans and – if necessary – pre-processes the data. This exploration stage also offers guidance on the most suitable algorithm for extracting meaningful market segments. At a more technical level, data exploration helps to

- identify the measurement levels of the variables;
- investigate the univariate distributions of each of the variables and,
- assess dependency structures between variables.

Data Cleaning

The first step before commencing data analysis is to clean the data. This includes checking if all values have been recorded correctly, and if consistent labels for the levels of categorical variables have been used. For many metric variables, the range of plausible values is known in advance. For example, age (in years) can be expected to lie between 0 and 110. It is easy to check whether any implausible values are contained in the data, which might point to errors during data collection or data entry. Similarly, levels of categorical variables can be checked to ensure they contain only permissible values. For example, gender typically has two values in surveys: female and male. Unless the questionnaire did offer a third option, only those two should appear in the data. Any other values are not permissible, and need to be corrected as part of the data cleaning procedure.

Descriptive Analysis

Being familiar with the data avoids misinterpretation of results from complex analyses. Descriptive numeric and graphic representations provide insights into the data. Statistical software packages offer a wide variety of tools for descriptive analysis. In R, we obtain a numeric summary of the data with command `Summary`. This command returns the range, the quartiles, and the mean for numeric variables. For categorical variables, the command returns frequency counts. The command also returns the number of missing values for each variable. Helpful graphical methods for numeric data are histograms, boxplots and scatter plots. Bar plots of frequency counts are useful for the visualization of categorical variables. Mosaic plots illustrate the association of multiple categorical variables. We explain mosaic plots in Step 7 where we use them to compare market segments. Histograms visualize the distribution of numeric variables. They show how often observations within a certain value range occur. Histograms reveal if the distribution of a variable is unimodal and symmetric or skewed. To obtain a histogram, we first need to create categories of values. We call this binning. The bins must cover the entire range of observations, and must be adjacent to one another usually, they are of equal length. Once we have created the bins, we plot how many of the observations fall into each bin using one bar for each bin. We plot the bin range on the x-axis, and the frequency of observations in each bin on the y-axis.

Pre-Processing

1.Categorical Variables

categorical features, they take on levels or values. These can be represented as various categories such as age, state, or customer type for example. Alternatively, these can be created by binning underlying numeric features, such as identifying individuals by age ranges (e.g., 0–10, 11–18, 19–30, 30–50, etc.). Finally, these can be numeric identifiers where the relationship between the values is not meaningful. ZIP codes are a common example of this. Two ZIP codes close numerically may be farther apart than another ZIP code that is distant numerically.

2.Numerical Variables

Numeric data typically represents data in the form of scalar values depicting observations, recordings or measurements. Here, by numeric data, we mean continuous data and not discrete data which is typically represented as categorical data. Numeric data can also be represented as a vector of values where each value or entity in the vector can represent a specific feature. Integers and floats are the most common and widely used numeric data types for continuous numeric data. Even though numeric data can be directly fed into machine learning models, you would still need to engineer features which are relevant to the scenario, problem and domain before building a model. Hence the need for feature engineering still remains. Let's leverage python and look at some strategies for feature engineering on numeric data.

Principle Component Analysis

Principal Component Analysis is an unsupervised learning algorithm that is used for the dimensionality reduction in Machine learning. It is a statistical process that converts the observations of correlated features into a set of linearly uncorrelated features with the help of orthogonal transformation. These new transformed features are called the Principal Components. It is one of the popular tools that is used for exploratory data analysis and predictive Modelling. It is a technique to draw strong patterns from the given dataset by reducing the variances.

PCA generally tries to find the lower-dimensional surface to project the high-dimensional data.

PCA works by considering the variance of each attribute because the high attribute shows the good split between the classes, and hence it reduces the dimensionality. Some real-world applications of PCA are image processing, movie recommendation system, optimizing the power allocation in various communication channels. It is a feature extraction technique, so it contains the important variables and drops the least important variable.

Step-5: Extracting Segments:

Grouping Customers:

We can consider market segments as clusters and using clustering these market segments can be extracted.

The extraction of segments from a given distribution can be done using various clustering methods like:

- Single linkage hierarchical clustering
- K means clustering

There is no single best Algorithm we just have to pick an algorithm based on the dataset.

Distance Based Methods:

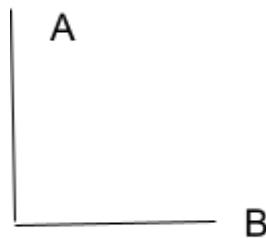
In these kinds of methods we need a distance measure based on which we can put two similar observations in the same group

1. Distance measures: following are the types of distance measures:

- Euclidean Distance: it is the most commonly used measure. It is basically the direct distance between the two points or the straight line between two points.



- Man-hatten Distance: In this case we measure the difference between two points through the streets on a grid manner.



- Asymmetric Binary distance: It is only applied when the given vectors are binary. Does not use all the dimensions just uses

the dimension where one of the two vectors has the value of 1.

Hierarchical Methods:

Hierarchical methods can be visualized using Dendograms where the root represents a cluster containing all the observations whereas the leaves represent a cluster of single customers.

Following are the types of hierarchical methods:

- Divisive Hierarchical : In this case we start with the complete dataset and splits into 2 clusters in the next step, it keeps following this process until each consumer has a cluster.
- Agglomerative Hierarchical : In this case we start with every consumer having a single segment and then we will keep on merging segments with similar properties until we get a final cluster with all the consumers.

For performing both of the above methods we need a distance measure.

Following are the linkage methods which can be used:

- Single linkage: distance between the two closest observations of the two sets
- Complete linkage: distance between the two observations of the two sets that are farthest away from each other.
- Average linkage: mean distance between observations of the two sets.

Many alternatives of hierarchical methods are available one of them is WARD clustering.

This is based on Squared Euclidean distance. It can be used to join two clusters with minimum squared euclidean distance.

Hierarchical methods are only reasonable when the size of the dataset is small.

Partitioning Methods:

These can be used when large datasets are there and the hierarchical method fails.

Some of these methods are as follows:

- Kmeans and Centroid Based:

Procedure followed by K means:

1. Decide the number of clusters k.
2. Select random centroids.
3. Each data point has to be assigned to the closest centroid
4. Calculate variance and give new centroid to each cluster.
5. Repeat 3rd and 4th step
6. If there is no change in the clusters finish the procedure.

This is the main algorithm and many variations to this algorithm are available.

- Improved Kmeans:

There have been many attempts to improvise k-means by devising a better algorithm to initialize the algorithm. One of these methods is to randomly select many starting points and picking the best out of those. A good representative has lesser difference from the other data points of the segment. A bad representative has a larger difference from rest of the data points of the segment.

- Hard Competitive Learning:

It differs from k-means clustering on how the segments are extracted. Here, a random point is selected and the centroid is moved a step ahead in its direction.

Hybrid Approaches:

In this case we can combine clustering algorithms to improvise the process.

Following are some of the types of this approach:

- Two step clustering: this procedure consists of two steps. The first step includes running a partitioning method and then later we need to apply a hierarchical procedure in the next step.
- Bagged Clustering: This also involves the combining of hierarchical and partitioning methods but along with that it involves a new term called Boot Strapping. Following are the steps of bagged clustering:
 1. Create b bootstrap samples.
 2. Repeat the partitioning method for each bootstrap sample to generate cluster centers.
 3. Use cluster centers to derive new data
 4. Calculating the hierarchical clustering using this dataset
 5. Finding the final answer by cut point of the Dendogram

Model Based Methods:

Lately many model based methods have been coming up. These techniques do not use distance to extract segments. They use the following assumptions:

- Each segment has a certain size.
- A consumer is a part of a certain segment then it must have same characteristics as that of the other consumers in the segment.

Model based approach involves selecting a structure and fine tuning of that structure for that we need a finite mixture model.

Following are included in the finite mixture model:

- Finite mixtures of distribution
- Finite mixtures of regression

Algorithms with Integrated Variable Selection:

While creating segments not all segmentation variables are of similar importance, we can remove the unwanted variables while data preprocessing but we can also use certain algorithms which selects the important variable and also extracts segments. Following are some of the ways to do so.

- Biclustering algorithms: These algorithms are mainly used to create clusters of both consumers and variables at the same time. It creates segments of consumers who all have a value of 1 for a group of variable.

Following are the steps of biclustering:

1. Rearrangement of rows and columns to create a matrix of similar entries.
2. Assignment of observation to a cluster.
3. Removal of rows which are assigned to first bicluster.

Advantages of biclustering:

1. No data transformation needed
2. Can identify niche markets

- Variable Selection Procedure of clustering Binary data

In this case we assume that there is a presence of a certain variables. Which are not relevant in extracting the segments. We first extract the variables which will help the most in extracting segments and it is based on k-means clustering method.

Following are the steps to be followed:

1. Selecting the optimal size of the subset relevant variables.
2. Performance of an exhaustive search for some variables for smallest with cluster sum of squares criteria.
3. Among these variables check which leads to the smallest increase within cluster sum of squares and add to the set of segmentation variables.
4. Addition of the variable to segmentation variable only if the increase is smaller than the thresh hold.

- Variable reduction: Factor cluster Analysis:

It is basically a 2 step reduction process in the first step we do the factor analysis of variables and in the second step we just use the factor scores from the first step to extract segments.

Data Structure Analysis:

It is important to validate different segmentation solutions but calculating different solutions can be a tedious task therefore we use data structure analysis to determine the reliability and stability of a solution. It helps us in getting insights into some essential properties of data. Following are some approaches to data structure analysis:

- Cluster Indices : when important decisions like how many segments do we need to extract are to be made then comes in the role of cluster indices. They are of two types:
 1. Internal cluster indices: here we only use a single segmentation solution. We just need to find out how compact is each of the segment and how well separated are two market segments.
 2. External cluster indices: In this case we need more than one market segmentation solution. But it might act as a really crucial factor if true segment structure is known, but it is mostly not given. Here we will compare two segmentation solutions. But we can face issues while comparing the solutions. As the levels might be arbitrary. This problem is referred to as label switching. We can solve this by checking if pairs of consumers are assigned to the same segment repeatedly rather than focusing on the segments individual consumers are assigned.
- Gorge Plots : In this we basically measure the distance of consumer from the segment representatives. For partitioning methods distance is already available. But in case of model base method we use probability of a consumer belonging to a given segment. Similarity can be visualized using gorge, silhouette or shadow plots.

Step 6: Profiling Segments:

Identifying Key Characteristics of Market Segments

The aim of the profiling step is to get to know the market segments resulting from the extraction step. Profiling is only required when data-driven market segmentation is used. For common sense segmentation, the profiles of the segments are predefined. If, for example, age is used as the segmentation variable for the Common-sense segmentation, it is obvious that the resulting segments will be age groups. Therefore, Step 6 is not necessary when common sense segmentation is conducted. The situation is quite different in the case of data-driven segmentation: users of the segmentation solution may have decided to extract segments on the basis of benefits sought by consumers. Yet – until after the data has been analyzed – the defining characteristics of the resulting market segments are unknown. Identifying these defining characteristics of market segments with respect to the segmentation variables is the aim of profiling. Profiling consists of characterizing the market segments individually, but also in comparison to the other market segments. If winter tourists in Austria are asked about their vacation activities, most state they are going alpine skiing. Alpine skiing may characterize a segment, but alpine skiing may not differentiate a segment from other market segments.

Traditional Approaches to Profiling Market Segments

Data-driven segmentation solutions are usually presented to users (clients, managers) in one of two ways:

- as high level summaries simplifying segment characteristics to a point where they are misleadingly trivial, or
- as large tables that provide, for each segment, exact percentages for each segmentation variable.

Such tables are hard to interpret, and it is virtually impossible to get a quick overview of the key insights. To identify the defining characteristics of the

market segments, the percentage value of each segment for each segmentation variable needs to be compared with the values of other segments or the total value provided in the far right column.

	Seg. 1	Seg. 2	Seg. 3	Seg. 4	Seg. 5	Seg. 6	Total
Rest and relax	83	96	89	82	98	96	90
Change of surroundings	27	82	73	82	87	77	67
Fun and entertainment	7	71	81	60	95	37	53
Free-and-easy-going	12	65	58	45	87	75	52
Not exceed planned budget	23	100	2	49	84	73	51
Life style of the local people	9	29	30	90	75	80	46
Good company	14	59	40	58	77	55	46
Excitement, a challenge	9	17	39	57	76	36	33
Maintain unspoilt surroundings	9	10	16	7	67	95	30
Cultural offers	4	2	5	96	62	38	28
Luxury / be spoilt	19	24	39	13	89	6	28
Unspoilt nature/natural landscape	10	10	13	15	69	64	26
Intense experience of nature	6	8	9	21	50	58	22
Cosiness/familiar atmosphere	11	24	12	7	49	25	19
Entertainment facilities	5	25	30	14	53	6	19
Not care about prices	8	7	43	19	29	10	18
Everything organised	7	21	15	12	46	9	16
Do sports	8	12	13	10	46	7	14
Health and beauty	5	8	10	8	49	16	12
Realise creativity	2	2	3	8	29	14	8

Using Fig as the basis of interpreting segments shows that the defining characteristics of segment 2, for example, are: being motivated by rest and relaxation, and not wanting to exceed the planned travel budget. Also, many members of segment 2 care about a change of surroundings, but not about cultural offers, an intense experience of nature, about not caring about prices, health and beauty and realizing creativity.

Segment Profiling with Visualization

To help you visualize different segments, we created a presentation illustrating how you can present various segments using various avatars, Colors, assigning them label.

I saw companies using various segmentation approaches. Some pretty simple – only based on customer demographics such as age or country. Some more complex, e.g. RFM based segments, based on purchase Recency, Frequency or Monetary value. Or name the segments by the importance of a client (VIP, Gold segment, Silver, Bronze...).

And some pretty sophisticated segmentations – using also predictive customer lifetime value or some statistical scores for each customer. For that, you usually need more advanced analytics, but it can be worth it. Especially if you have thousands of customers and you want to treat them personally.

Identifying Defining Characteristics of Market segment

There are several different ways businesses can segment a market, but not all market segments are equally valuable to a business. Before deciding to focus on a segment, it's important to see whether it is viable. Each market segment should:

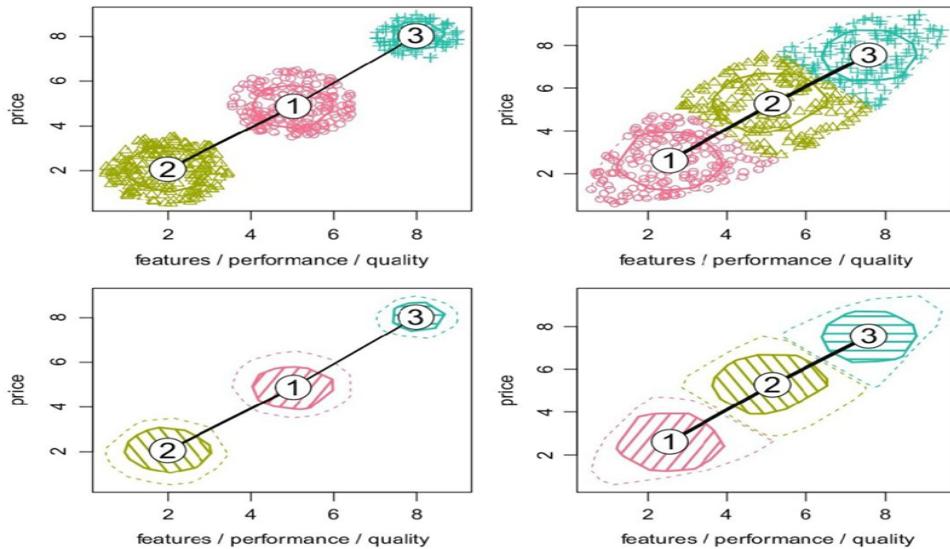
- Be measurable: According to Qualtrics, your business should be able to estimate how much your segment will spend on your products and services. Businesses need to know approximately how many people are within that segment and how much they are going to spend.
- Be substantial: Net MBA notes that a viable market segment needs to be large enough to support your business. If the market is too small, your business will not be able to earn enough revenue to survive. The segment also needs to have the means to purchase your products and services.
- Be accessible: If you're going to tailor your business to a specific segment, they need to be easily accessible and reachable to you. If they are physically too far from your business or resistant to your marketing, then it is not a good option.
- Be unique: If a market segment is very similar to another one, then it's likely they are not unique enough to warrant tailored messaging and campaigns. In order to dedicate resources and time catering to

a market segment, they need to be truly different from other consumers.

- Be durable: Some market segments change too rapidly for businesses to keep up. A viable market segment needs to be stable to warrant the cost of targeted and personalized marketing.

Assessing segment Separations

Segment separation plots are very simple if the number of segmentation variables is low, but become complex as the number of segmentation variables increases. But even in such complex situations, segment separation plots offer data analysts and users a quick overview of the data situation, and the segmentation solution.



Examples of segment separation plots are provided in Fig for two different data sets (left compared to right column). These plots are based on two of the artificial data sets used in Table 2.3: the data set that contains three distinct, and the data set with an elliptic data structure. The segment separation plot consists of (1) a scatter plot of the (projected) observations coloured by segment membership and the (projected) cluster hulls, and (2) a neighborhood graph.

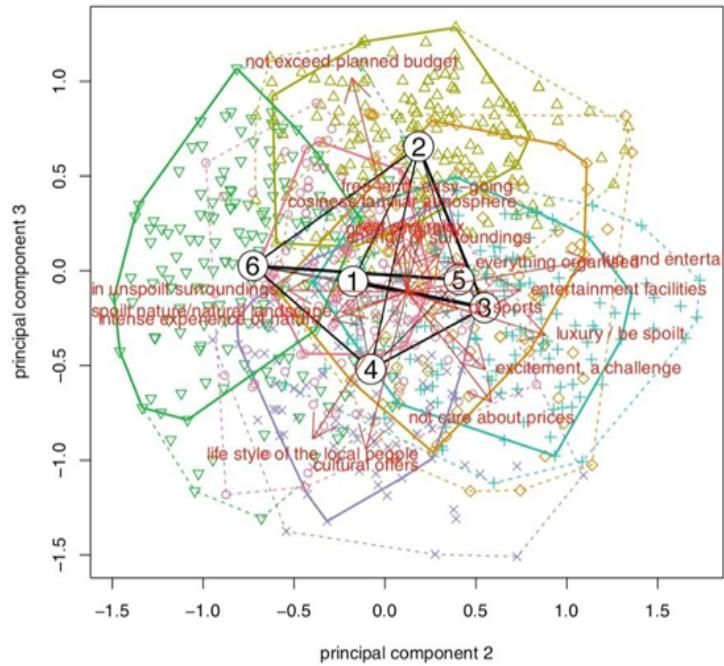
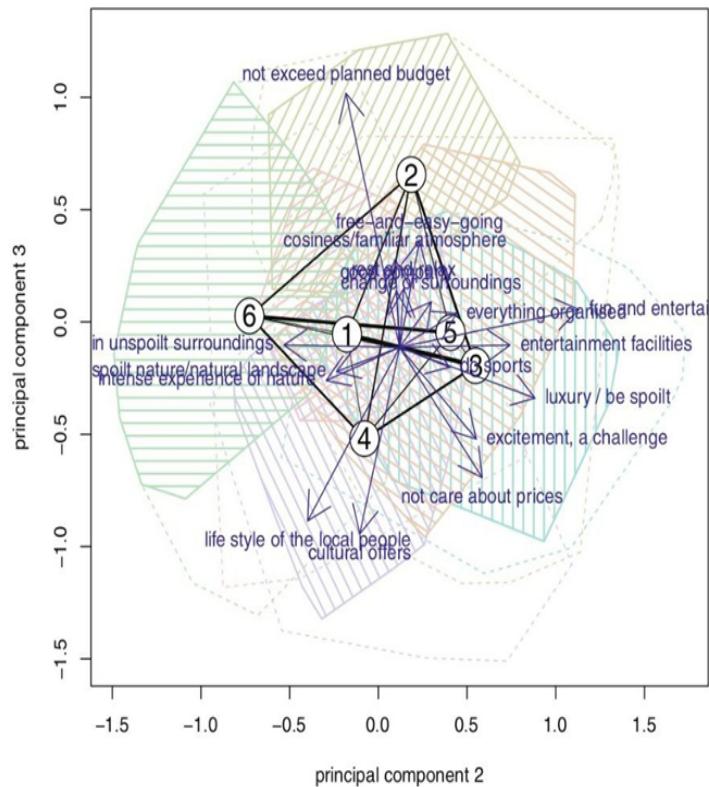


Figure shows the existence of a market segment (segment 6, green shaded area) that cares about maintaining unspoilt surroundings, unspoilt nature, and wants to intensely experience nature when on vacations. Exactly opposite is segment 3 (cyan shaded area) wanting luxury, wanting to be spoilt, caring about fun, entertainment and the availability of entertainment facilities, and not caring about prices.



Each segment separation plot only visualizes one possible projection. So, for example, the fact that segments 1 and 5 in this particular projection overlap with other segments does not mean that these segments overlap in all projections.

Step 7: Describing Segments

INTRODUCTION -

Market segmentation is a marketing term that refers to aggregating prospective buyers into groups or segments with common needs and who respond similarly to a marketing action. Common examples of market segmentation include geographic, demographic, psychographic, and

behavioral. Market segmentation is a consumer-oriented process and can be applied to almost any type of market. In dividing or segmenting markets, researchers typically look for shared characteristics such as common needs, common interests, similar lifestyles or even similar demographic profiles. So, market segmentation assumes that different segments require different marketing programmes, as diverse customers are usually targeted through different offers, prices, promotions, distributions or some combination of marketing variables . Companies that understand market segments can prove themselves to be effective marketers while earning a greater return on their investments.

NOMINAL AND ORDINAL DESCRIPTOR VARIABLES -

Nominal data is defined as data that is used for naming or labeling variables, without any quantitative value. Ordinal data is a type of categorical data with an order. The variables in ordinal data are listed in an ordered manner. The ordinal variables are usually numbered, so as to indicate the order of the list.

KEY DIFFERENCES BETWEEN THE NOMINAL AND ORDINAL VARIABLES -

- **Data Characteristics** - The major character difference between ordinal and nominal data is that ordinal data has a set order to it. This set order is the bedrock of all other character differences between these two data types. For instance, both ordinal and nominal data are evaluated using nonparametric statistics due to their categorical nature. Therefore, the mean and standard deviation cannot be evaluated for these data types. However, the use of parametric statistics for ordinal data may be permissible in some cases. This is done with methods that are a close substitute to mean and standard deviation.



- **Tests** - There are four types of tests carried out on nominal data, namely; McNemar test, Cochran Q's test, Fisher's Exact test and Chi-Square test. The ordinal data tests are also four, namely; Wilcoxon signed-rank test, Friedman 2-way ANOVA, Wilcoxon rank-sum test and Kruskal-Wallis 1-way test.
- **Data Analysis** - Nominal data analysis is done by grouping input variables into categories and calculating the percentage or mode of the distribution, while ordinal data is analysed by computing the mode, median and other positional measures like quartiles, percentiles, etc. Although discouraged, ordinal data is sometimes analysed using parametric statistics, with methods which are a close substitute to mean and standard deviation.



- **Collection techniques** - The different nominal data collection techniques we have include; open ended questions, multiple response choice questions and close-open ended questions, while ordinal data is collected using likert scale, interval scale, rating scale etc. Even though these collection techniques differ from each other, a single questionnaire could use both nominal and ordinal data collection techniques. Use a single questionnaire to collect both nominal and ordinal data occurs in the event that the researchers need to collect both nominal and ordinal data.
- **Quantitative value** - Nominal data are categorical in nature, while ordinal data are in between categorical and quantitative. This is because we sometimes assign quantitative values to ordinal data

SIMILARITIES OF NOMINAL AND ORDINAL VARIABLES -

Nominal data and ordinal data are both groups of non-parametric variables used to store information. They are both classified under categorical data

- **Data Characteristics** - The characteristics of nominal and ordinal data are similar in some aspects. For instance, they are both qualitative, have an inconclusive mean value, and have a conclusive mode. These similarities are all based on the fact that they are both categorical data.

- **Data type** - There are two main types of data which are categorical and numerical data. Nominal and ordinal data are two of the four sub-data types, and they both fall under categorical data. Categorical data can be counted, grouped, and sometimes ranked in order of importance. With categorical data, information can be placed into groups to bring some sense of order or understanding.
- **Visualization techniques** - They are both visualized or analyzed graphically through with pie chart and bar chart. Although ordinal data can also be visualized with grayscale, mosaic, etc., The pie chart and bar chart is the common visualization techniques are used to analyze percentage and frequency.



- **Data Analysis** - Both nominal and ordinal data can be analyzed using percentage and frequency (i.e. mode). The modal value of these two data types is conclusive. In addition, they both have an inconclusive mean and standard deviation. Hence, it can't be used for data analysis.

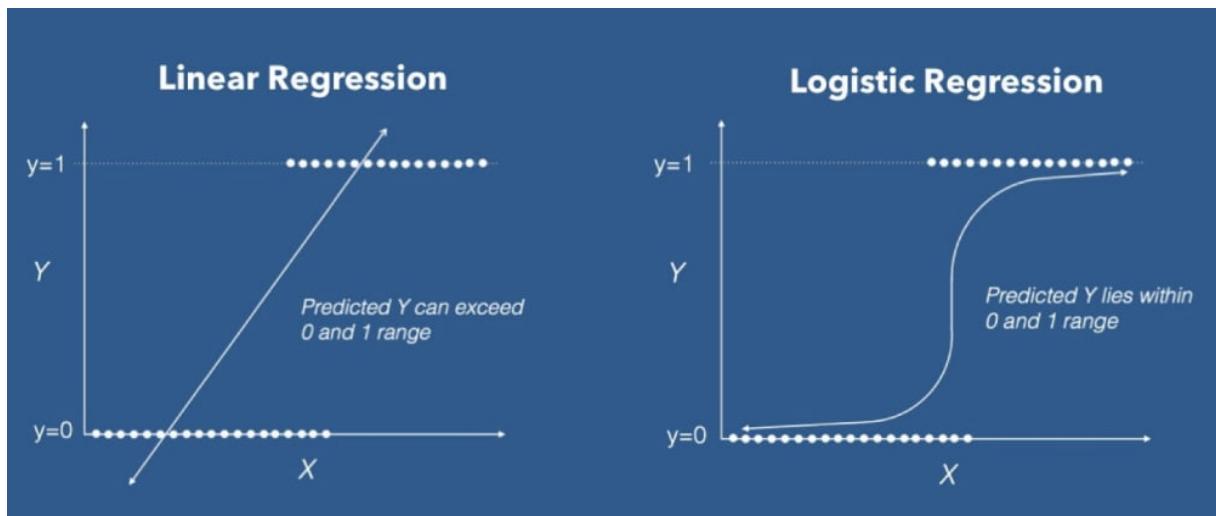
BINARY LOGISTIC REGRESSION -

Binary logistic regression (LR) is a regression model where the target variable is binary, that is, it can take only two values, 0 or 1. It is a “Supervised machine learning” algorithm that can be used to model the

probability of a certain class or event. It is used when the data is linearly separable and the outcome is binary or dichotomous in nature.

Why Apply Logistic Regression?

Linear regression doesn't give a good fit line for the problems having only two values (being shown in the figure), It will give less accuracy while prediction because it will fail to cover the datasets, being linear in nature.

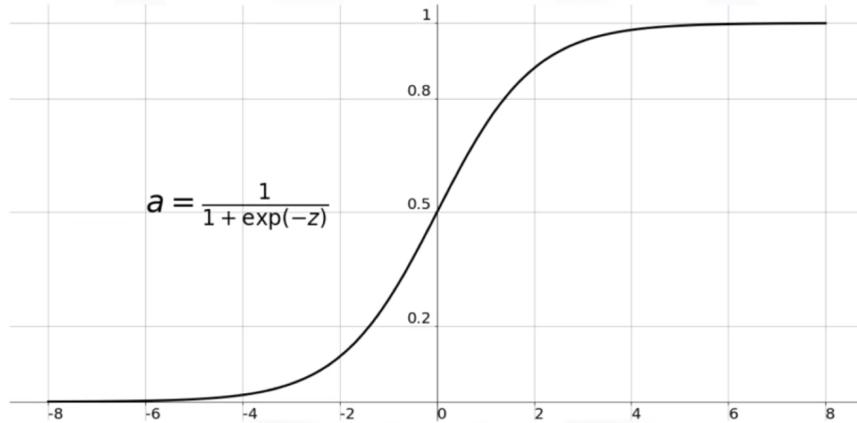


For the best fit of categorical datasets, a Curve is being required which is being possible with the help of Logistic Regression, as it uses a Sigmoid function to make predictions

Mathematics Involved in Logistic Regression

The main reason behind bending of the Logistic Regression curve is because of being calculated using a Sigmoid Function (also known as Logistic Function because being used in logistic regression) being given below

Sigmoid Function



This is the mathematical function which is having the 'S – Shaped curve'. The value of the Sigmoid Function always lies between 0 and 1, which is why it's being deployed to solve categorical problems having two possible values.

MULTINOMINAL LOGISTIC REGRESSION -

Multinomial logistic regression is an extension of logistic regression that adds native support for multi-class classification problems. It is useful for situations in which you want to be able to classify subjects based on values of a set of predictor variables. This type of regression is similar to logistic regression, but it is more general because the dependent variable is not restricted to two categories.

Multinomial logistic regression does necessitate careful consideration of the sample size and examination for outlying cases. Like other data analysis procedures, initial data analysis should be thorough and include careful univariate, bivariate, and multivariate assessment.

Multinomial logistic regression is often considered an attractive analysis because; it does not assume normality, linearity, or homoscedasticity. A

more powerful alternative to multinomial logistic regression is discriminant function analysis which requires these assumptions are met. Indeed, multinomial logistic regression is used more frequently than discriminant function analysis because the analysis does not have such assumptions. Multinomial logistic regression does have assumptions, such as the assumption of independence among the dependent variable choices. This assumption states that the choice of or membership in one category is not related to the choice or membership of another category (i.e., the dependent variable). The assumption of independence can be tested with the Hausman-McFadden test. Furthermore, multinomial logistic regression also assumes non-perfect separation. If the groups of the outcome variable are perfectly separated by the predictor(s), then unrealistic coefficients will be estimated and effect sizes will be greatly exaggerated.

TREE BASED METHODS - CLASSIFICATION AND REGRESSION TREES (CART)

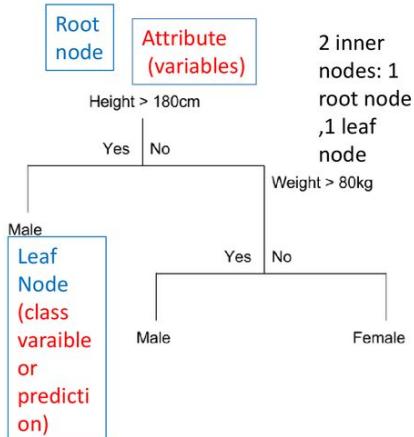
Decision Trees are an important type of algorithm for predictive modeling machine learning.

The classical decision tree algorithms have been around for decades and modern variations like random forest are among the most powerful techniques available.

Classification and Regression Trees or CART for short is a term introduced by Leo Breiman to refer to Decision Tree algorithms that can be used for classification or regression predictive modeling problems. Classification trees are similar to regression trees, except that it is used to predict a qualitative response rather than a quantitative one. For a regression tree, the prediction response for an observation is given by the mean response of the training observations that belong to the same terminal node. In contrast, for a classification tree, we predict that each observation belongs to the most commonly occurring class of training observations in the region to which it belongs.

CART Model Representation

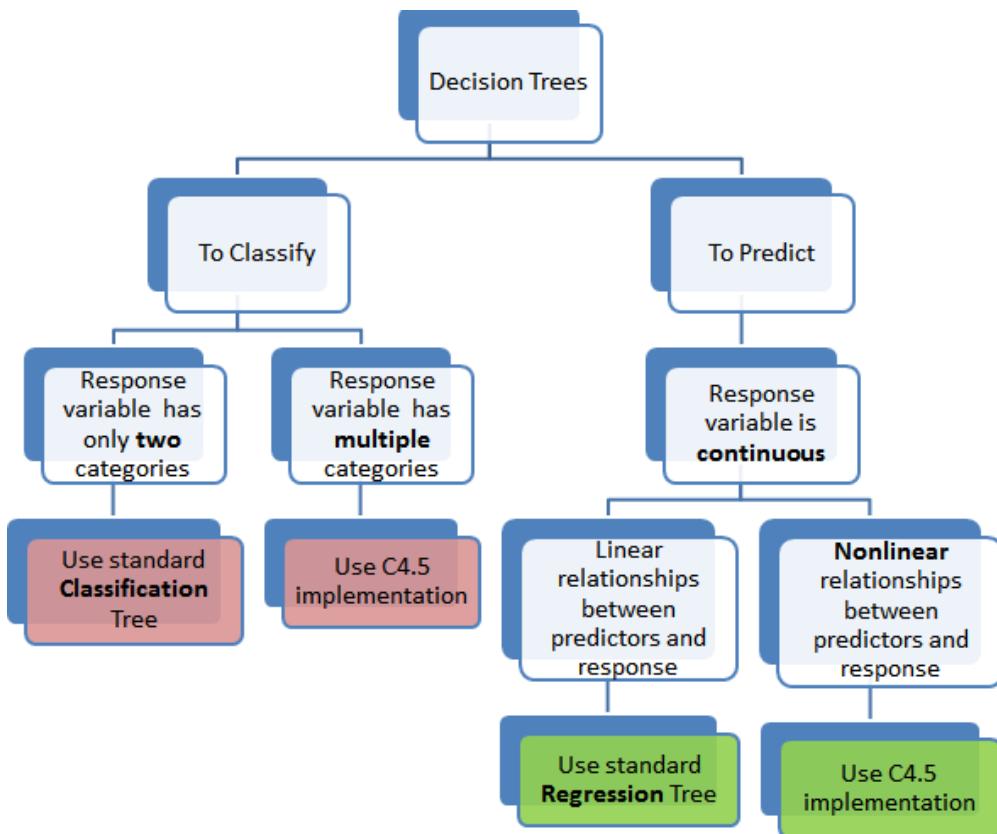
- *CART is a binary tree.*
- *Each root node represents a single input variable (x) and a split point on that variable (assuming the variable is numeric).*
- *The leaf nodes of the tree contain an output variable (y) which is used to make a prediction.*
- *Given a dataset with two inputs (x) of height in centimeters and weight in kilograms the output of sex as male or female, below is a crude example of a binary decision tree (completely fictitious for demonstration purposes only).*



<https://machinelearningmastery.com/classification-and-regression-trees-for-machine-learning/>

Classification CART v9d4

8



Learning a CART Model From Data

Creating a CART model involves selecting input variables and split points on those variables until a suitable tree is constructed. The selection of which input variable to use and the specific split or cut-point is chosen using a greedy algorithm to minimize a cost function. Tree construction ends using a predefined stopping criterion, such as a minimum number of training instances assigned to each leaf node of the tree.

Greedy Splitting

Creating a binary decision tree is actually a process of dividing up the input space. A greedy approach is used to divide the space called recursive binary splitting.

This is a numerical procedure where all the values are lined up and different split points are tried and tested using a cost function. The split with the best cost (lowest cost because we minimize cost) is selected.

All input variables and all possible split points are evaluated and chosen in a greedy manner (e.g. the very best split point is chosen each time).

For regression predictive modeling problems the cost function that is minimized to choose split points is the sum squared error across all training samples that fall within the rectangle:

$$\text{sum}(y - \text{prediction})^2$$

Where y is the output for the training sample and prediction is the predicted output for the rectangle.

For classification the Gini index function is used which provides an indication of how “pure” the leaf nodes are (how mixed the training data assigned to each node is).

$$G = \text{sum}(pk * (1 - pk))$$

Where G is the Gini index over all classes, p_k are the proportion of training instances with class k in the rectangle of interest. A node that has all classes of the same type (perfect class purity) will have G=0, whereas a G that has a 50-50 split of classes for a binary classification problem (worst purity) will have a G=0.5.

For a binary classification problem, this can be re-written as:

$$G = 2 * p_1 * p_2$$

or

$$G = 1 - (p_1^2 + p_2^2)$$

The Gini index calculation for each node is weighted by the total number of instances in the parent node. The Gini score for a chosen split point in a binary classification problem is therefore calculated as follows:

$$G = ((1 - (g_{1_1}^2 + g_{1_2}^2)) * (n_{g1}/n)) + ((1 - (g_{2_1}^2 + g_{2_2}^2)) * (n_{g2}/n))$$

Where G is the Gini index for the split point, g_{1_1} is the proportion of instances in group 1 for class 1, g_{1_2} for class 2, g_{2_1} for group 2 and class 1, g_{2_2} group 2 class 2, n_{g1} and n_{g2} are the total number of instances in group 1 and 2 and n are the total number of instances we are trying to group from the parent node.

Stopping Criterion

The recursive binary splitting procedure described above needs to know when to stop splitting as it works its way down the tree with the training data.

The most common stopping procedure is to use a minimum count on the number of training instances assigned to each leaf node. If the count is less than some minimum then the split is not accepted and the node is taken as a final leaf node.

The count of training members is tuned to the dataset, e.g. 5 or 10. It defines how specific to the training data the tree will be. Too specific (e.g. a count of 1) and the tree will overfit the training data and likely have poor performance on the test set.

Pruning The Tree

The stopping criterion is important as it strongly influences the performance of your tree. You can use pruning after learning your tree to further lift performance.

The complexity of a decision tree is defined as the number of splits in the tree. Simpler trees are preferred. They are easy to understand (you can print them out and show them to subject matter experts), and they are less likely to overfit your data.

More sophisticated pruning methods can be used such as cost complexity pruning (also called weakest link pruning) where a learning parameter (α) is used to weigh whether nodes can be removed based on the size of the sub-tree.

Step 8: Selecting The Target Segments:

MARKET SEGMENT EVALUATION -

To evaluate different market segments effectively it is necessary to systematically review two issues: the market attractiveness of the competing segments and the organization's comparative ability to address the needs of that segment. There are a number of criteria that can be used to judge the attractiveness of a market segment. These fall under three broad headings: market factors, the nature of competition and the wider environmental factors.

Market factors :

When assessing market attractiveness the particular features of a market will affect any evaluation.

- **Segment size :** A large segment will generally have greater sales potential. This in itself will make it more attractive but it may also

offer the potential of gaining economies of scale because of the larger volumes involved. Large segments with their potentially larger sales can justify the higher investments that may be necessary for organizations wishing to operate within them. However, large segments may not always be the most attractive. Large segments can be more competitive as their very size will attract other companies into them.

- **Segment rate of growth(measured in terms of real revenue growth after inflation)** :Segments that are growing are normally seen as being more attractive than segments where growth has peaked or even begun to decline. Segments in growth are seen as having a longer-term potential and therefore justify any investment necessary.
- **Segment profitability** :What is the total profitability of the segment? If you are already operating in this segment it is not your organization's profitability alone that should be reviewed. In order that all segments are evaluated on a consistent basis it is the profitability of all companies operating in the segment that should be calculated. This will have to be an estimate based on analyzing competitors' activities.
- **Customer price sensitivity** :Segments where consumer shave low price sensitivity are likely to be more attractive as higher profit margins can be gained. Consumers will be more concerned about quality and service rather than price alone. Price sensitive segments are more susceptible to price competition, which leads to lower margins.
- **Predictability** :The potential value of a market will be easier to predict if it is less prone to disturbance and the possibility of discontinuities. In the long term a predictable market is likely to be more viable.
- **Pattern of demand** :The attractiveness of a segment will be affected by any seasonal or other cyclical demand patterns it faces.

The same problem occurs in other industry sectors such as travel and tourism.

- **Quality of competition** :Segments that have weak competition are more attractive than segments where there are strong and aggressive competitors. It is not the number of competitors operating but the nature of their competition that is critical in judging an opportunity.
- **Potential to create a differentiated position** :A segment will be more attractive if it contains unsatisfied customer needs that allow the company to create a differentiated product or service and gain a higher margin by charging a premium price.
- **Likelihood of new entrants** :Segments that currently have limited competition may appear attractive. However, the potential for other companies to enter this market has to be taken into account.
- **Barriers to entry into the market segment** :There may be entry barriers to a segment that will reduce its appeal. These can be in the form of patents, the necessity for new specialized plant or machinery, or the need for high promotional expenditure. It may be that the overall level of investment necessary to enter an area successfully maybe unrealistic for some companies. These same barriers may also put off other potential entrants. Therefore if a company calculates that it can overcome these barriers it may be able to enter a segment where there is little direct competition.
- **Barriers to exiting the market segment** :There may be barriers that make exiting a segment difficult. Expensive facilities may have to be built that can only be used in servicing a particular market segment. Therefore withdrawing from this segment would leave expensive plant redundant. Other barriers could include service agreements to provide spare parts to customers for a number of years into the future, or plant and machinery that would be expensive to decommission. Organizations would have to anticipate

the potential barriers to exit when they are initially evaluating a segment's attractiveness.

Environmental factors :

- **Social** :Social changes can lead to newly emerging segments that are not currently served by any organization .There can be a significant advantage to companies that are the first to move into these areas. Organizations also need to review the impact that any likely changes in social trends will have on a particular segment.
- **Political** :Changes in the political environment can create new segments in a market. The deregulation of the utilities market created several new market segments that organizations could address. The political environment may also make certain segments less attractive. Segments that are located in particular geographic areas may be affected by political instability. There may also be regulatory changes that will affect a sector such as pharmaceuticals.
- **Economic** :Economic trends may make segments more or less attractive. For example, the growing affluence of older people in Western economies is making them a much more attractive group than twenty years ago.
- **Technology** :Technological changes have to be taken into consideration when evaluating a segment. A judgment will have to be made as to whether new entrants will be able to enter a segment competing on a different basis by using technology to create innovative ways of delivering a product or service.
- **Environmental** :Consumers' and governments' concerns about environmental issues have become much more important in recent years. Therefore an evaluation of the environmental issues that may affect an organization's ability to service a segment will have to be considered.

Step 9: Customising Market Mix:

Market segmentation no longer stands independently as an advertising method. Instead, it is going hand in hand with the other regions of strategic advertising: positioning and opposition. In fact, the segmentation process is frequently seen as part of what is referred to as the segmentation-targeting-positioning technique.

The segmentation-targeting-positioning approach postulates a sequential manner. The process starts with market segmentation (the extraction, profiling and description of segments), followed by concentrating on (the evaluation of segments and choice of a goal phase), and in the end, positioning.

The four Ps are often referred to as the marketing mix. They encompass a range of factors that are considered when marketing a product, including what consumers want, how the product or service meets or fails to meet those wants, how the product or service is perceived in the world, how it stands out from the competition, and how the company that produces it interacts with its customers.

The 4 P's :

- **Product**
- **Price**
- **Place**
- **Promotion**



4Ps of Marketing Mix

Product :

One of the important things decisions an organisation needs to make while growing the product size of the advertising blend, is to specify the product in view of patron wishes. Often this does not suggest designing a completely new product, however alternatively enhancing an existing one. Other advertising blend selections that fall underneath the product dimension are: naming the product, packaging it, imparting or no longer presenting warranties, and after income guide offerings.

Creating a marketing campaign starts with an understanding of the product itself. Who needs it, and why? What does it do that no competitor's product can do? Perhaps it's a new thing altogether and is so compelling in its design or function that consumers will have to have it when they see it. The job of the marketer is to define the product and its qualities and introduce it to the consumer. Defining the product also is key to its distribution. Marketers need to understand the life cycle of a product, and business executives need to have a plan for dealing with products at every stage of the life cycle.

The type of product also dictates in part how much it will cost, where it should be placed, and how it should be promoted.

Many of the most successful products have been the first in their category. For example, Apple was the first to create a touchscreen smartphone that could play music, browse the Internet, and make phone calls. Apple reported total sales of the iPhone to be \$71.6 billion in Q1 2022. In 2021, Apple hit the milestone of 2 billion iPhones sold.

Price :

Price is the amount that clients could be willing to pay for a product. Marketers must link the charge to the product's real and perceived cost, while also thinking about delivery prices, seasonal discounts, competitors' prices, and retail markup.

In some instances, business choice-makers may additionally improve the price of a product to give it the advent of luxury or exclusivity. Or, they may lower the price so more purchasers will attempt it.

Marketers also want to determine whilst and if discounting is suitable. A discount can attract more customers, but it could additionally deliver the influence that the product is less desirable than it was.

UNIQLO, founded in Japan, is a global manufacturer of casual put on. Like its competition Gap and Zara, UNIQLO creates lower priced, fashion-forward garments for more youthful shoppers.

What makes UNIQLO unique is that its products are modern and exceptional. It accomplishes this via buying material in massive volumes, usually seeking the highest-first-class and lowest-value materials in the global. The enterprise additionally directly negotiates with its manufacturers and has built strategic partnerships with modern Japanese manufacturers. UNIQLO additionally outsources its manufacturing to companion factories. That gives it the flexibility to change production partners as its needs trade.

Place :

The key selection relating to the place measurement of the advertising and marketing mix is a way to distribute the product to the customers. This consists of answering questions consisting of: have to the product be made to be had for buy online or offline simplest or both; ought to the manufacturer promote without delay to customers; or have to a wholesaler or a store or both be used

Place is the attention of wherein the product should be to be had, in brick-and-mortar shops and on line, and how it'll be displayed. The selection is key: The makers of a luxurious beauty product could want to be displayed in Sephora and Neiman Marcus, no longer in Walmart or Family Dollar. The intention of enterprise executives is always to get their merchandise in the front of the customers who're the maximum likely to shop for them. That

method placing a product best in sure shops and getting it exhibited to the first-rate advantage. The term placement additionally refers to advertising and marketing the product in the right media to get the eye of clients.

For example, the 1995 movie *GoldenEye* was the 17th installment in the James Bond movie franchise and the first that did not feature an Aston Martin car. Instead, Bond actor Pierce Brosnan got into a BMW Z3. Although the Z3 was not released until months after the film had left theaters, BMW received 9,000 orders for the car the month after the movie opened.

Promotion :

Typical promoting decisions that want to be made when designing a advertising and marketing blend encompass: growing an advertising message in an effort to resonate with the goal marketplace, and identifying the handiest manner of speaking this message. Other tools inside the promotion category of the advertising mix consist of public members of the family, private promoting, and sponsorship.

The intention of promoting is to talk to purchasers that they need this product and that it's miles priced as it should be. Promotion encompasses advertising, public members of the family, and the overall media strategy for introducing a product.

Marketers tend to tie merchandising and site factors collectively to reach their core audiences. For instance, In the virtual age, the "location" and "advertising" factors are as a great deal on line as offline. Specifically, where a product seems on a organization's web page or social media, as well as which types of search capabilities will cause focused ads for the product.

The Swedish vodka brand Absolut sold only 10,000 cases of its vodka in 1980. By 2000, the company had sold 4.5 million cases, thanks in part to its iconic advertising campaign. The images in the campaign featured the brand's

signature bottle styled as a range of surreal images: a bottle with a halo, a bottle made of stone, or a bottle in the shape of the trees standing on a ski slope. To date, the Absolut campaign is one of the longest-running continuous campaigns of all time, from 1981 to 2005.

How to Use the 4 Ps of Marketing in Your Marketing Strategy?

The four Ps provide a framework on which to construct your advertising and marketing method. Think via each factor. And do not worry while the elements overlap. That's inevitable.

First, analyze the product you'll be marketing. What are the traits that make it appealing? Consider other comparable products which can be already in the marketplace. Your product may be tougher, less complicated to apply, more appealing, or longer-lasting. Its components is probably environmentally-friendly or clearly sourced. Identify the characteristics in order to make it attractive for your target purchasers.

Think thru the suitable price for the product. It's not definitely the fee of manufacturing plus a profit margin. You can be positioning it as a top class or luxury product or as a bare-bones decrease-priced alternative.

Placement includes figuring out the kind of keep, on line and off, that stocks products like yours for clients like yours.

Step 10: Evaluation And Monitoring:

The purpose of evaluating the effectiveness of the marketplace segmentation approach is to determine whether or not growing a customised

advertising mix for one or more segments did obtain the predicted benefits for the organisation.

In the quick term, the primary preferred final results for most organizations could be expanded income. For non for income corporations it may be a few other performance criterion, together with the amount of donations raised or number of volunteers recruited. These measures may be monitored continuously to permit ongoing assessment of the segmentation method. In addition, taking a longer term attitude, the effectiveness of targeted positioning could be measured. For instance, a tracking have a look at might provide perception approximately how the enterprise is perceived within the marketplace place. If the segmentation method is successful, the organisation ought to an increasing number of be perceived as being specially true at fulfilling certain wishes. If this is the case, the employer should derive a aggressive advantage from this specialized positioning due to the fact the goal phase will understand it as one among their desired providers.

Segment Evolution :

Like any feature of markets, market segments exchange over time. The environments wherein the organization operates, and movements taken by using competitors exchange. Haley (1985), the father of gain segmentation, says that now not following-up a segmentation observe manner sacrificing a considerable part of the price it can generate. Haley (1985) proceeds to endorse a monitoring system to make certain that any changes are recognized as early as possible and acted upon. Haley refers back to the tracking system as an early warning gadget activating action only if an irregularity is detected. Or, as Cahill (2006) places it: Keep trying out, hold researching, preserve measuring. People change, tendencies exchange, values trade, the whole thing modifications.

A variety of motives pressure real trade of market segments, consisting of: evolution of clients in terms in their product savviness or their family lifestyles cycle, the supply of latest products within the category; and the emergence of disruptive innovations converting a marketplace in its entirety.