



PM: Product Management and Development

Week 7 – Understanding Consumer Preferences

Motivating Example

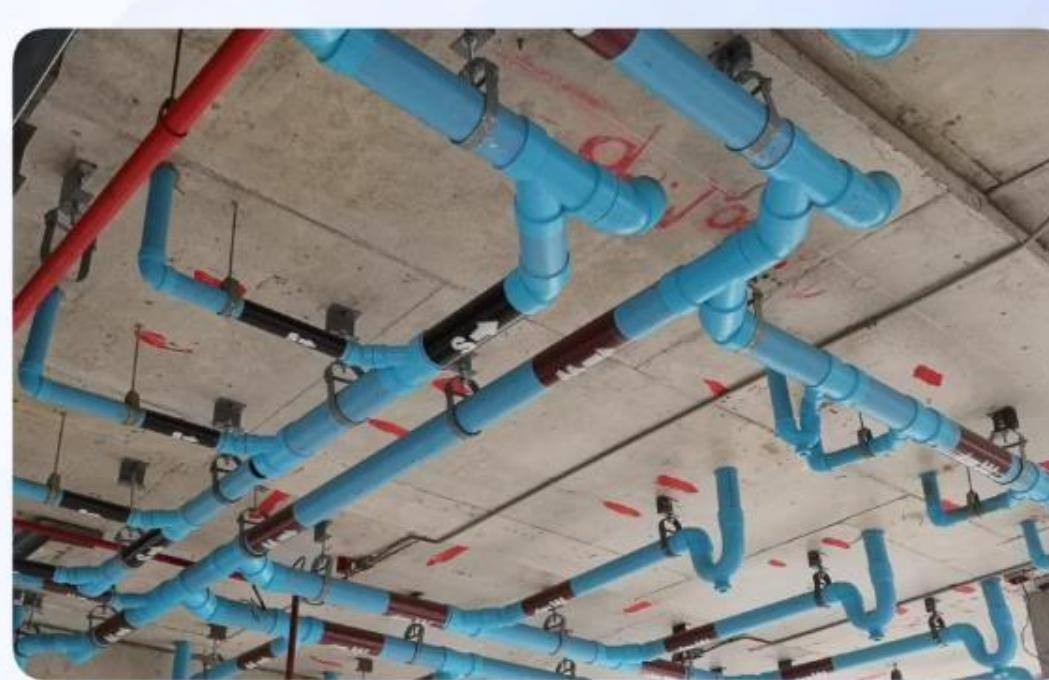
DuPont: Pricing Value for Farmers



- How to estimate the right pricing for the product?
- How do consumers derive value of the product?

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Consumer Surplus



Consumer surplus = Total benefit derived from the product - Price paid for the product

Consumers choose the product with better consumer surplus.

Economic Benefits



- Economic benefit is the maximum price consumers are willing to pay for a product/service offering.
- Maximum price depends on the total benefit customers derive from the product.

DuPont's Alathon 25: Value Estimation



- What is it offering?
- How is it different?

DuPont's Features:

- Better durability
- Lesser failure rate

Product features translates into consumer benefit when seen through customers' perspective.

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Value Estimation of Benefits



- Less chances of failure
- Less damage to the crops
- Less cost of replacement
- More savings
- More economic value

Different customers derive different value from the same product.

Example: Economic Value and Price

Crop – Reduction: \$0.40	$\begin{aligned} \$40 \times 0.20 \times 5\% \\ = \$0.40 \end{aligned}$	Benefits in the economic terms EVC = \$10.21
Labour Savings: \$3.00	$\begin{aligned} \$60 \times 5\% = \$3.00 \end{aligned}$	
Replacement Savings: \$0.31	$\begin{aligned} \$6.5 \times 5\% = \$0.31 \end{aligned}$	
More durable: 3% failure rate as compared to 8%		
Current alternative price: \$6.50		

Framework: Economic Value

What other alternatives to DuPont are available to customers?

Negative
Differentiation Value

Positive
Differentiation Value

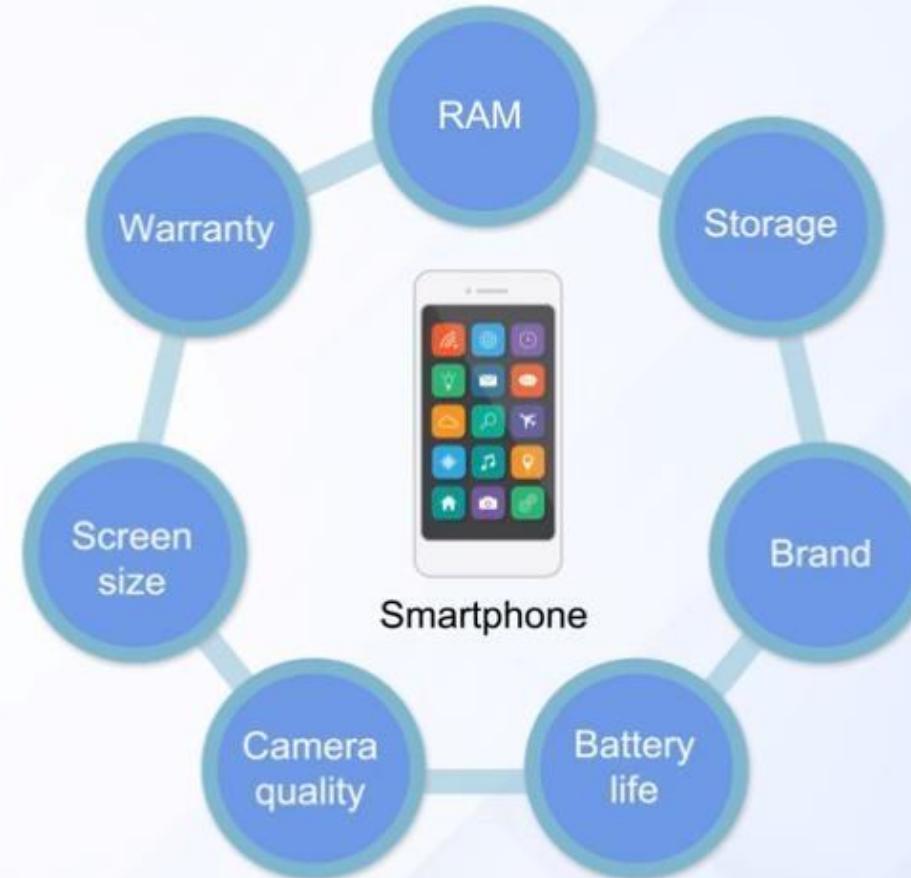
Reference Value
(Current alternative
price: \$6.50)

Economic Value:
The price a
fully informed
consumer will
be willing to pay

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Module Overview

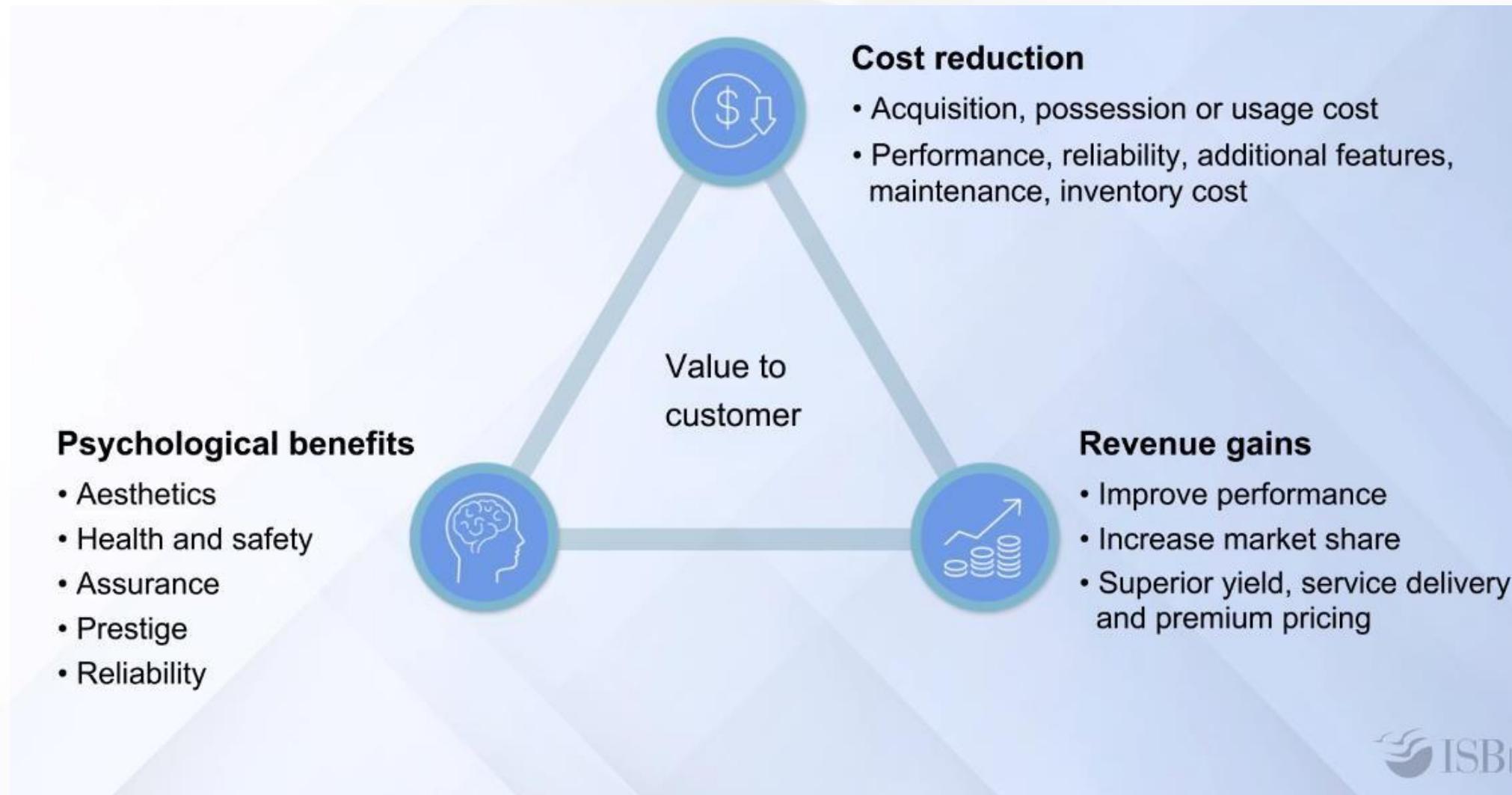
Product Attributes



Product Attributes



Value Triad



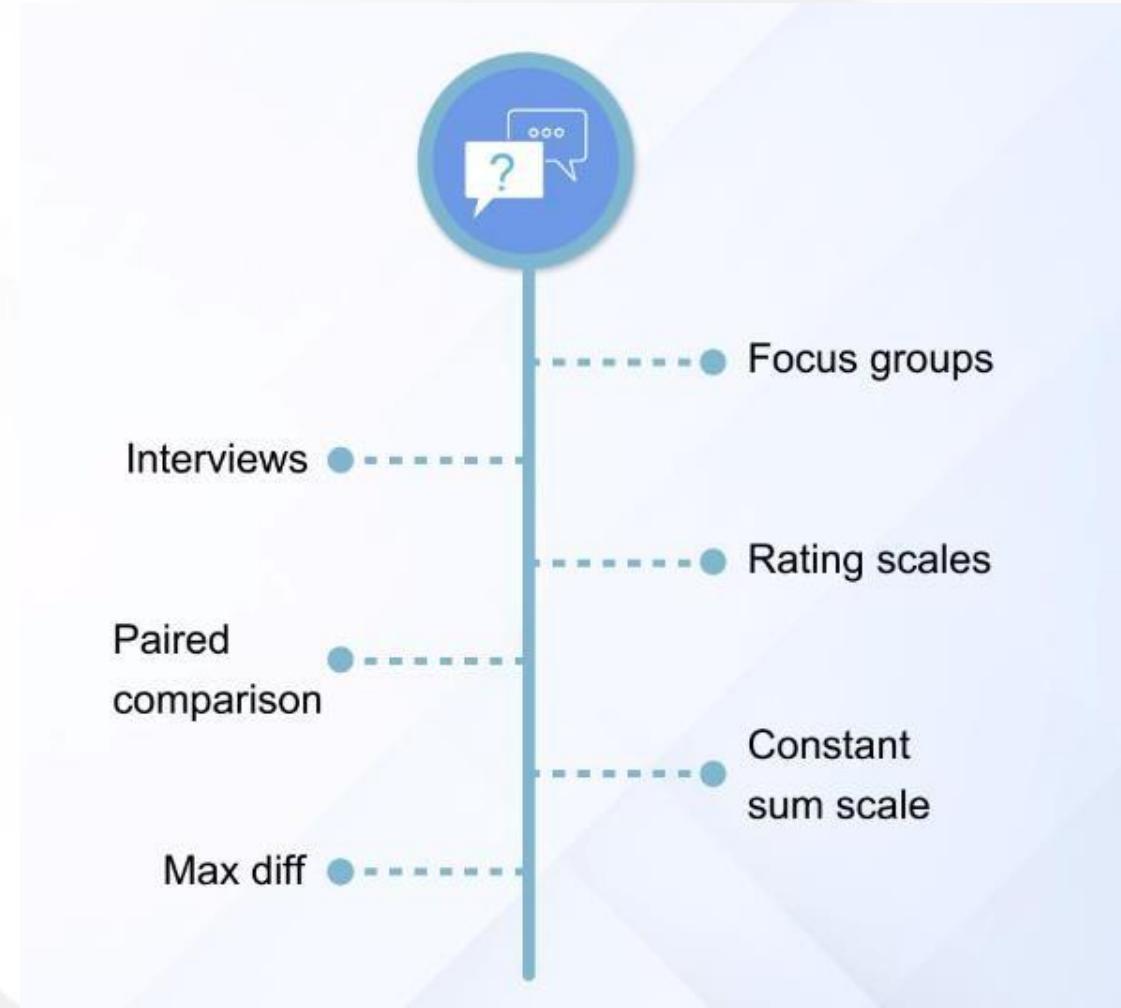
The Dupont Case

Durability was closer from the B2B setting as farmers were interested in buying underground pipes.

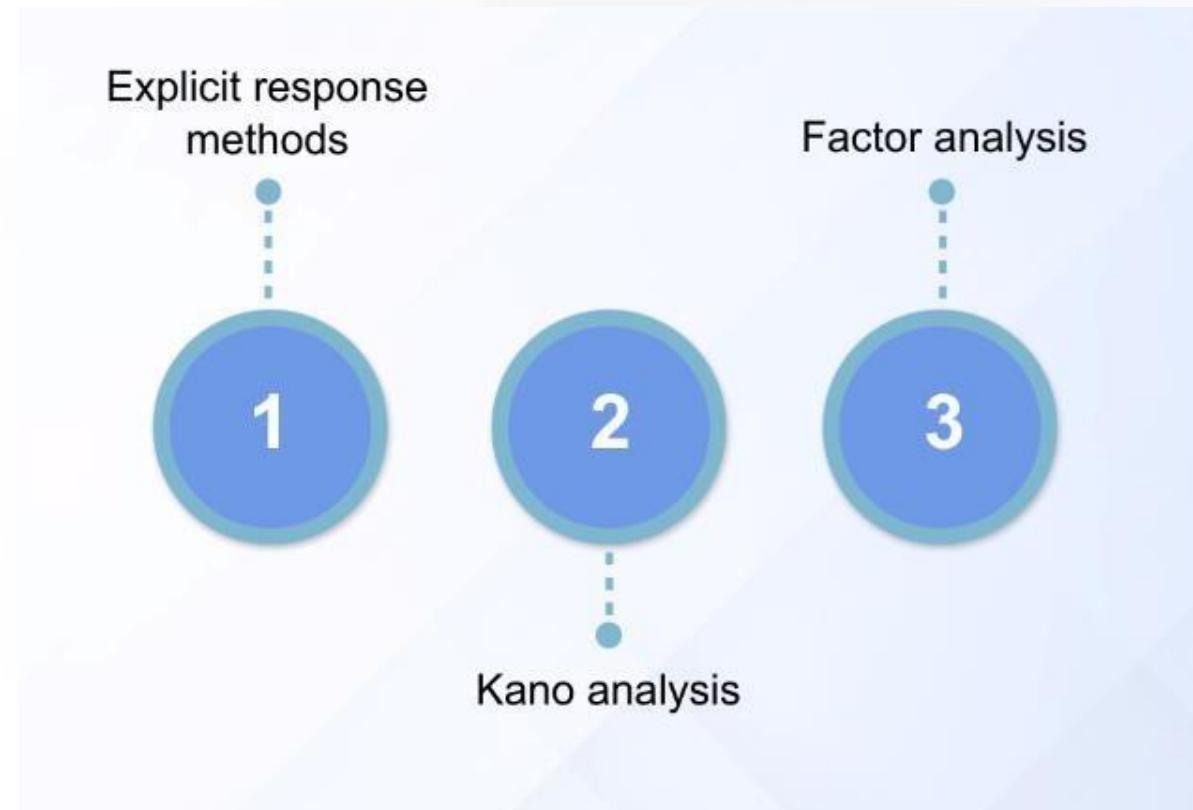


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Explicit Response Approaches



Module Overview



Learning Outcomes

List the most important features that are considered while choosing a product through Explicit Response Methods

Determine the prioritizing features of a product to satisfy the customer needs by using the Kano Model

Discover the consumer latent needs through Factor Analysis method

Understanding Consumer Preferences: Explicit Response Methods

Consumer Interviews



Identify features customers care about

- Product features
- Available products in the market
- Challenges faced

Identifying Consumers' Hidden Needs



- What are consumers' desires?
- What are consumers' purchase motives?

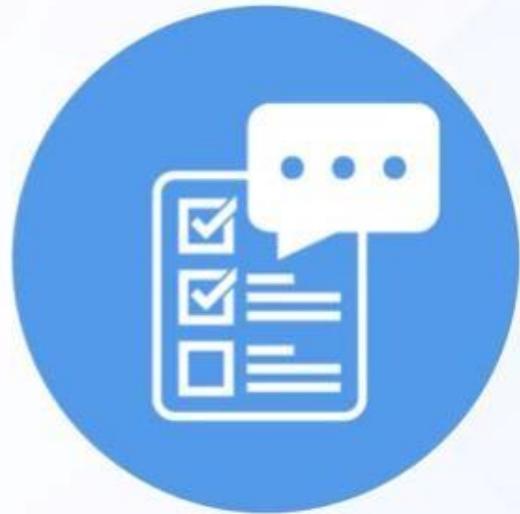


- What kind of challenges are consumers facing in the product category?
- What are consumers' problems?

Does not get to the depth of the problem

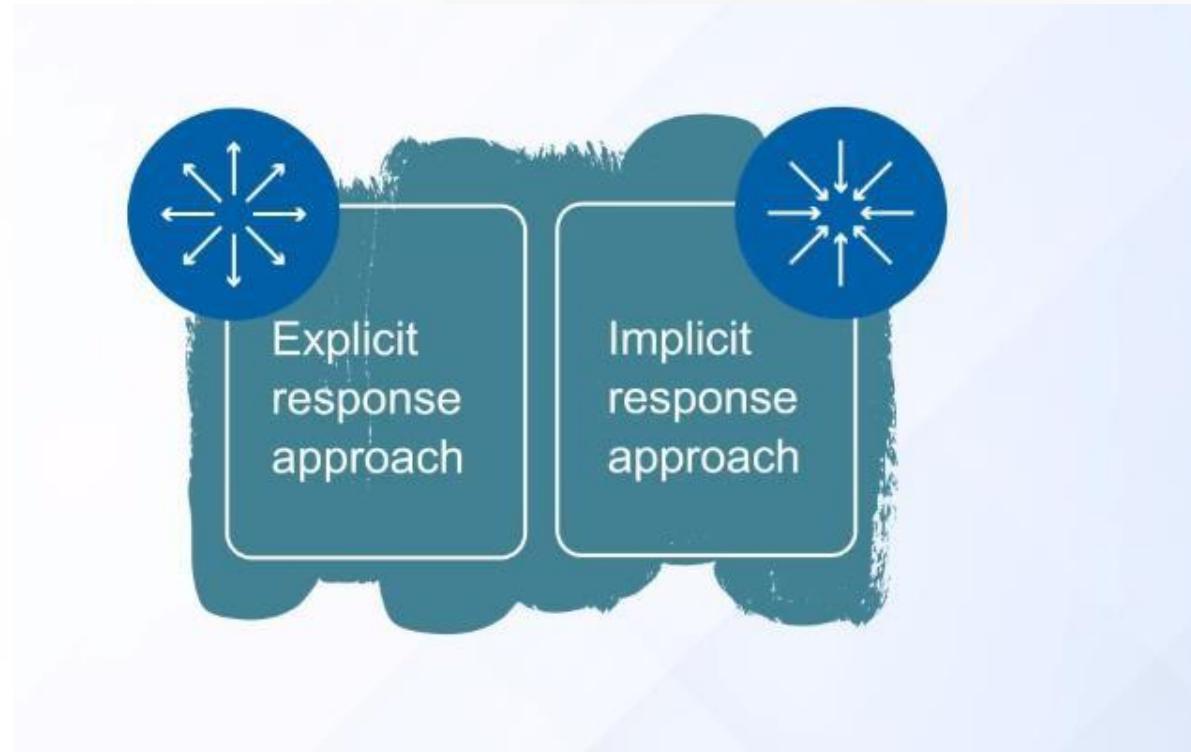
Helps identify the hidden needs for better product development

Exploratory Questions for Consumer Interviews



- What association does the customer make when using the product x?
- What problems/defects/complaints does the customer associate with the use of the product x?
- What criteria does the customer take into consideration when buying the product x?
- What new features or services would better meet the expectations of the customer?
- What do customers care about?

Response Approaches



Explicit Response Approaches

The explicit response approaches are:

- Rating scales
(on 5-point or 7-point scale)
- Rank Ordering
- Constant Sum Scales
- Magnitude Estimation Scales
- Paired Comparisons
- Max-Diff Design
- Kano Method

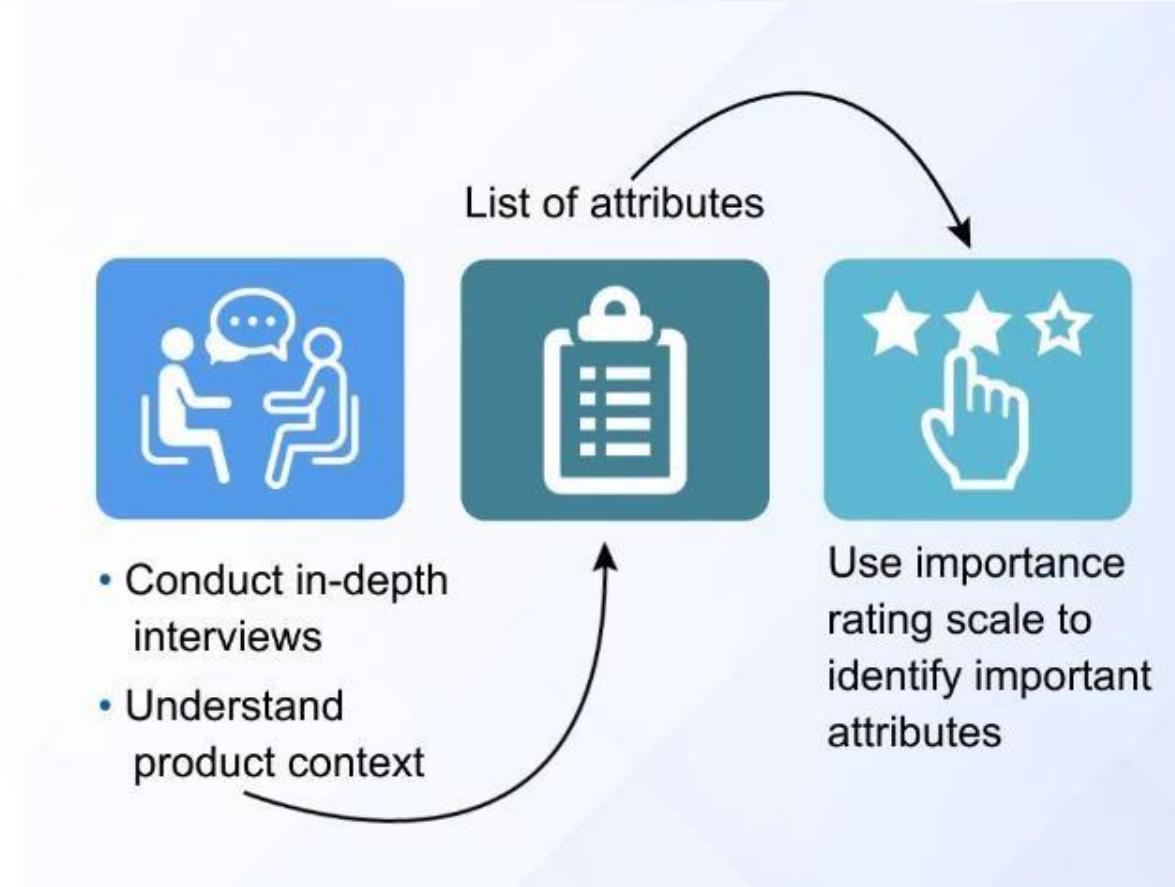
Example: Importance Rating Scale

Please indicate **how important each of these aspects** of a casual dining restaurant is to you.
Use the scale across the top of this list to describe how important each aspect is to you.

	Not at all	Somewhat	Very	Extremely	Critically
Prompt greeting	[]	[]	[]	[]	[]
Overall cleanliness	[]	[]	[]	[]	[]
Comfortable environment	[]	[]	[]	[]	[]
Server attentiveness	[]	[]	[]	[]	[]
Server friendliness	[]	[]	[]	[]	[]
Pace of meal	[]	[]	[]	[]	[]
Taste of food	[]	[]	[]	[]	[]
Cuisine type	[]	[]	[]	[]	[]
Receive bill in timely manner	[]	[]	[]	[]	[]
Reasonable prices	[]	[]	[]	[]	[]



Identify Important Attributes Using Importance Rating Scale



Example: Rank Ordering Scale

Please indicate how important each of these aspects of a casual dining restaurant is to you. Rank the aspects by placing a 1 beside the aspect you think is most important for you, a 2 beside the aspect you think is second-most important, and so on.

Rank	
Prompt greeting	
Overall cleanliness	
Comfortable environment	
Server attentiveness	
Server friendliness	
Pace of meal	
Taste of food	
Temperature of food	
Receive bill in timely manner	
Reasonable prices	

Example: Rank Ordering Scale

Please indicate how important each of these aspects of a casual dining restaurant is to you. Rank the aspects by placing a 1 beside the aspect you think is most important for you, a 2 beside the aspect you think is second-most important, and so on.

	Rank
Prompt greeting	
Overall cleanliness	1
Comfortable environment	
Server attentiveness	
Server friendliness	
Pace of meal	
Taste of food	
Temperature of food	
Receive bill in timely manner	
Reasonable prices	



Example: Rank Ordering Scale

Please indicate how important each of these aspects of a casual dining restaurant is to you. Rank the aspects by placing a 1 beside the aspect you think is most important for you, a 2 beside the aspect you think is second-most important, and so on.

	Rank
Prompt greeting	
Overall cleanliness	1
Comfortable environment	
Server attentiveness	
Server friendliness	
Pace of meal	
Taste of food	2
Temperature of food	
Receive bill in timely manner	
Reasonable prices	



Example: Constant Sum Scale

Please indicate how important each of these aspects of a casual dining restaurant is to you. To do this, **please distribute 100 points across these aspects according to how important each is to you.** You can give as many or as few points as you like to each aspect, but the **total number of points you assign must be 100.**

Prompt greeting	_____
Overall cleanliness	_____
Comfortable environment	_____
Server attentiveness	_____
Server friendliness	_____
Pace of meal	_____
Taste of food	_____
Temperature of food	_____
Receive bill in timely manner	_____
Reasonable prices	_____
Total	100

Example: Magnitude Estimation Scale

Please indicate how important each of these aspects of a casual dining restaurant is to you. **Please use a scale where “Server Friendliness” has been given a score of 50 to show how important it is.** For example, if an aspect is only half as important as “Server Friendliness”, you might give it a 25 because that is half of 50. If an attribute is much more important than “Server Friendliness”, then you would give it a much larger rating. For example, if you think an aspect is three times as important as “Server Friendliness”, then you would give it a 150, and so on. If you think something is not important at all, give it a 0.

Prompt greeting	_____
Overall cleanliness	_____
Comfortable environment	_____
Server attentiveness	_____
Server friendliness	_____
Pace of meal	_____
Taste of food	_____
Temperature of food	_____
Receive bill in timely manner	_____
Reasonable prices	_____

Example: Magnitude Estimation Scale

Please indicate how important each of these aspects of a casual dining restaurant is to you. **Please use a scale where “Server Friendliness” has been given a score of 50 to show how important it is.** For example, if an aspect is only half as important as “Server Friendliness”, you might give it a 25 because that is half of 50. If an attribute is much more important than “Server Friendliness”, then you would give it a much larger rating. For example, if you think an aspect is three times as important as “Server Friendliness”, then you would give it a 150, and so on. If you think something is not important at all, give it a 0.

Prompt greeting	<hr/>
Overall cleanliness	<hr/>
Comfortable environment	<hr/>
Server attentiveness	<hr/>
Server friendliness	50
Pace of meal	<hr/>
Taste of food	<hr/>
Temperature of food	<hr/>
Receive bill in timely manner	<hr/>
Reasonable prices	<hr/>



Example: Pairwise Constant Sum Scale

We would like to understand the relative importance of aspects of restaurants that you consider when deciding your overall preference for a restaurant. Listed below are several pairs of aspects. **Within each pair, distribute 100 points across the two aspects according to how important each aspect is to you.** You can give as many or as few points as you like to each aspect, but the **total number of points you assign must be 100.**

			Total
Comfortable environment	25	Server attentiveness	75
Pace of meal	_____	Receive bill in timely manner	_____
Receive bill in timely manner	_____	Overall cleanliness	_____
...			

Example: Paired Comparisons

We would like to understand how important various aspects of a casual dining restaurant are to you. **In each of the following pairs, which aspect do you think is more important?** Please check one aspect within each pair.

Example: Paired Comparisons

We would like to understand how important various aspects of a casual dining restaurant are to you.
In each of the following pairs, which aspect do you think is more important? Please check one aspect within each pair.

Comfortable environment

X

OR

Server attentiveness

Example: Paired Comparisons

We would like to understand how important various aspects of a casual dining restaurant are to you.
In each of the following pairs, which aspect do you think is more important? Please check one aspect within each pair.

Comfortable environment	<u>X</u>	OR	Server attentiveness	<u> </u>
Pace of meal	<u> </u>	OR	Receive bill in timely manner	<u> </u>

Example: Maximum Difference Scaling

Please indicate how important each of these aspects of a casual dining restaurant is to you. **In each of the following sets of items, please pick the ONE item you consider MOST important and the ONE item you consider least important.**

Set1

Temperature of food

Server friendliness

Server attentiveness

Prompt greeting

Set2

Server attentiveness

Taste of food

Overall cleanliness

Evaluating Importance in Maximum Difference Scaling

Set1

Temperature of food

Server friendliness

Server attentiveness

Prompt greeting

Set2

Server attentiveness

Taste of food

Overall cleanliness

Set3

Overall cleanliness

Server attentiveness

Temprature of food

Prompt greeting

...

Set4

Prompt greeting

Comfortable environment

Temprature of food

Overall cleanliness

Attribute sets are created scientifically through factorial designs.

Calculating Standardized Importance

Analysis:

Raw Importance of X (attribute) = (#Best – #Worst)/Total number of sets in which X appears

Standardised Importance = (Raw+1)/2

Evaluating Importance Using Attributes

SET				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET

SET				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET

SET				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET

-----				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Evaluating Importance Using Attributes

SET

				Best	Worst
				4	9
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Analysis

a	#b	#w	d	#s	raw	std
1	0	2	-2	6	-0.33	0.33
2	0	2	-2	6	-0.33	0.33
3	0	0	0	6	0.00	0.50
4	6	0	6	6	1.00	1.00
5	0	6	-6	6	-1.00	0.00
6	4	0	4	6	-0.67	0.83
7	2	0	2	6	0.33	0.67
8	2	0	2	6	0.33	0.67
9	1	1	0	6	0.00	0.50
10	0	4	-4	6	-0.67	0.17

Raw Importance of X (attribute) = (#Best – #Worst)/Total number of sets in which X appears

Standardised Importance = (Raw+1)/2

Evaluating Importance Using Attributes

SET

				Best	Worst
4	7	8	9	4	9
3	6	8	10	6	10
2	5	9	10	9	5
1	8	9	10	8	10
4	5	6	10	4	5
3	5	7	9	7	5
2	6	7	8	6	2
1	5	6	7	6	5
2	3	7	10	7	10
2	4	6	9	4	2
3	4	5	8	4	5
1	2	3	4	4	1
1	4	7	10	4	10
1	3	6	9	6	1
1	2	5	8	8	5

Analysis

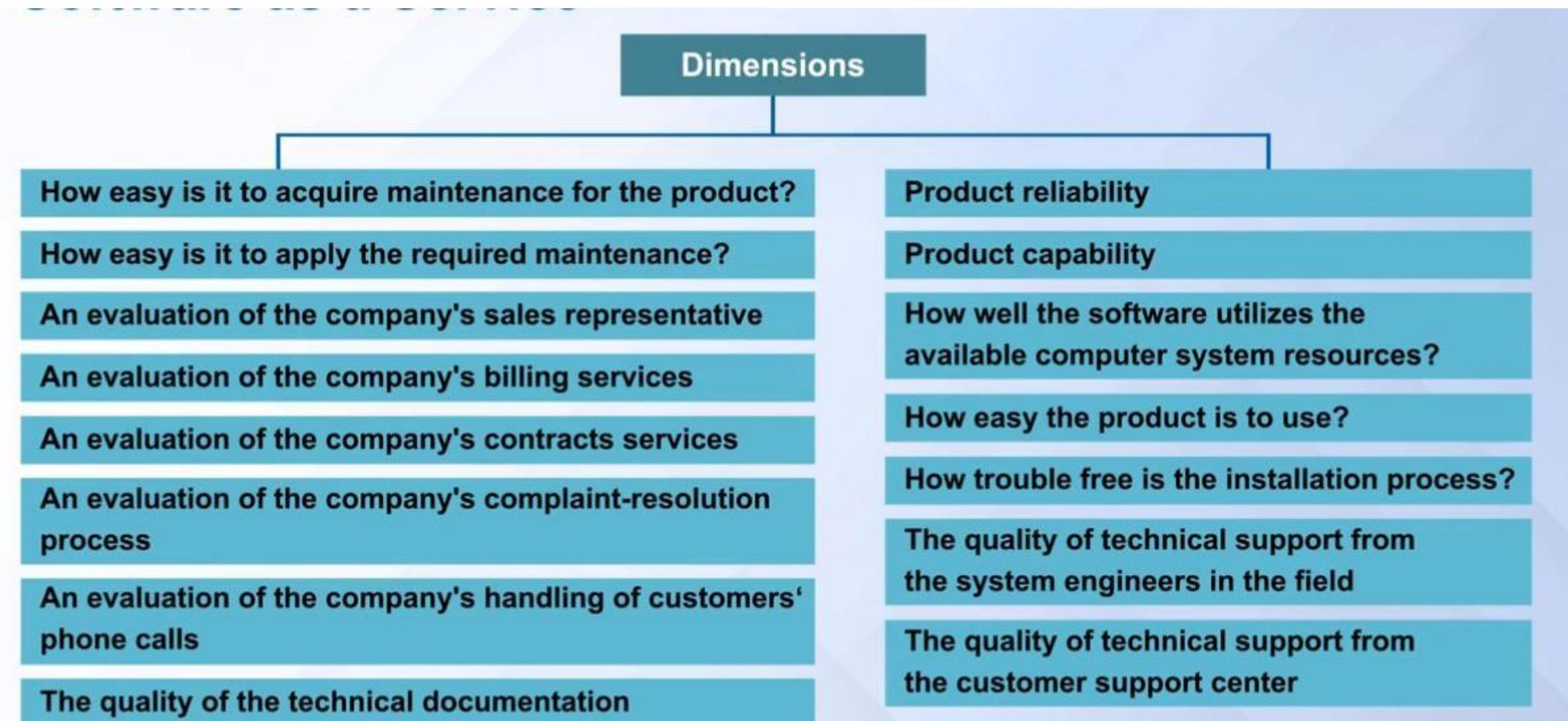
a	#b	#w	d	#s	raw	std
1	0	2	-2	6	-0.33	0.33
2	0	2	-2	6	-0.33	0.33
3	0	0	0	6	0.00	0.50
4	6	0	6	6	1.00	1.00
5	0	6	-6	6	-1.00	0.00
6	4	0	4	6	-0.67	0.83
7	2	0	2	6	0.33	0.67
8	2	0	2	6	0.33	0.67
9	1	1	0	6	0.00	0.50
10	0	4	-4	6	-0.67	0.17

Raw Importance of X (attribute) = (#Best – #Worst)/Total number of sets in which X appears

Standardised Importance = (Raw+1)/2

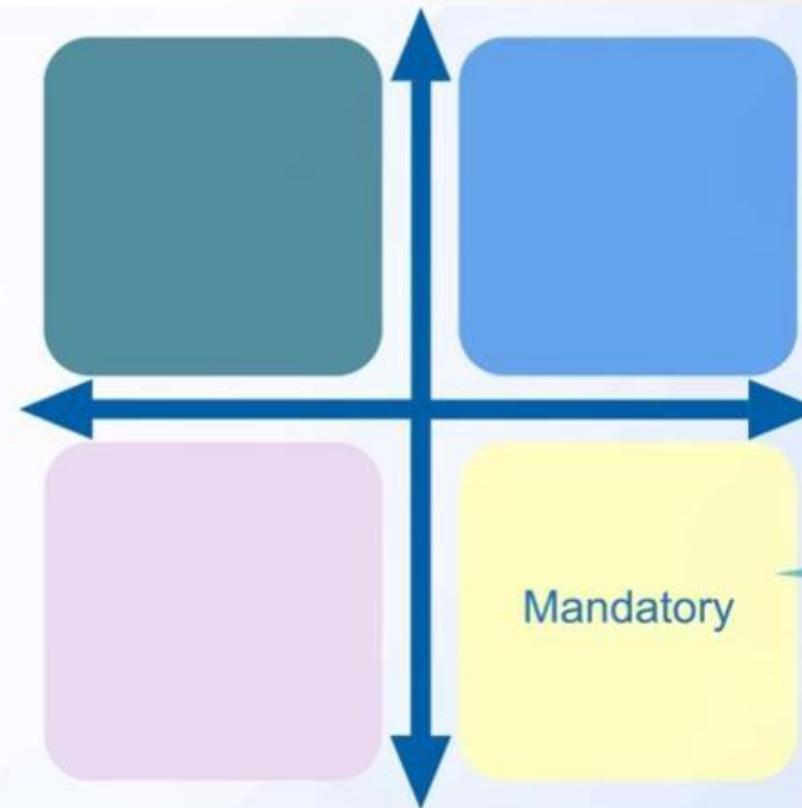
The Kano Method

Software as a Service



Consumers' ranking/rating of attributes helps understand their needs.

Prioritising Needs and Features

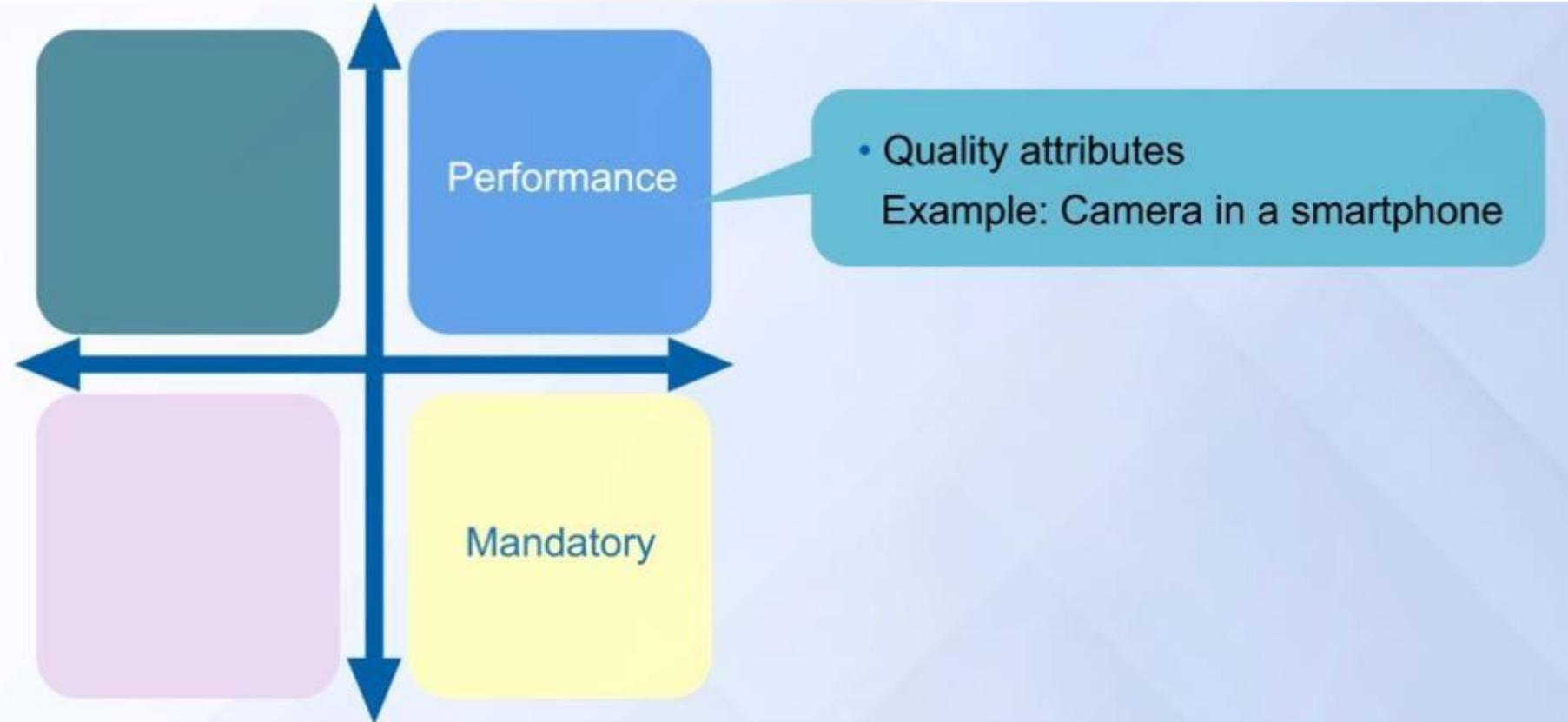


- Customers expect certain attributes in their product
- Example: A decent braking system, wheels, etc. in cars
- Also called hygiene factors or basic attributes

No matter how well the product meets the need, the customer simply accepts it as something expected. However, if the need is not met, the customer is very dissatisfied.

Activate Windows

Prioritising Needs and Features

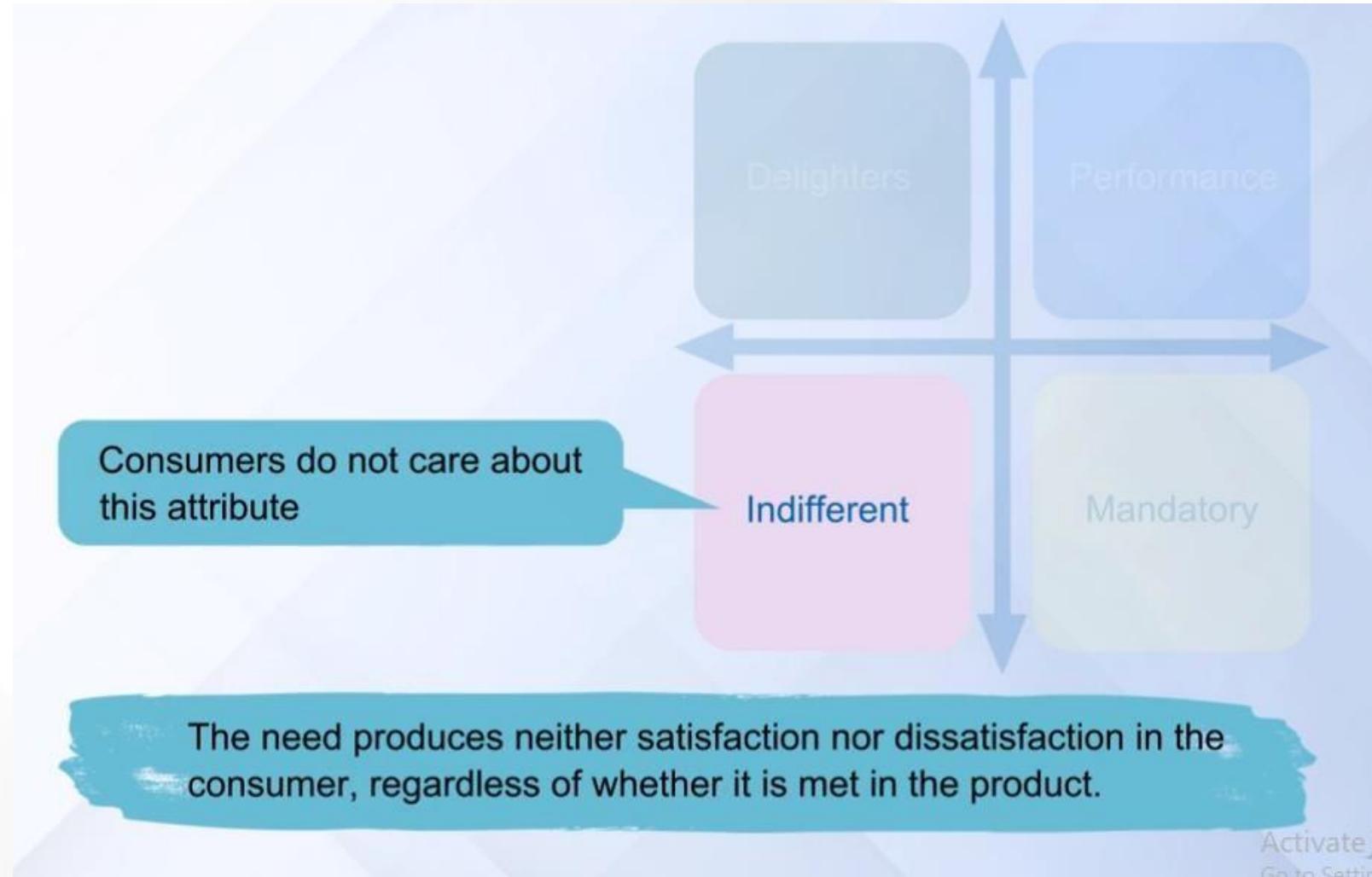


The better the product is at meeting the need, the better the customer likes it.

Prioritising Needs and Features

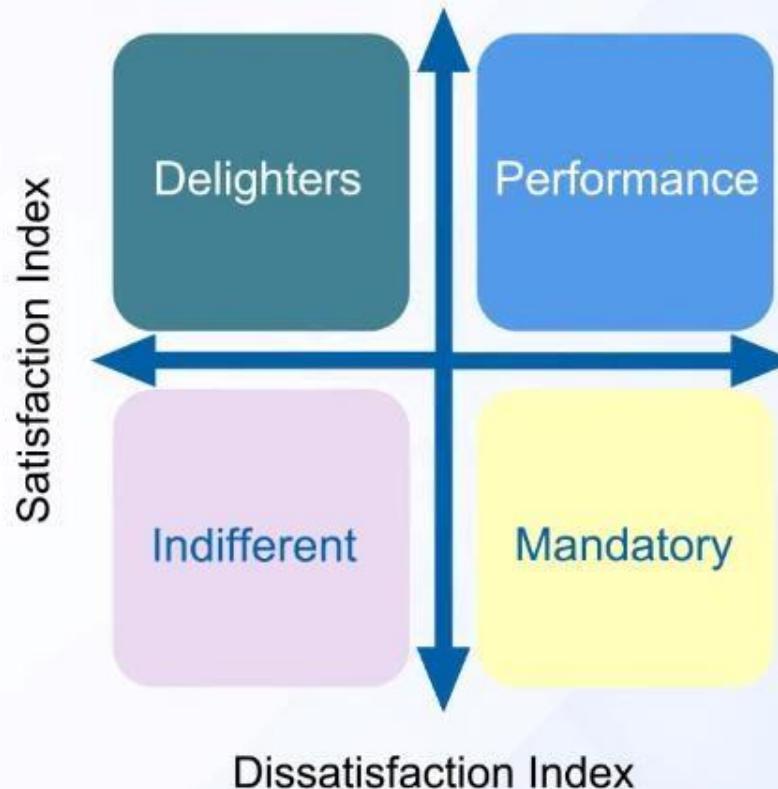


Prioritising Needs and Features

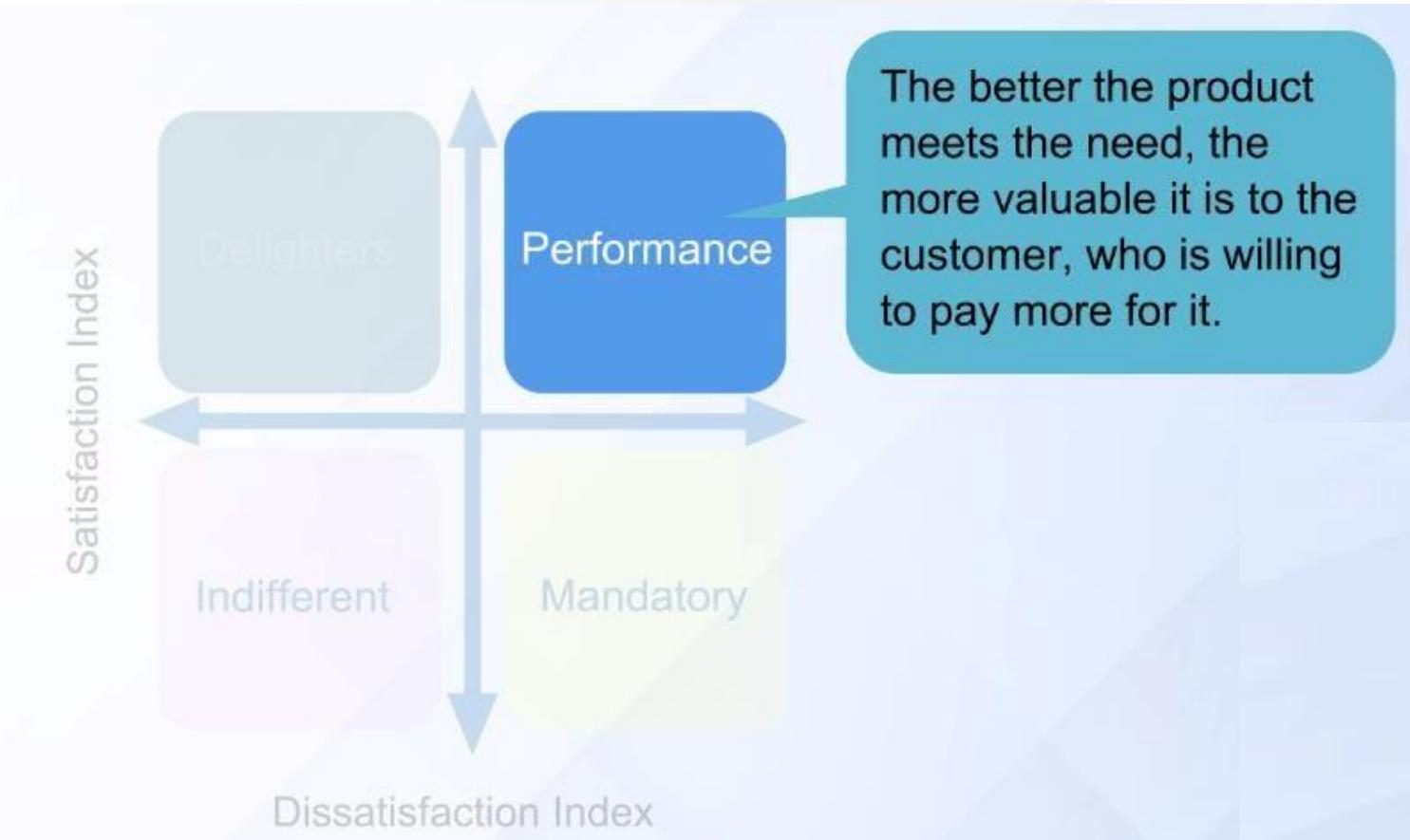


Activate
Go to Settings

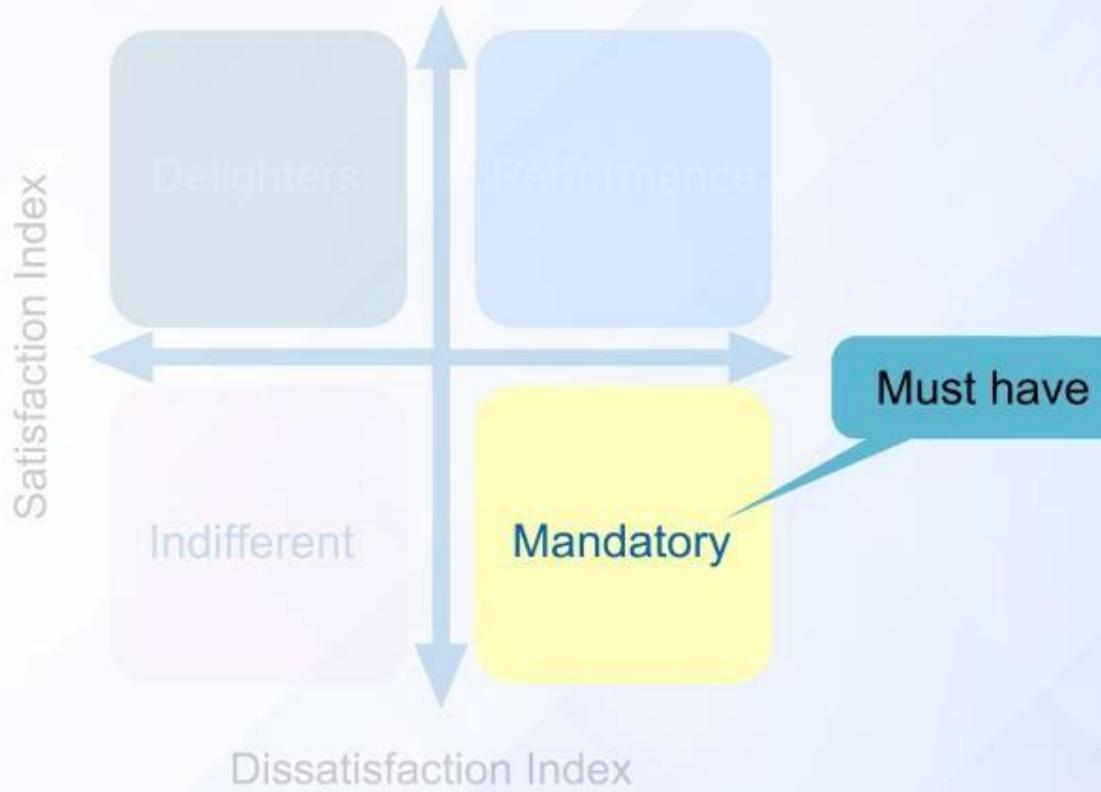
Customer Preference Matrix



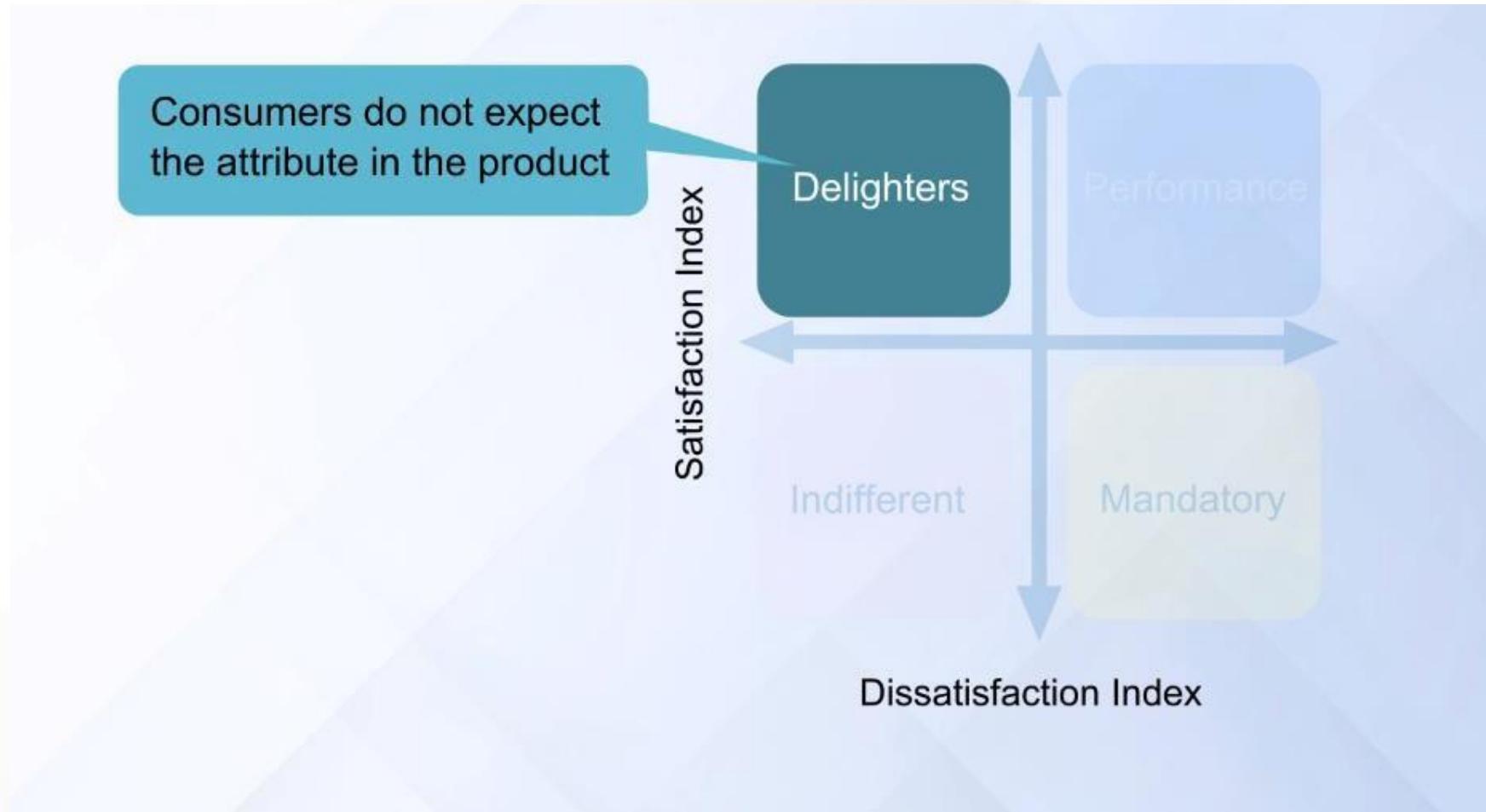
Customer Preference Matrix



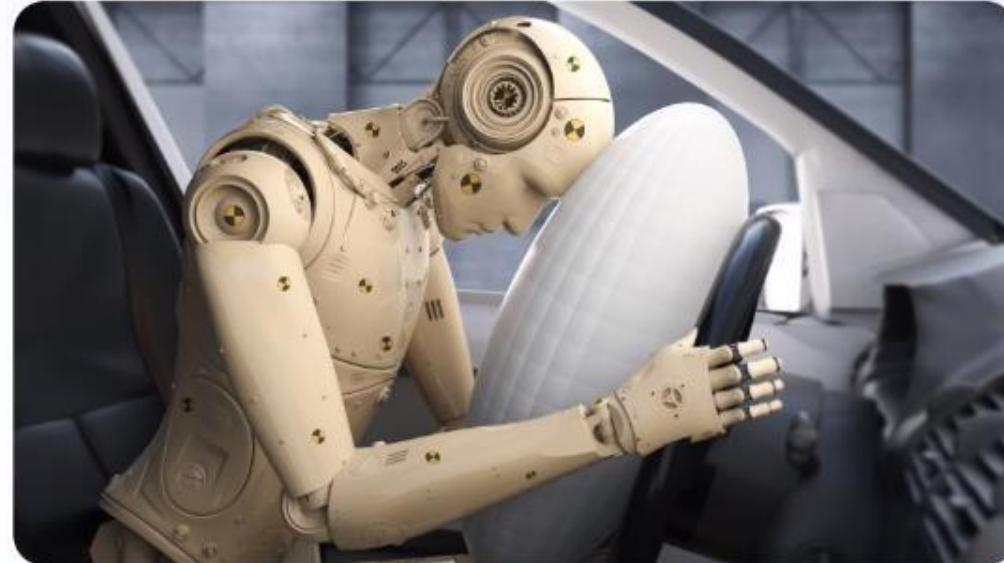
Customer Preference Matrix



Customer Preference Matrix



Delighters Move Over Time



Airbags were Delighters – Customers did not expect it but liked it when they found it

Airbags became Mandatory – Customers expect safety airbags in all cars

Delighters Move Over Time



Navigation system are Delighters – Customers did not expect it but liked it when they found it

Navigation system will become Mandatory – Customers expect it as acceptable attribute

Kano Method Snapshot

Example: Speed of answer by customer service rep

Step 1: Questionnaire

If you have to wait for less than 2 minutes before the customer service rep answers your call, how do you feel?	<p>✗1. I like it that way 2. It must be that way 3. I am neutral 4. I can live with it that way 5. I dislike it that way</p>
If you have to wait for more than 2 minutes before the customer service rep answers your call, how do you feel?	<p>1. I like it that way 2. It must be that way 3. I am neutral ✗4. I can live with it that way 5. I dislike it that way</p>

Step 2: Evaluation Table

Customer Requirement	Dysfunctional (Negative) Question				
	1	2	3	4	5
Functional (Positive) Question	1				✗
	2				
	3				
	4				
	5				

Kano Method Snapshot

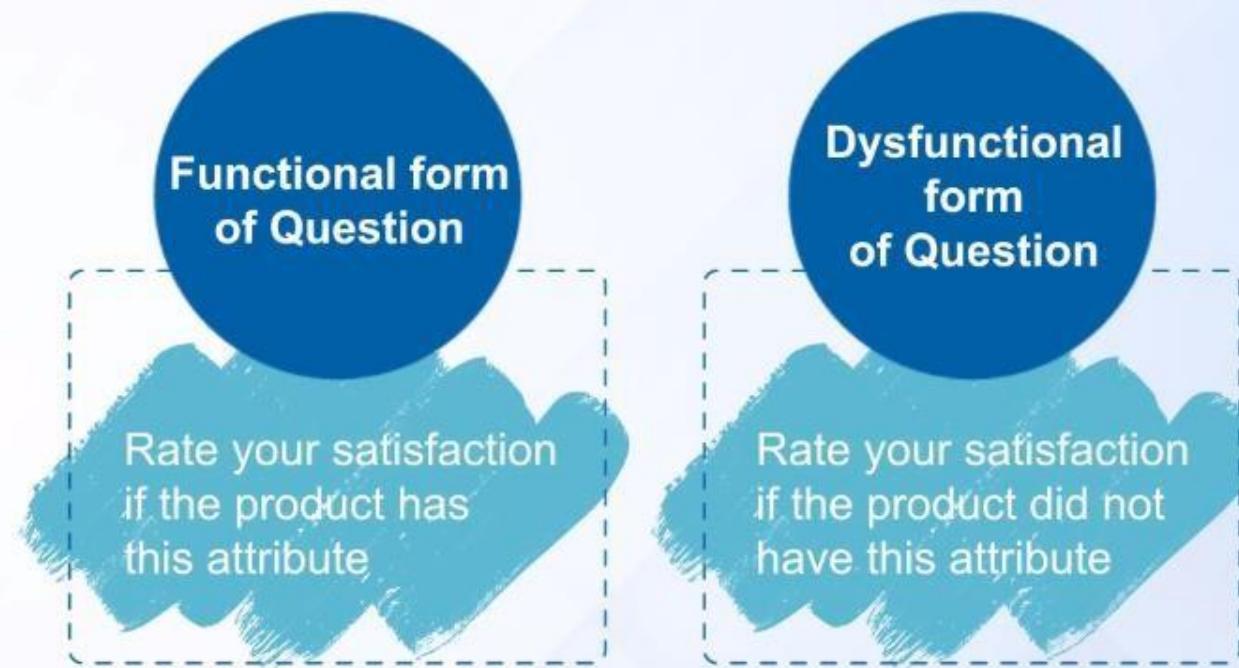
Step 3: Table of Results

Product Requirement	A	O	M	I	R	Q	Total	Category
Speed of Answer	1							
Resolution								
Rep communication								

The Kano Method: Data Collection and Analysis

Step 1: Data Collection

A pair of customer requirement question in Kano questionnaire



Example: Kano Questionnaire

Functional form of question	How would you feel, if you had a camera in your cell-phone?	I like it	
		I expect it	✓
		I am neutral	
		I can live with it	
		I dislike it	

Dysfunctional form of question	How would you feel, if you had NO camera in your cell-phone?	I like it	
		I expect it	
		I am neutral	
		I can live with it	
		I dislike it	✓

Example: Kano Questionnaire

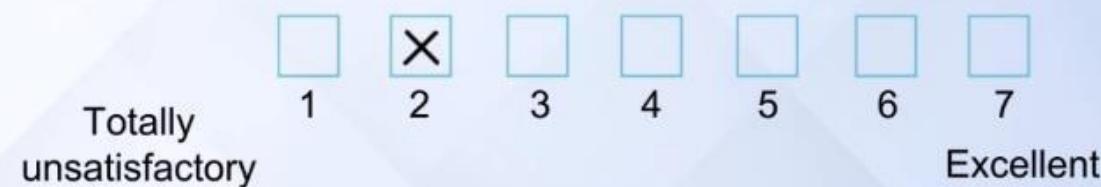
If your skis make it easier for you to ski in deep powder snow, how do you feel?

- I like it that way
- It must be that way
- I am neutral
- I can live with it that way
- I dislike it that way

If your skis do not make it any easier for you to ski in deep powder snow, how do you feel?

- I like it that way
- It must be that way
- I am neutral
- I can live with it that way
- I dislike it that way

How would you rank the deep powder snow features of your skis?



Step 2: Kano Evaluation Table

Customer Survey Responses		Dysfunctional Question Answer				
		1. Like	2. Must Be	3. Neutral	4. Live With	5. Dislike
Functional Question Answer	1. Like	Questionable	Attractive	Attractive	Attractive	One-Dimensional
	2. Must Be	Reverse	Indifferent	Indifferent	Indifferent	Must-Be
	3. Neutral	Reverse	Indifferent	Indifferent	Indifferent	Must-Be
	4. Live With	Reverse	Indifferent	Indifferent	Indifferent	Must-Be
	5. Dislike	Reverse	Reverse	Reverse	Reverse	One-Dimensional

- Attractive or delighter
- One-dimensional or linear or performance
- Must-have or mandatory
- Indifferent
- Reverse
- Questionable

Example: Kano Evaluation Table for Laptop Attributes

Customer Requirements	Delight	Performance	Mandatory	Indifferent	Reverse	Questionable	Total	Kano Catagory
Appearance								
Light and mobile	19	54	27	22	1	2	125	Performance
Stylish design	57	25	15	27	0	1	125	Delight
Large screen size	20	15	11	72	5	2	125	Indifferent
Performance								
High computing power	14	57	29	21	2	2	125	Performance
Solid audio capability	69	19	15	20	2	0	125	Delight
Powerful graphics	58	27	15	24	1	0	125	Delight
Large storage	28	25	46	24	2	0	125	Mandatory
High network performance	16	37	22	47	1	2	125	Indifferent
Function								
Multimedia functions	22	49	27	24	1	2	125	Performance
Expandable device	61	9	20	34	0	1	125	Delight
Wireless LAN	18	27	58	21	0	1	125	Mandatory
Remote control	23	5	11	83	2	1	125	Indifferent
Service								
On-site installation	18	20	15	67	5	0	125	Indifferent
Software support	17	20	53	34	1	0	125	Mandatory
Phone technical support	22	15	11	74	3	0	125	Indifferent
Replacement and repair services	16	51	32	24	1	1	125	Performance

Ting Wang Ping Ji, (2010), "Understanding customer needs through quantitative analysis of Kano's model", International Journal of Quality & Reliability Management, Vol. 27 Iss 2 pp. 173 - 184

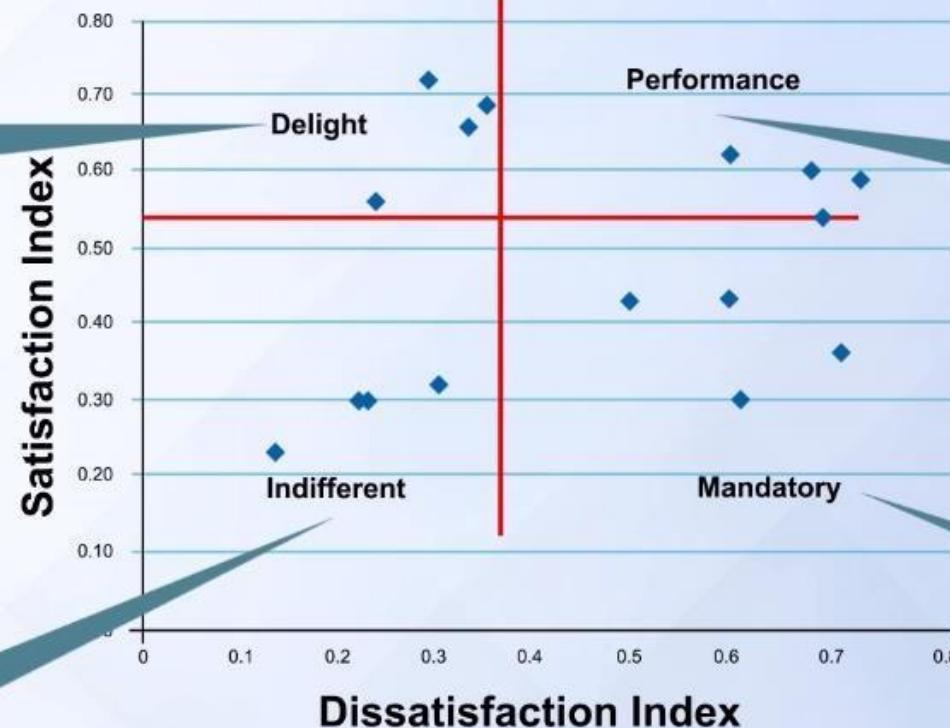
Step 3: Analysis – Customer Satisfaction

Customer Satisfaction and Dissatisfaction Indexes

Customer Requirements	Delight	Performance	Mandatory	Indifferent	Reverse	Questionable	Total	Rank Category	Satisfaction Index	Dissatisfaction Index
Appearance										
Light and mobile	19	54	27	22	1	2	125	Performance	0.6	-0.66
Stylish design	57	25	15	27	0	1	125	Delight	0.66	-0.32
Large screen size	20	16	11	29	0	0	125	Indifferent	0.3	-0.22
Satisfaction_Index		$= \frac{\% \text{Delighted} + \% \text{Performance}}{\% \text{Delighted} + \% \text{Performance} + \% \text{Mandatory} + \% \text{Indifferent}}$								
Performance										
High computing power	14	57	29	21	2	4	125	Performance	0.59	-0.71
Good audio capability	69	19	15	20	2	0	125	Delight	0.72	-0.28
Powerful graphics	58	27	15	24	1	0	125	Delight	0.69	-0.34
Large storage	28	25	46	24	2	0	125	Mandatory	0.43	-0.58
High network performance	16	37	22	47	1	2	125	Indifferent	0.43	-0.48
Dissatisfaction_Index		$= \frac{\% \text{Mandatory} + \% \text{Performance}}{\% \text{Delighted} + \% \text{Performance} + \% \text{Mandatory} + \% \text{Indifferent}}$								
Function										
Memory	49	37	37	37	0	0	125	Performance	0.62	-0.58
Expanding device	61	41	37	37	0	0	125	Delight	0.56	-0.23
Wireless LAN	18	24	24	24	0	0	125	Indifferent	0.36	-0.69
Remote control	23	9	11	83	2	1	125	Indifferent	0.23	-0.13
Service										
On-site installation	18	20	15	67	5	0	125	Indifferent	0.32	-0.29
Software support	17	20	53	34	1	0	125	Mandatory	0.3	-0.59
Phone technical support	22	15	11	74	3	0	125	Indifferent	0.3	-0.21
Replacement and repair services	16	51	32	24	1	1	125	Performance	0.54	-0.67

Customer Requirement: Attribute Importance Matrix

Attributes which are unexpected but welcome changes



Attribute where more effect is desirable - unidimensional

Attributes which do not matter to the customer

Must have attributes without which the product would not even be considered

Example: Customer Requirements from Hotels

Characteristic	Business Client	Vacationer	How Good Are We?
Price	Performance	Must Be	Satisfactory
Fast check-in	Performance	Performance	Weak
Express checkout	Must Be	Performance	Weak
Location	Performance	Performance	Satisfactory
Comfortable bed	Must Be	Must Be	Satisfactory
Continental breakfast	Must Be	Delighter	Satisfactory
Jacuzzi	Delighter	Performance	Weak
Internet hook-up	Must Be	Delighter	Weak
Newspaper	Must Be	Delighter	Satisfactory
Cable/HBO	Delighter	Must Be	Satisfactory
Exercise room	Delighter	Performance	Weak
Swimming pool	Delighter	Must Be	Satisfactory
Restaurant	Performance	Performance	Weak

Kano Evaluation Table

Customer Survey Responses		Dysfunctional Question Answer				
		1. Like	2. Must Be	3. Neutral	4. Live With	5. Dislike
Functional Question Answer	1. Like	Questionable	Attractive	Attractive	Attractive	One-Dimensional
	2. Must Be	Reverse	Indifferent	Indifferent	Indifferent	Must-Be
	3. Neutral	Reverse	Indifferent	Indifferent	Indifferent	Must-Be
	4. Live With	Reverse	Indifferent	Indifferent	Indifferent	Must-Be
	5. Dislike	Reverse	Reverse	Reverse	Reverse	One-Dimensional

Example: Customer Requirements from Laptop

Customer Requirements	Delight	Performance	Mandatory	Indifferent	Reverse	Questionable	Total	Kano Catagory
Appearance								
Light and mobile	19	54	27	22	1	2	125	Performance
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Customer Satisfaction and Dissatisfaction Indexes

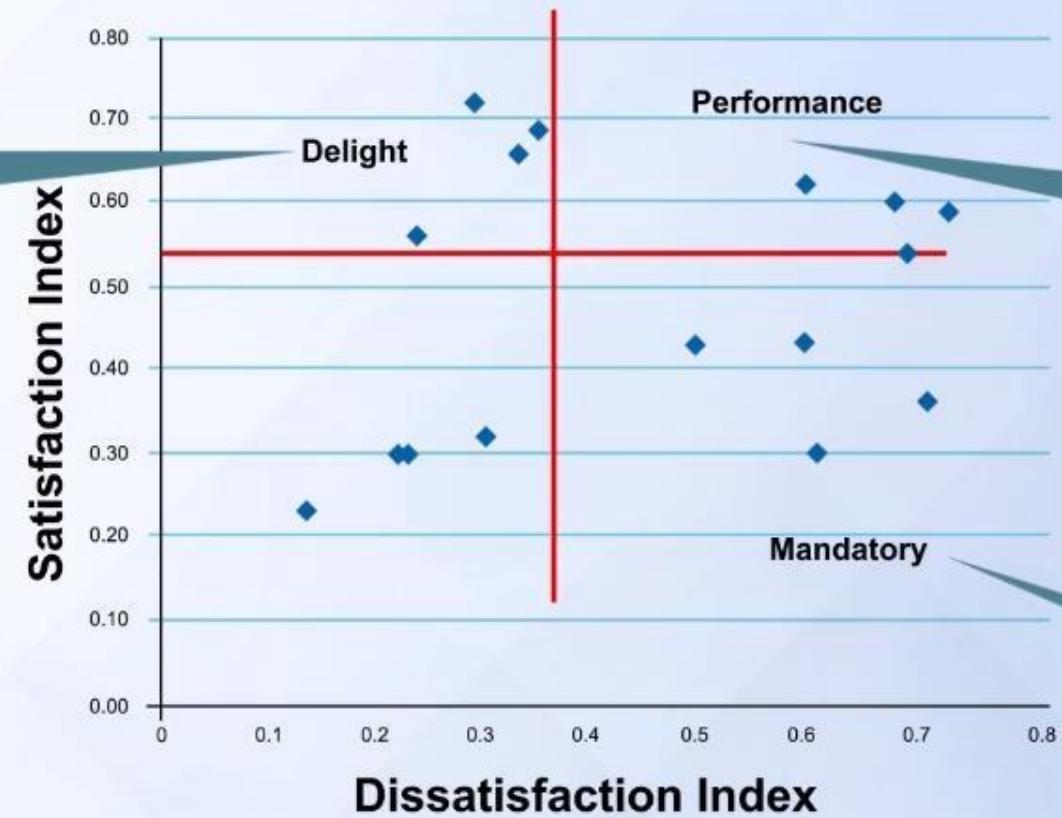
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Solid audio capability	69	19	15	20	2	0	125	Delight	0.72	-0.28		
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Wireless LAN	18	%Mandatory +%Indifferent							Mandatory	0.36	-0.69	
Remote control	33	5	%Mandatory +%Indifferent							Indifferent	0.23	-0.13
Service	%Delighted +%Performance +%Mandatory +%Indifferent											
On-site installation	16	20	15	67	0	0	125	Indifferent	0.32	-0.29		
Software support	17	20	53	34	1	0	125	Mandatory	0.3	-0.59		
Phone technical support	22	15	11	74	3	0	125	Indifferent	0.3	-0.21		
Replacement and repair services	16	51	32	24	1	1	125	Performance	0.54	-0.67		

Customer Requirement: Attribute Importance Matrix

The attributes remember which consumers do not expect in this category



The more of this attribute, the more value consumers put

The attributes which must have rights

Example: Customer Requirements from Hotels

Characteristic	Business Client	Vacationer	How Good Are We?
Price	Performance	Must Be	Satisfactory
Fast check-in	Performance	Performance	Weak
Express checkout	Must Be	Performance	Weak
Location	Performance	Performance	Satisfactory
Comfortable bed	Must Be	Must Be	Satisfactory
Continental breakfast	Must Be	Delighter	Satisfactory
Jacuzzi	Delighter	Performance	Weak
Internet hook-up	Must Be	Delighter	Weak
Newspaper	Must Be	Delighter	Satisfactory
Cable/HBO	Delighter	Must Be	Satisfactory
Exercise room	Delighter	Performance	Weak
Swimming pool	Delighter	Must Be	Satisfactory
Restaurant	Performance	Performance	Weak

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Newspaper	Must Be	Delighter	Satisfactory
Cable/HBO	Delighter	Must Be	Satisfactory
Exercise room	Delighter	Performance	Weak
Swimming pool	Delighter	Must Be	Satisfactory
Restaurant	Performance	Performance	Weak

Latent Needs – Factor Analysis

Factor Analysis: Toothpaste Example



What do customers feel about the different attributes of a toothpaste?



Attributes

- Anti-cavity
- Teeth whitening
- Gum strengthening
- Breath freshening
- Prevention of tooth decay

Factor Analysis: Toothpaste Example

With 6 variables and data collected from 30 respondents,
consider these:

Were there any **underlying themes** in the survey?
How to **discover** an underlying (or 'latent') theme across a series of variables?



Factor analysis

Factor Analysis: Toothpaste Example

Name	Anti-cavity	Whiten teeth	Gum strengthening	Fresh breath	Tooth decay	Fill tooth gaps
R1	7	3	6	4	2	4
R2	1	3	2	4	5	4
R3	6	2	7	4	1	3
R4	4	5	4	6	2	5
R5	1	2	2	3	6	2
R6	6	3	6	4	2	4
R7	5	3	6	3	4	3
R8	6	4	7	4	1	4
R9	3	4	2	3	6	3
R10	2	6	2	6	7	6
R11	6	4	7	3	2	3
R12	2	3	1	4	5	4

Activate Windows

Factor Analysis: Toothpaste Example

Name	Anti-cavity	Whiten teeth	Gum strengthening	Fresh breath	Tooth decay	Fill tooth gaps
R1	7	3	6	4	2	4
R2	1	3	2	4	5	4
R3	6	2	7	4	1	3
R4	4	5	4	6	2	5
R5	1	2	2	3	6	2
R6	6	3	6	4	2	4
R7	5	3	6	3	4	3
R8	6	4	7	4	1	4
R9	3	4	2	3	6	3
R10	2	6	2	6	7	6
R11	6	4	7	3	2	3
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Activate Window

Factor Analysis: Toothpaste Example

Name	Anti-cavity	Whiten teeth	Gum strengthening	Fresh breath	Tooth decay	Fill tooth gaps
R1	7	3	6	4	2	4
R2	1	3	2	4	5	4
R3	6	2	7	4	1	3
R4	4	5	4	6	2	5
R5	1	2	2	3	6	2
R6	6	3	6	4	2	4
R7	5	3	6	3	4	3
R8	6	4	7	4	1	4
R9	3	4	2	3	6	3
R10	2	6	2	6	7	6
R11	6	4	7	3	2	3
R12	2	3	1	4	5	4

Author: S. Sankaran

Factor Analysis: Toothpaste Example

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R4	4	5	4	6	2	5
R5	1	2	2	3	6	2
R6	6	3	6	4	2	4
R7	5	3	6	3	4	3
R8	6	4	7	4	1	4
R9	3	4	2	3	6	3
R10	2	6	2	6	7	6
R11	6	4	7	3	2	3
R12	2	3	1	4	5	4

Intuitive Understanding of Factor Analysis

Factor Analysis

Factor analysis takes the original variables and projects them.



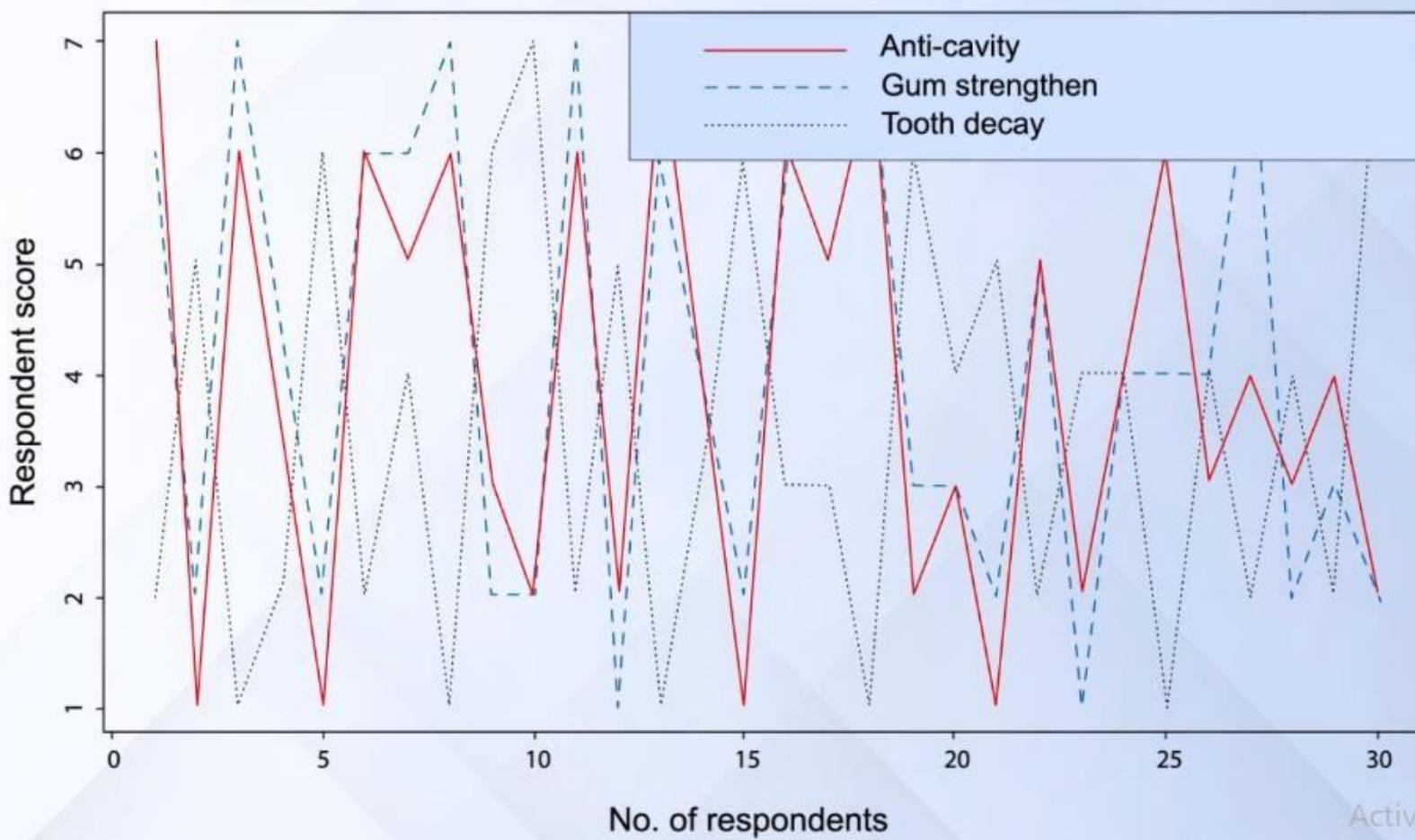
Factor Analysis

Factor scores

Factor loading

A factor is a new variable constructed from the group of the correlated variables in the original data.

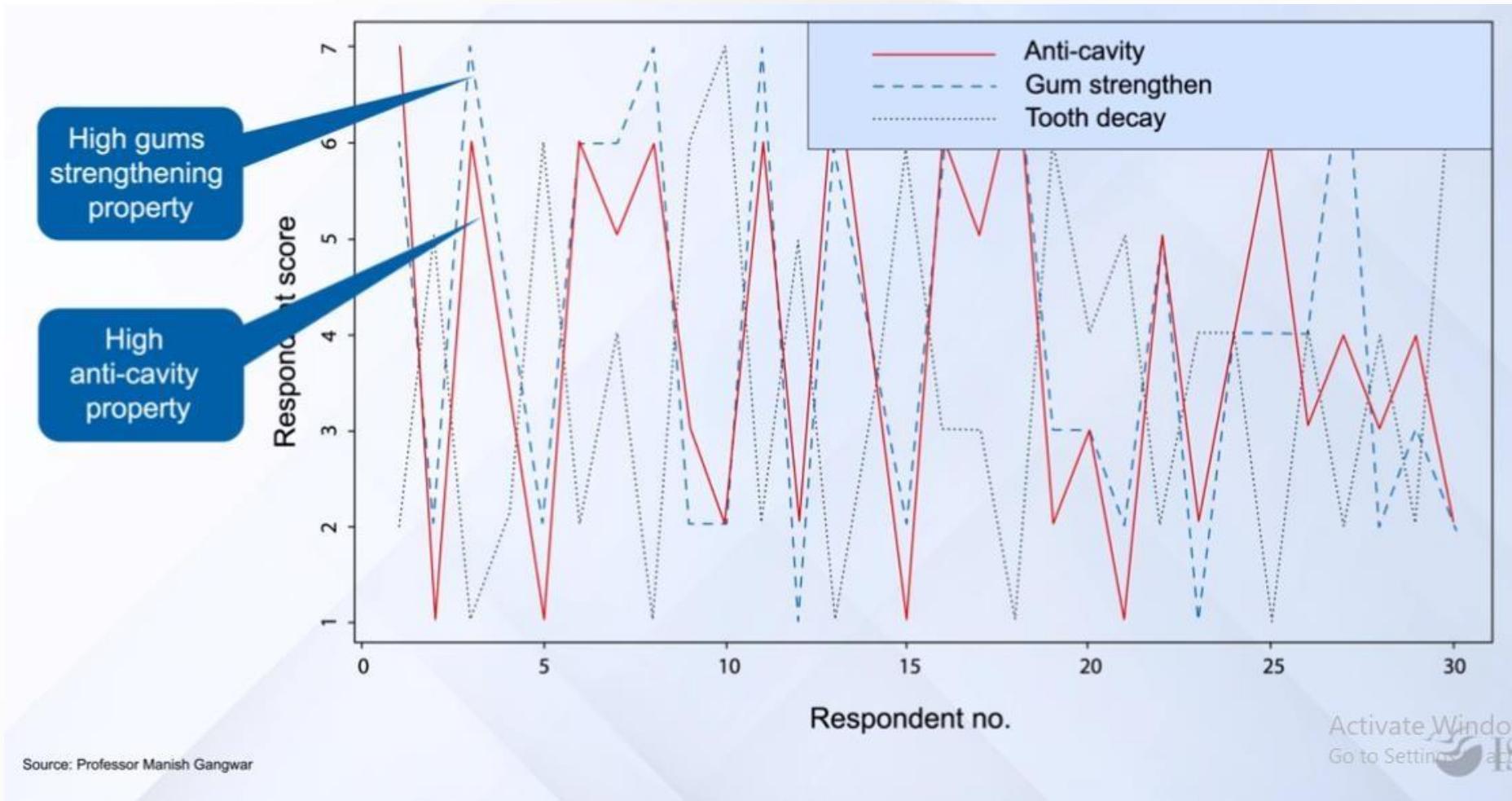
Toothpaste Example: Results



Source: Professor Manish Gangwar

Activate
Go to Settings

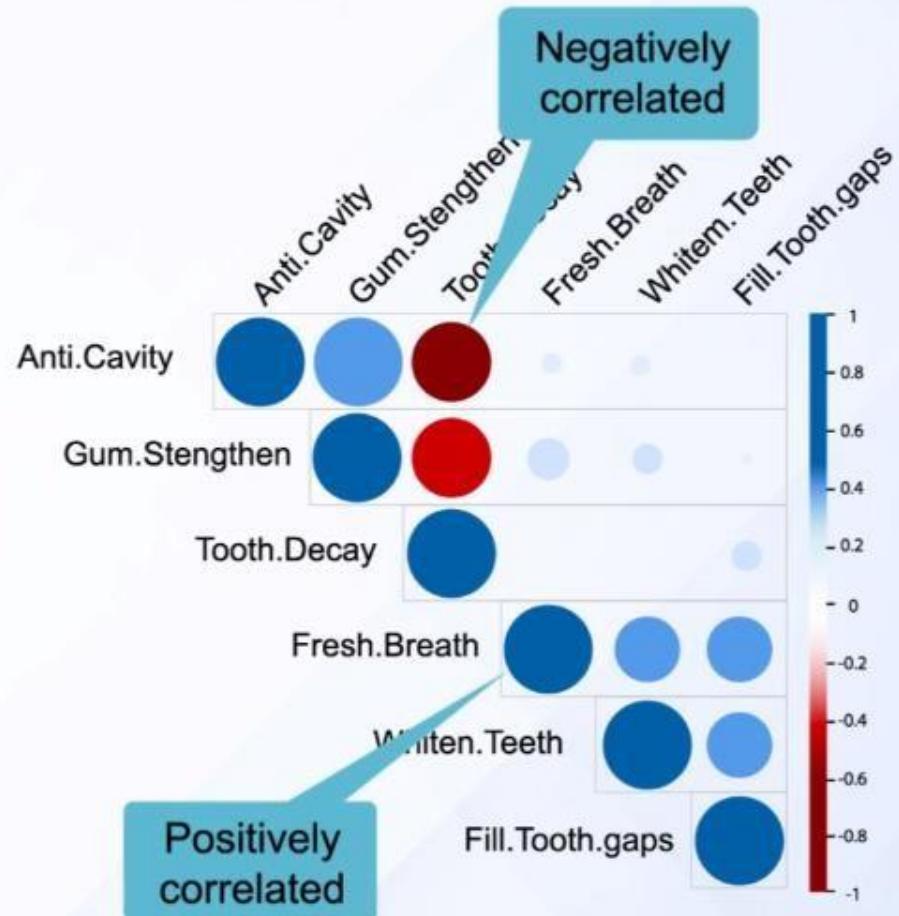
Toothpaste Example: Results



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Activate Window
Go to Settings

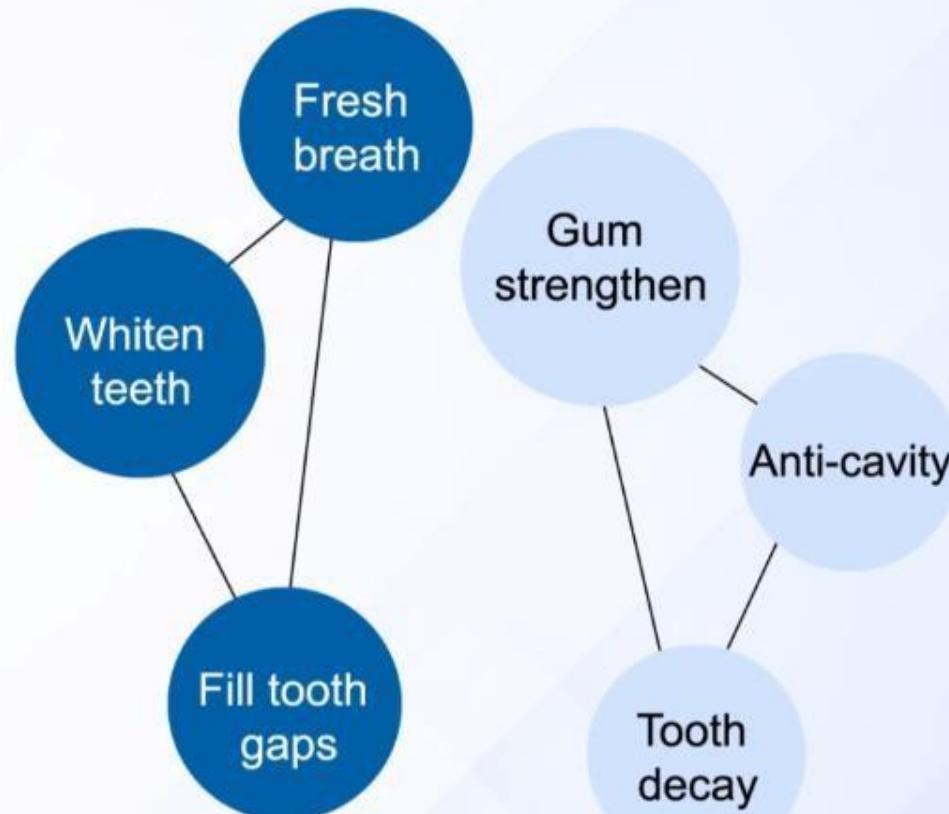
Correlation



Correlation Table

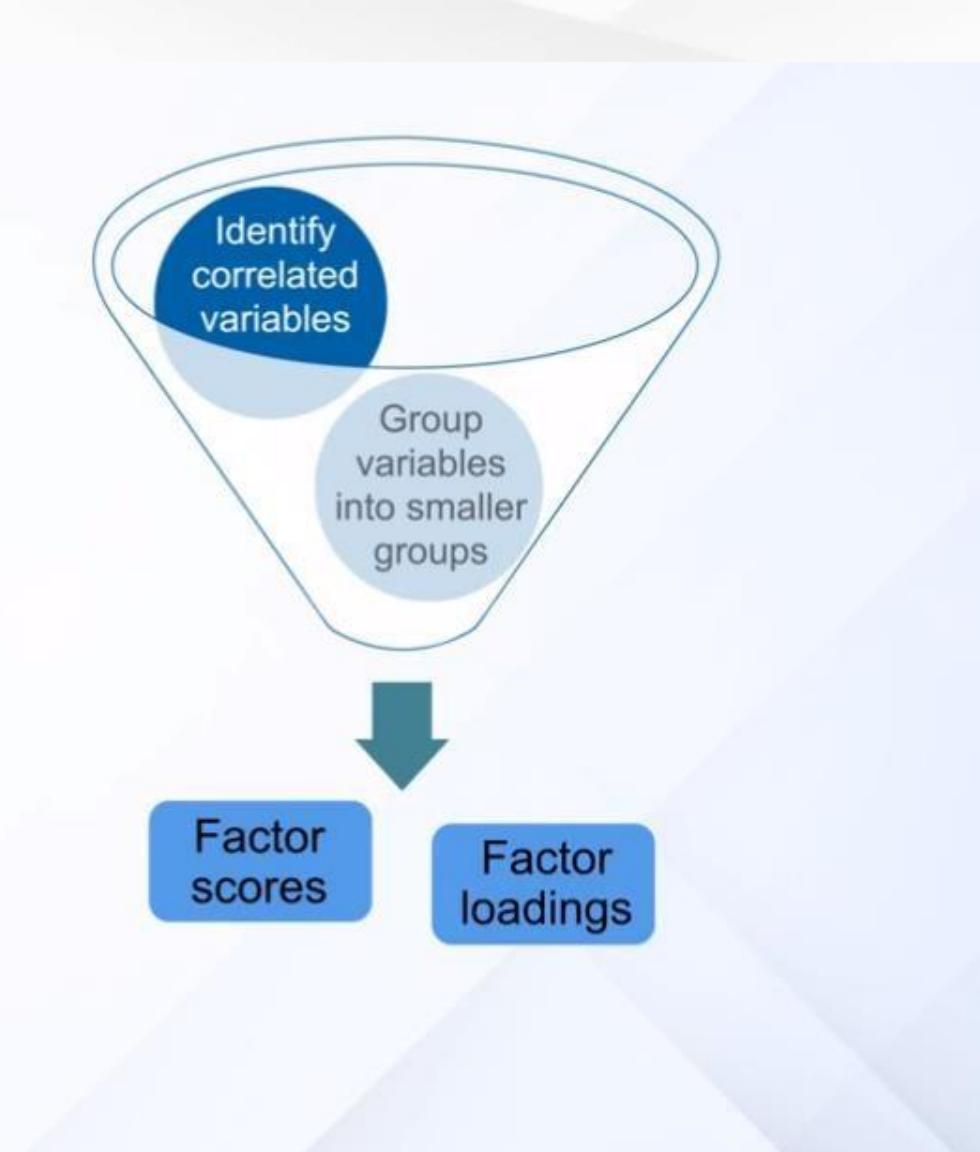
	Anti.Cavity	Whiten.Teeth	Gum.Strength	Fresh.Breath
Anti.Cavity	1.000	-0.053	0.873	-0.086
Whiten.Teeth	-0.053	1.000	-0.155	0.572
Gum.Strength	0.873	-0.155	1.000	-0.248
Fresh.Breath	-0.086	0.572	-0.248	1.000
	Tooth.Decay	Fill.Tooth.gaps		
Anti.Cavity	-0.858	0.004		
Whiten.Teeth	0.020	0.640		
Gum.Strength	-0.778	-0.018		
Fresh.Breath	-0.007	0.640		
Tooth.Decay	1.000	-0.136		
Fill.Tooth.gaps	-0.136	1.000		

Toothpaste Example: Results

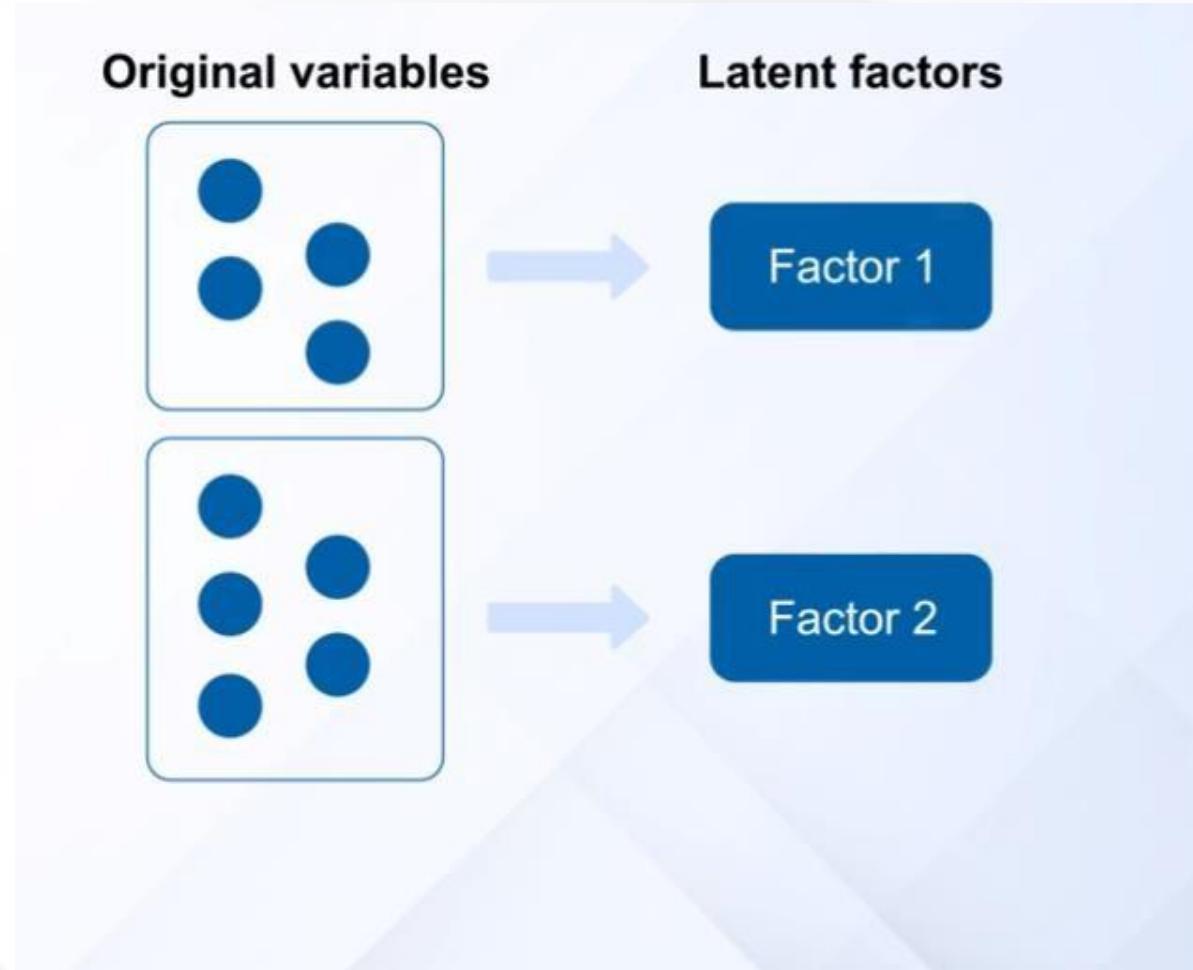


Factor App (Interpretation of Results)

Factor Analysis



Identifying Latent Factors Through Factor App

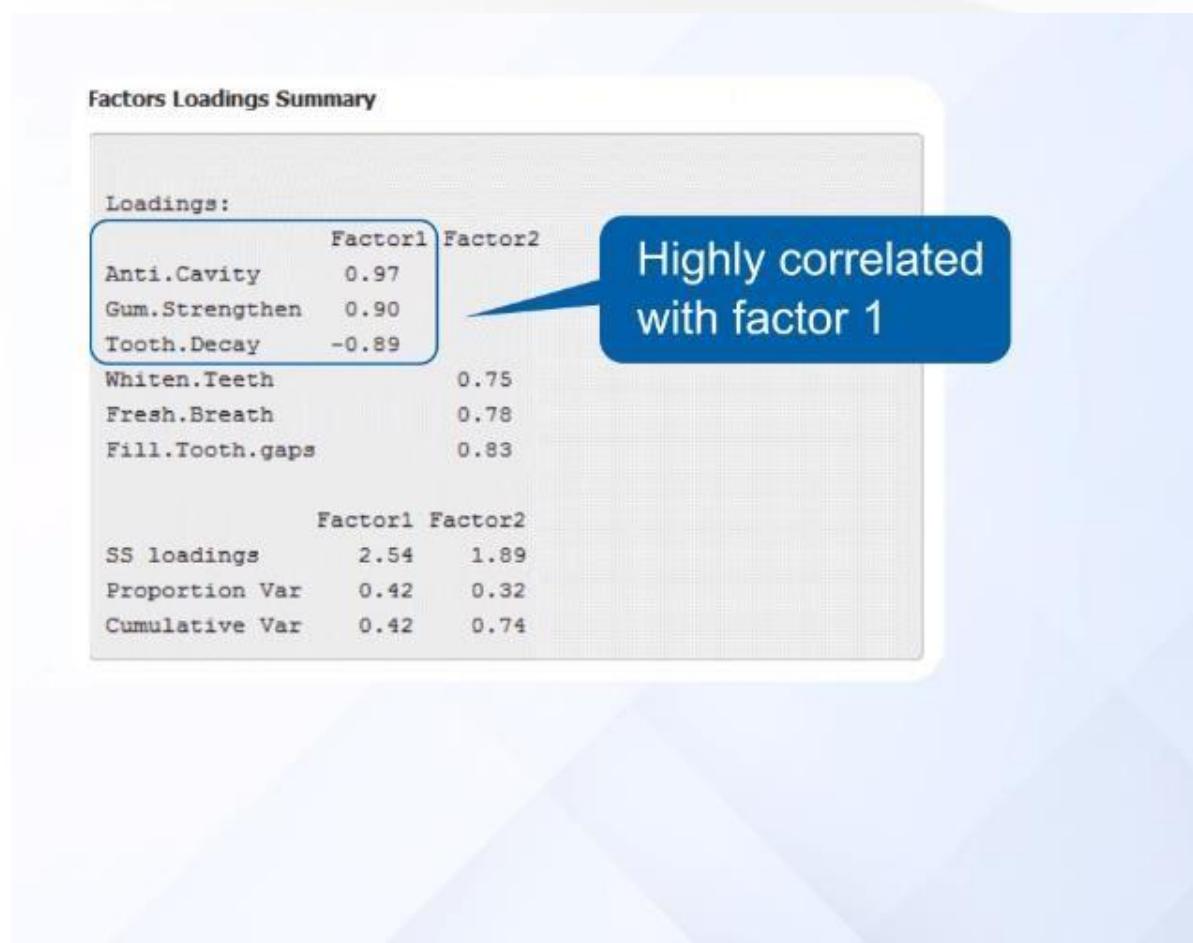


Example: Identifying Latent Factors Through Factor App

Factors Loadings Summary		
Loadings:		
	Factor1	Factor2
Anti.Cavity	0.97	
Gum.Strengthen	0.90	
Tooth.Decay	-0.89	
Whiten.Teeth	0.75	
Fresh.Breath	0.78	
Fill.Tooth.gaps	0.83	
	Factor1	Factor2
SS loadings	2.54	1.89
Proportion Var	0.42	0.32
Cumulative Var	0.42	0.74

Shows which variables load onto which factors

Example: Identifying Latent Factors Through Factor App



Example: Identifying Latent Factors Through Factor App

Factors Loadings Summary		
Loadings:		
	Factor1	Factor2
Anti.Cavity	0.97	
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	Factor1	Factor2
SS loadings	2.54	1.89
Proportion Var	0.42	0.32
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Highly correlated
with factor 2

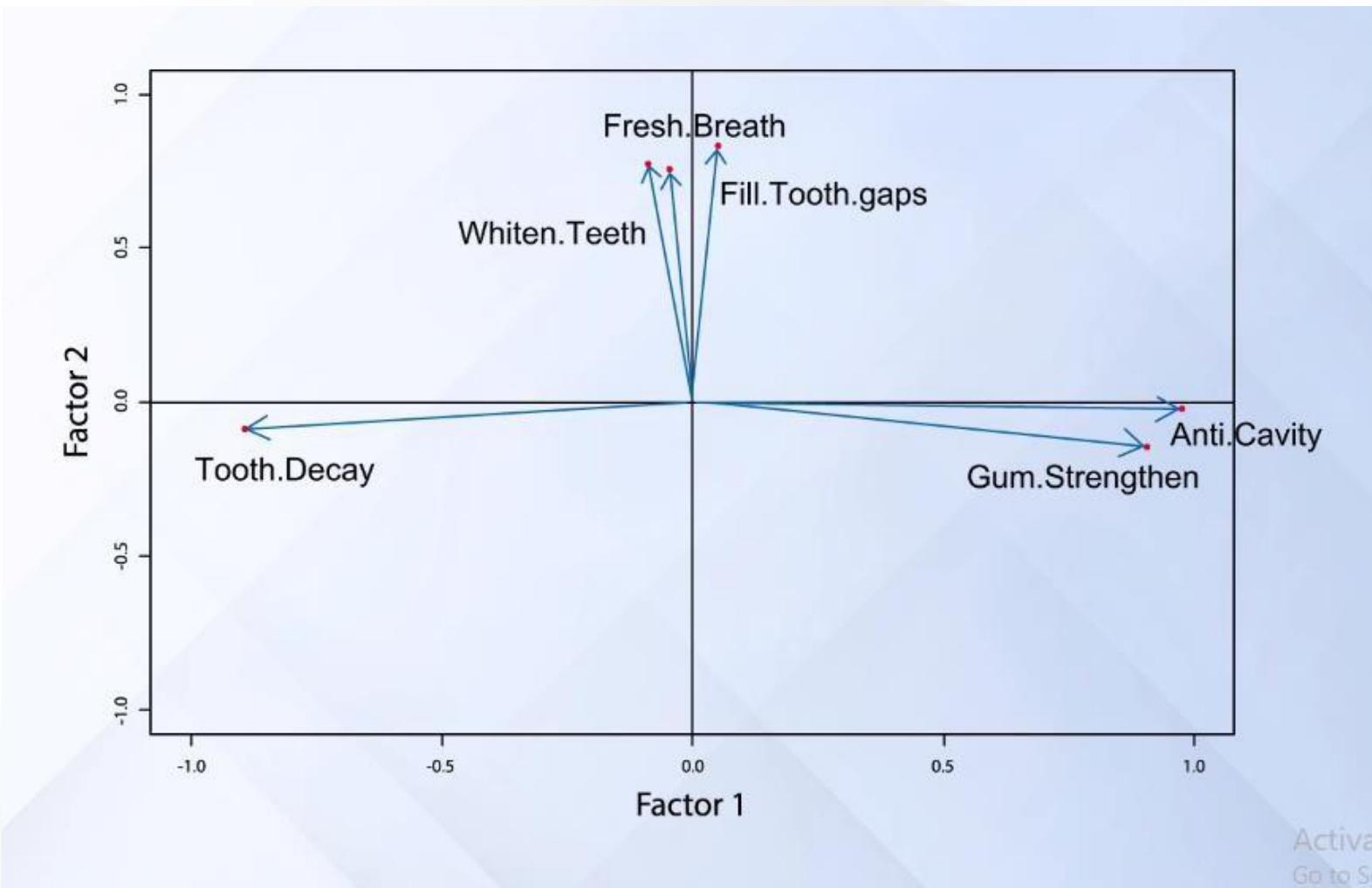
Example: Interpreting Latent Factors

Latent factor	Related property of toothpaste
Factor 1	Health
Factor 2	Cosmetic

Example: Interpreting Cumulative Variance

Factors Loadings Summary		
Loadings:		
	Factor1	Factor2
Anti.Cavity	0.97	
Gum.Strengthen	0.90	
Tooth.Decay	-0.89	
Whiten.Teeth		0.75
Fresh.Breath		0.78
Fill.Tooth.gaps		0.83
	Factor1	Factor2
SS loadings	2.54	1.89
Proportion Var	0.42	0.32
Cumulative Var	0.42	0.74

Example: Interpreting the Results Pictorially



Activat
Go to Se

Example: pictorial Representation of Factor Loadings



Example: Factor Scores

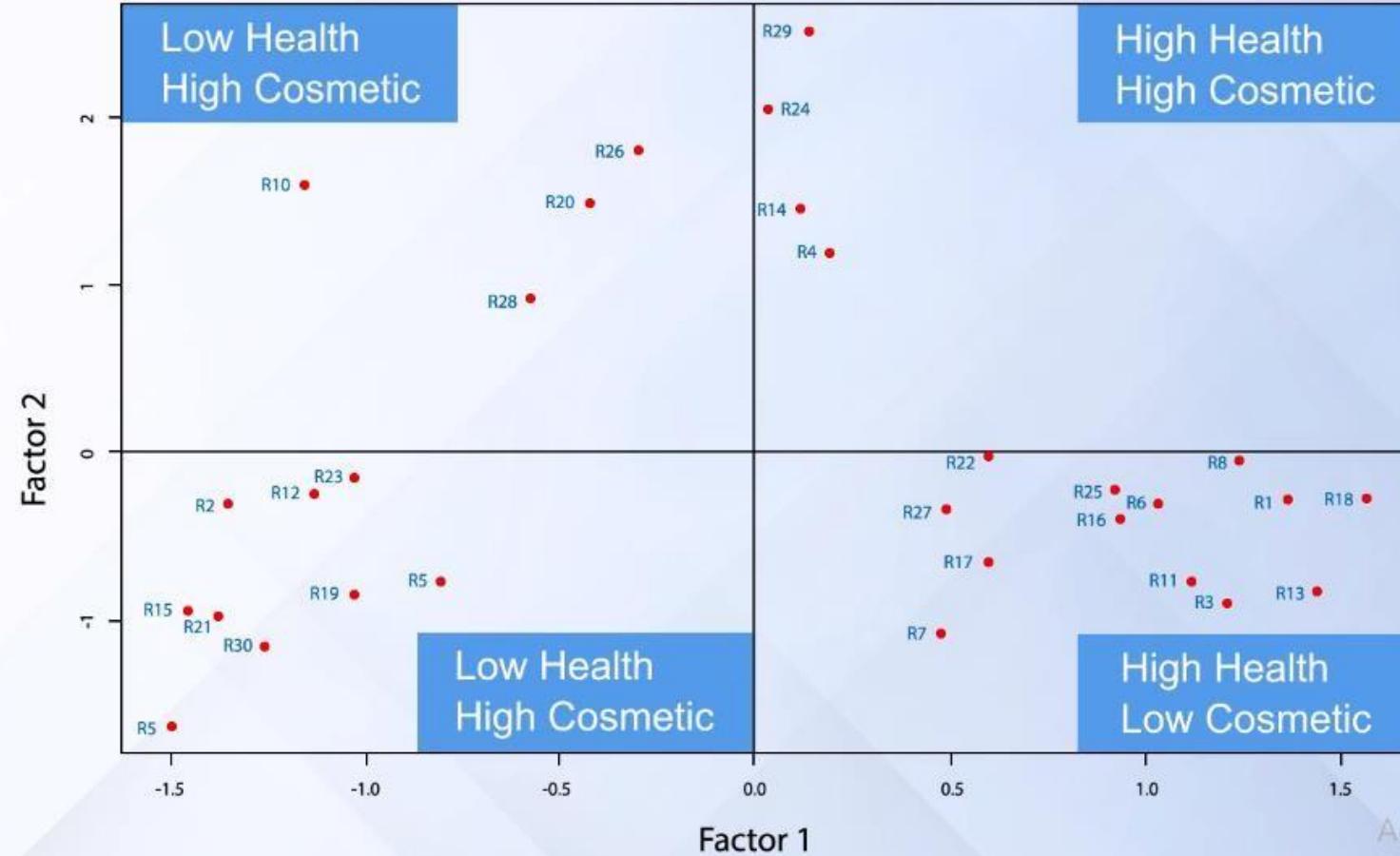
Standardisation of ratings given by the respondents originally

The screenshot shows a software interface with a navigation bar at the top. The 'Scores' tab is selected, indicated by a dotted underline. Below the navigation bar, there are three tabs: 'Factor vs Variables 2', 'Factor vs Users', and 'Data'. A file icon labeled 'x1.csv' is visible. The main content area displays a table with four rows (R1-R4) and two columns (Factor1 and Factor2). The data is as follows:

	Factor1	Factor2
R1	1.36	-0.28
R2	-1.35	-0.31
R3	1.21	-0.89
R4	0.19	1.20

Each respondent has a factor score corresponding to each factor

Example: Plotting Factor Scores

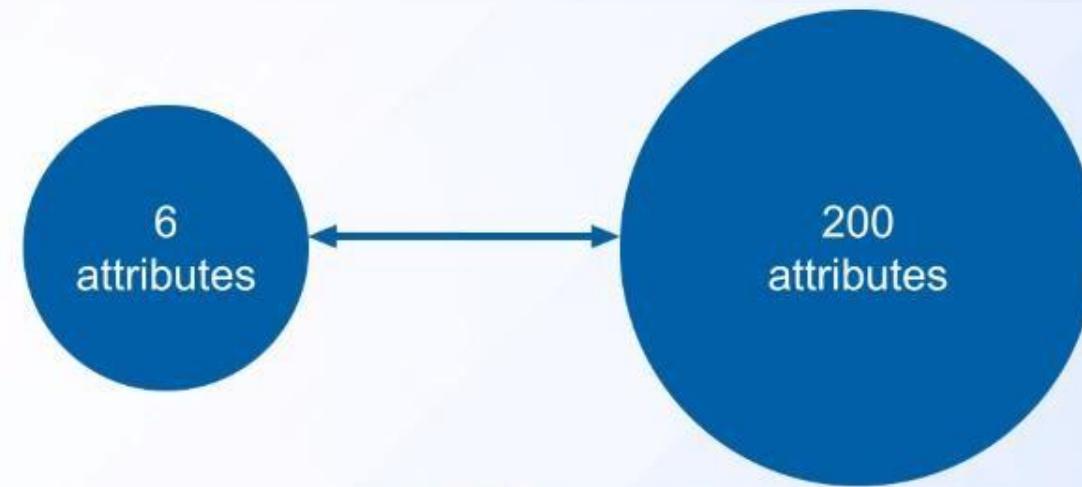


Activ
Go to

Factor App (Other Results of Interest and Summary)

Deciding the Number of Factors

How to decide the number of factors or latent constructs?



Will the **Two Factor Solution** be enough?

Cumulative Variance

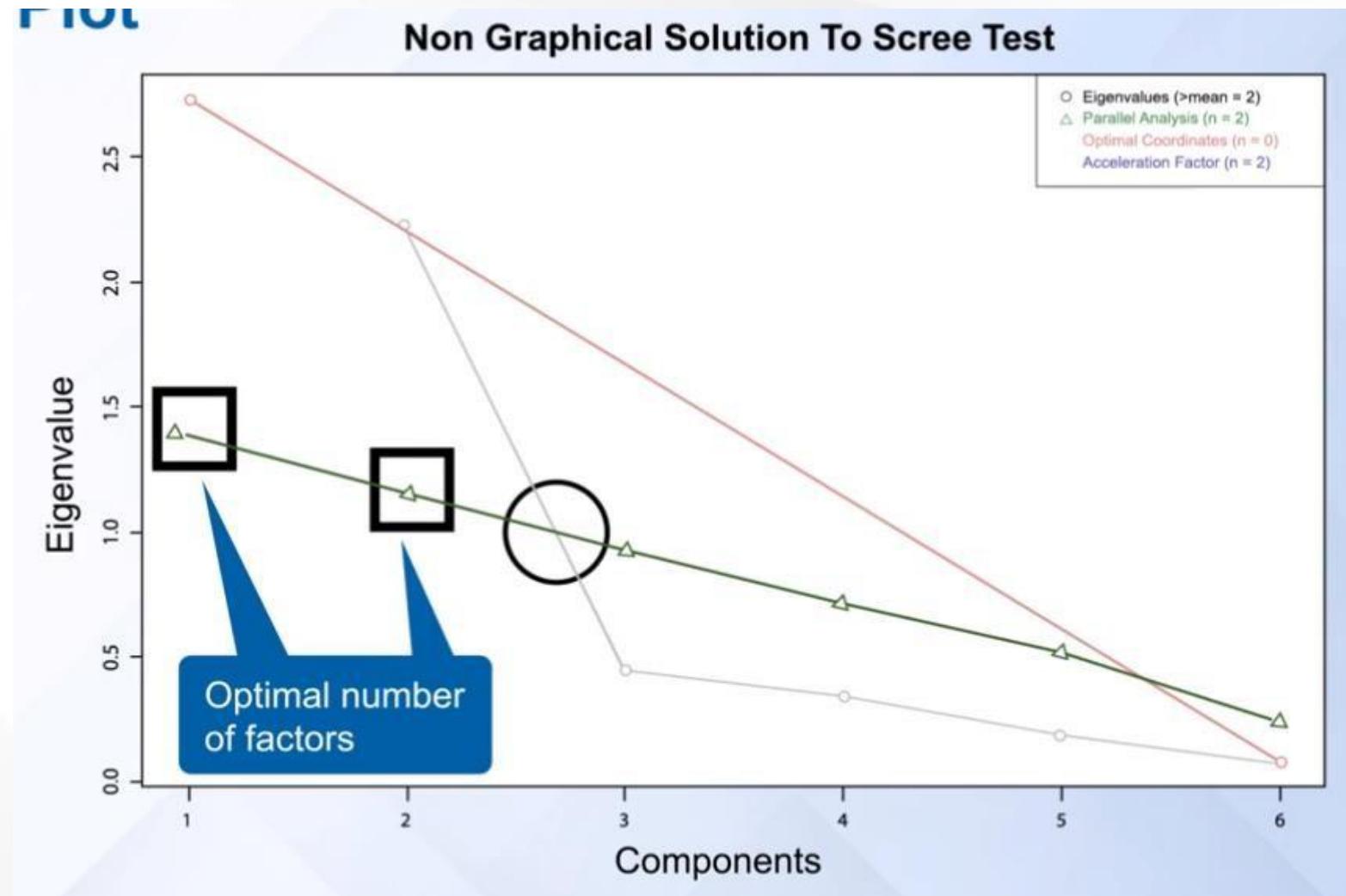


Cumulative Variance



The goal was to reduce the dimensionality
or understand the latent constructs of the
product benefits.

Scree Plot



Compressing the Variables



- A part of the variables cannot be explained.
- Primarily, all the information in the 6 variables is captured through 2 factors.

The Uniqueness Table

01

Factor analysis of each variable is done

03

The Uniqueness Table tells how much information of the original variable is not explained by the Two Factor Solution



02

Two Factor Solution is settled upon

Example: The Uniqueness Table

	Factor1	Factor2
SS loadings	2.54	1.89
Proportion Var	0.42	0.32
Cumulative Var	0.42	0.74

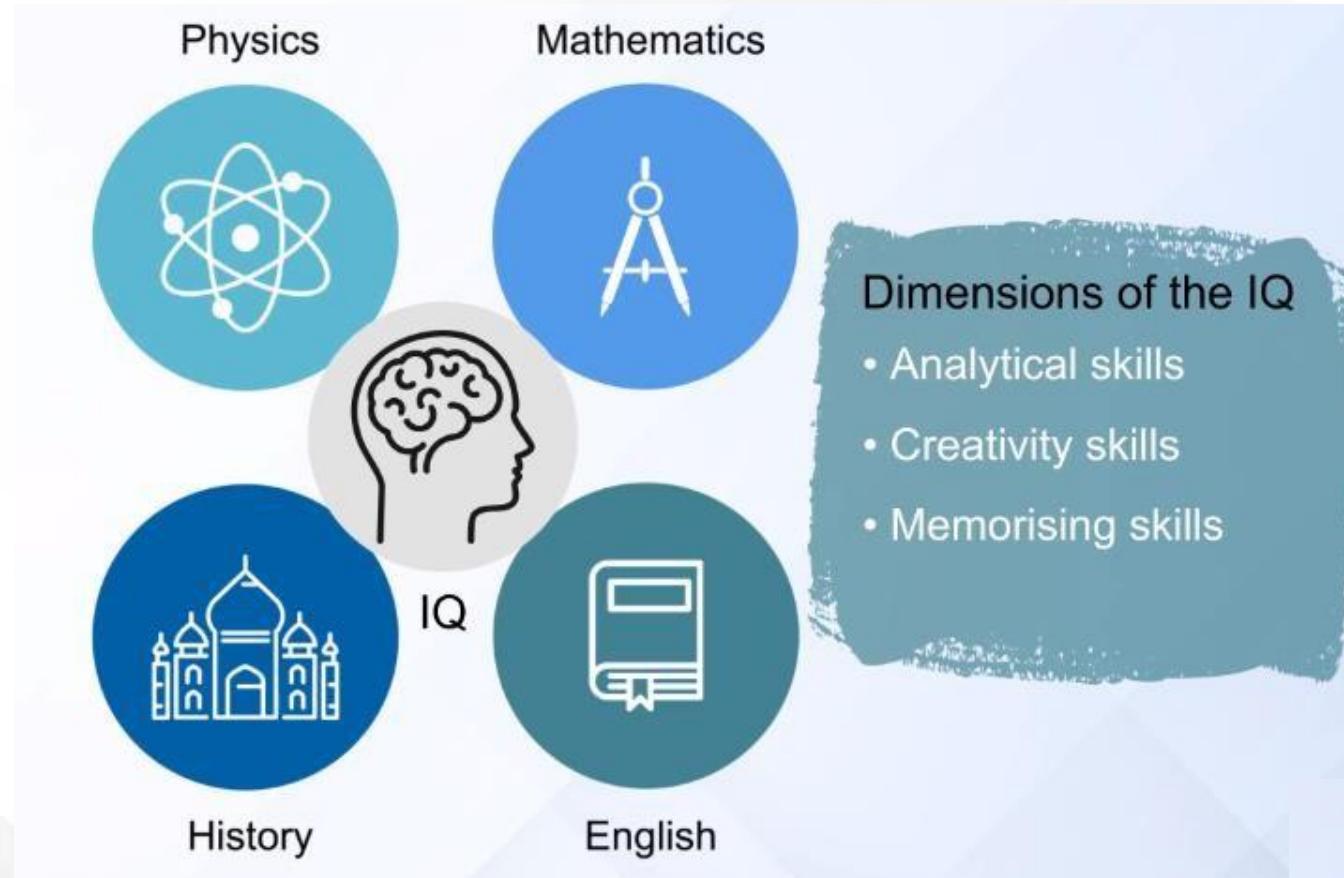
Uniqueness table -	
Variable	Uniqueness
Anti.Cavity	0.06
Whiten.Teeth	0.44
Gum.Strengthen	0.17
Fresh.Breath	0.38
Tooth.Decay	0.21
Fill.Tooth.gaps	0.31

Example: The Uniqueness Table

Variable	Uniqueness
Anti.Cavity	0.06
Whiten.Teeth	0.44
Gum.Strengthen	0.17
Fresh.Breath	0.38
Tooth.Decay	0.21
Fill.Tooth.gaps	0.31

- There are original variables where 90% of the information cannot be captured by the Factor Solution.
- That variable is not correlated with the other variables and should be considered as a factor.

Example: Evaluating Students' Scores



Factor Analysis: Summary



Untangle webs of inter-correlated variables into a *small set of 'clean' factors*.

Reduce data size by shrinking the number of columns (from 6 to 2 here).

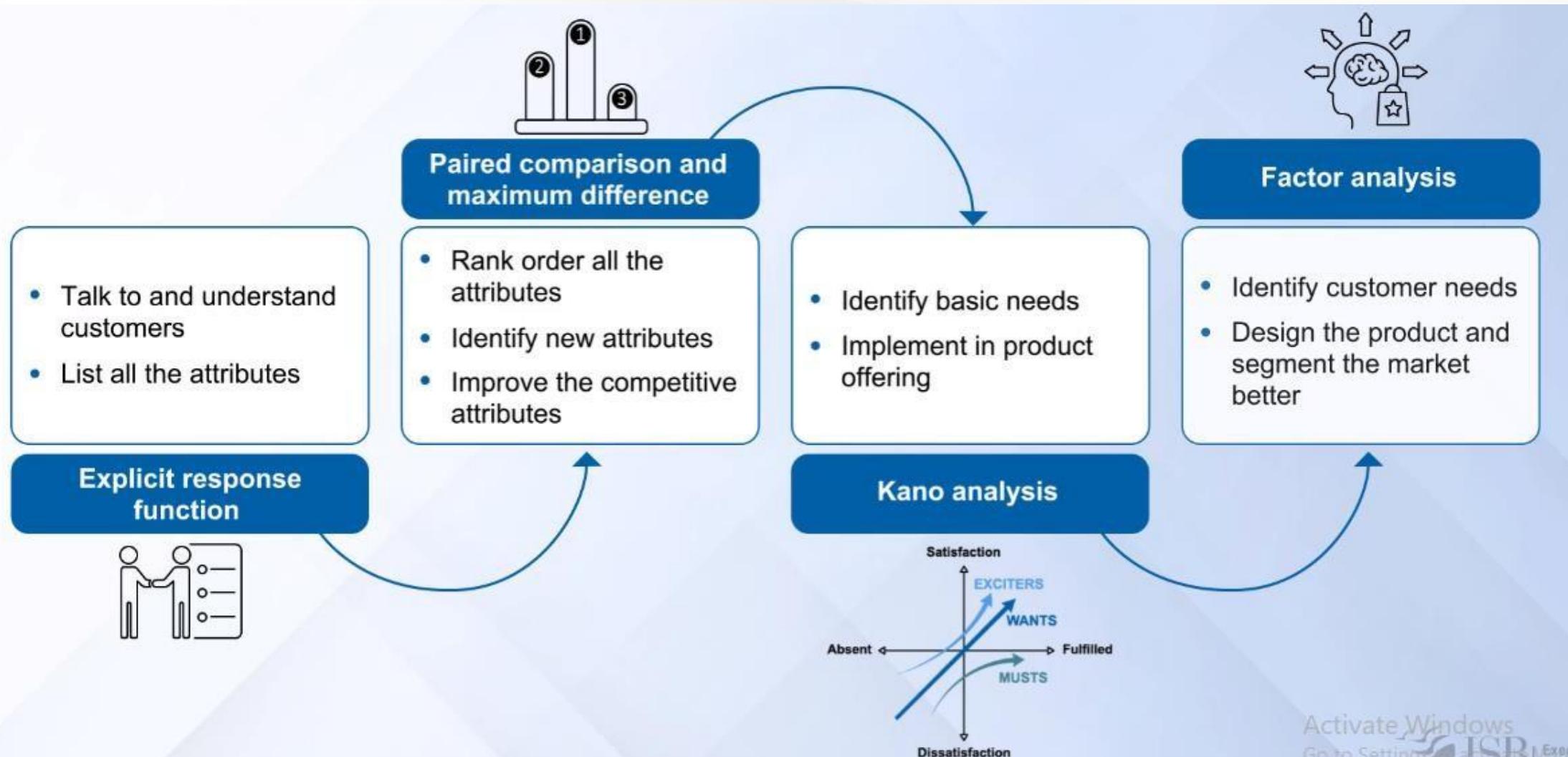
Interpret factors in terms of *variable loadings*.

Obtain factor scores as the values of each observation on each factor.

Use a simple, **menu-driven app interface** to carry out the entire exercise.

Module Summary

Learning Outcomes





ISB | **Executive**
Education