Module 3.1 Customer Satisfaction

Customer Relationship Management

Eric Tham
Institute of Systems Science
National University of Singapore

isstyc@nus.edu.sg

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- **Factors determining customer satisfaction**
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1. Measuring Customer Satisfaction

Customer Satisfaction

- Definition of Satisfaction
  - The results of a comparison between what customer expects from a product or service and the actual performance received.
  - Influenced by customer response to tangible aspects of the product, and intangible perception.
- A customers experience of a product or a service is multifaceted so it may be hard to determine
  - Various components of satisfaction need to be measured individually to get an accurate total picture of customer satisfaction
  - What would the components of satisfaction be?

Components of Customer Satisfaction

You provide value when you deliver the four components that should create customer satisfaction after product delivery

- A perfect *product or service*
- Delivered in a caring, friendly *manner*
- On *time* (as defined by the customer)
- With the backing of an effective *after-sale* process

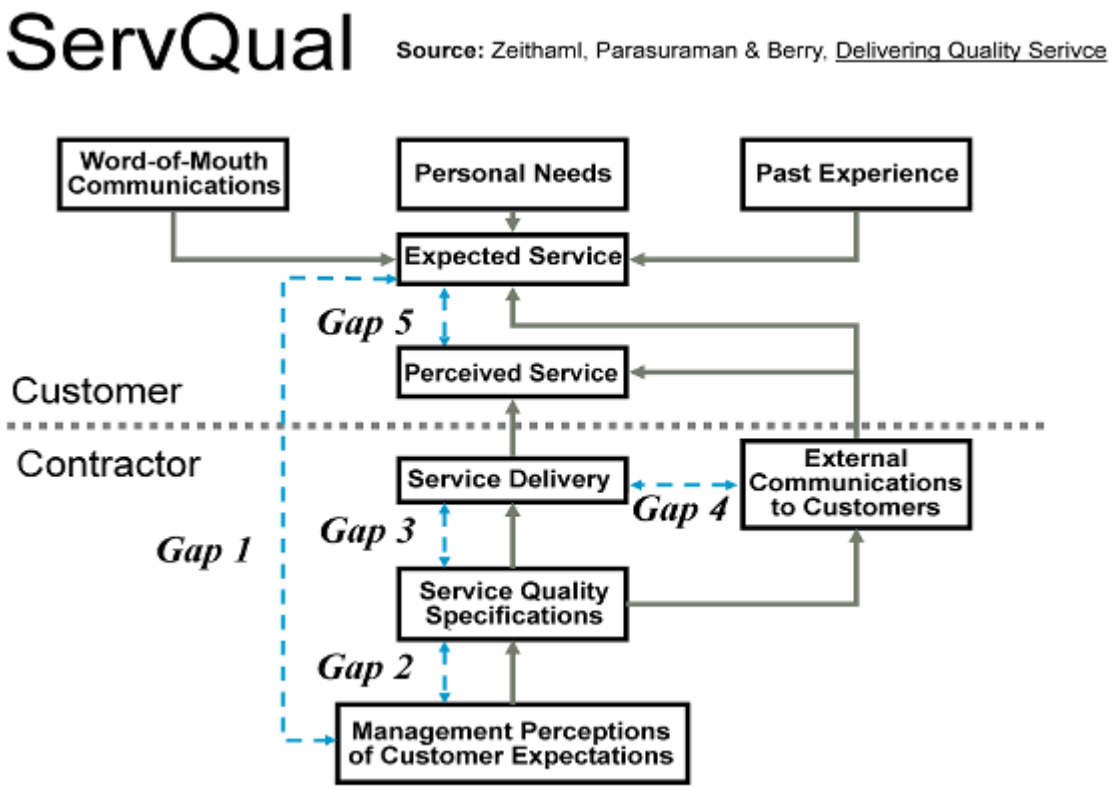
From Micah Solomon" High-tech, High-touch Customer Service"

SERVQUAL Model

- SERVQUAL is a multi-dimensional research instrument, designed to capture consumer expectations and perceptions of a service along the five dimensions that represent service quality.
- SERVQUAL is built on the expectancy-disconfirmation paradigm, which in simple terms means that service quality is understood as the extent to which consumers' pre-consumption expectations of quality are met or not by their service experience.

- The dimensions are:
  - » Reliability: the ability to perform the promised service dependably and accurately
  - » Assurance: the knowledge and courtesy of employees and their ability to convey trust and confidence
  - » Tangibles: the appearance of physical facilities, equipment, personnel and communication materials
  - » Empathy: the provision of caring, individualized attention to customers
  - » Responsiveness: the willingness to help customers and to provide prompt service

The SERVQUAL Model



Gaps in Service

Gap 1 is the difference between what customers expect and what managers think they expect

Gap 2 is the difference between management perception and the actual specification of the customer experience

Gap 3 is the difference from the experience specification to the delivery of the experience

Gap 4 is the difference between the delivery of the customer experience and what is communicated to customers

Gap 5 is the difference between a customer's perception of the experience and the customer's expectation of the service

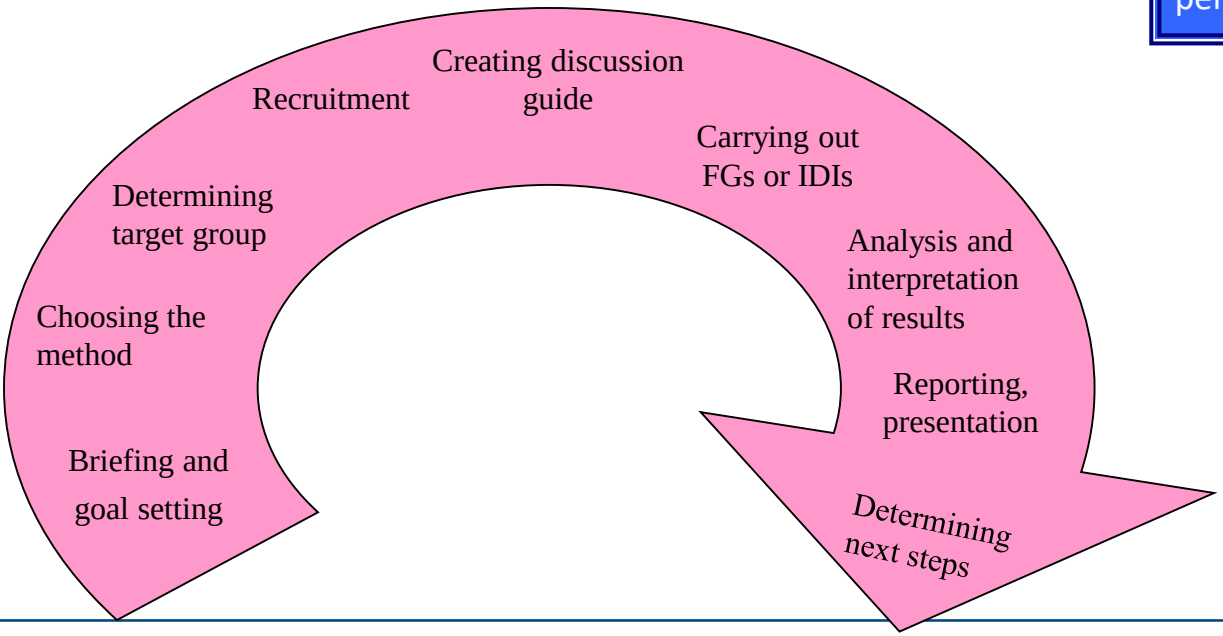
Qualitative Market Research/Surveys

- **The objective of qualitative research is to understand respondents and to find out explanations behind their behaviour, choices and opinions**

- **Common methods are focus groups or in-depth interviews**

- **Offers possibility of digging deeper / in-depth**

FOCUS GROUPS (FGs)
Cost efficient: information gathered simultaneously from 6-10 persons



IN-DEPTH INTERVIEW(IDIs)
Used when it is important to be able to follow the thought path of individuals

Organisation of a Basic Customer Satisfaction Survey

- **This first part of the survey (or the first part of each dimension rating section) will typically have an overall rating question for each major customer service dimension plus one or two related open-end questions at the end of the dimension's section.**

- **Scale and question examples:**
  - **(5 point scale - Excellent, Good, Average, Fair, Poor)**
  - **(5-point scale - Very Satisfied, Satisfied, Neutral/Not Sure, Dissatisfied, Very Dissatisfied)**

- **Example:**
  - **Please rate ABC's customer service overall.**
  - **Overall, how satisfied are you with ABC's customer service?**

- **On a scale of 0-10, How likely would you be to recommend ABC's customer service to a friend (or colleague)?**

How to Design a Survey? – Customer Satisfaction

- **A basic and effective baseline customer satisfaction survey program should focus on measuring customer perceptions. How well does your company deliver on the critical success factors and dimensions of the business as defined by the customer?**

- **For example, is your service prompt and is your staff courteous? How responsive and understanding of the customer's problem are your representatives? The findings of company performance should be analyzed both with all your customers as well as by key segments.**

- **An effective customer satisfaction survey reflects what respondents care about most. Pre-survey interviews with customers to surface and identify the dimensions and factors they consider important ensure that the survey questionnaire does not overlook one or more important areas and specific service details.**

Example: Measuring the results of a survey of Desired Product Qualities

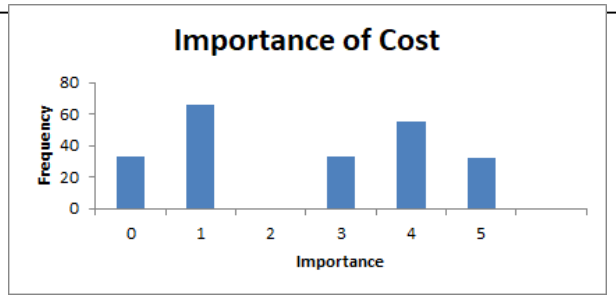
- The Korean firm *SwanSong* are in the process of assessing how the market perceives their new Constellation 100 Mobile, which was launched six months ago
- A group of product owners were surveyed to see how satisfied they were with the Constellation 100 Mobile
- In particular how did they rate the below attributes
- The attributes were
  - Cost
  - Appearance
  - Durability
  - Features
  - After sales support
  - Battery Life
  - Security

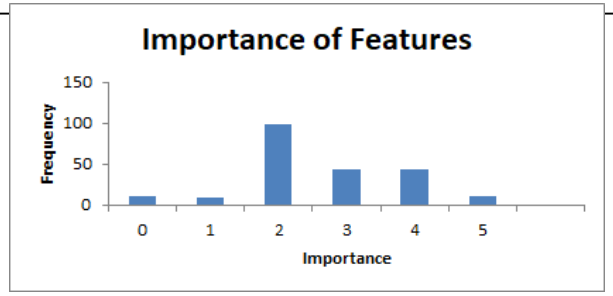
- Respondents were asked to give a score between 0 and 5 to each attribute, where

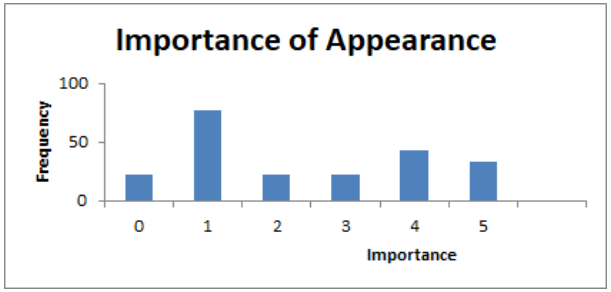
  0 = Highly Unsatisfactory $\Longrightarrow$ 5 = Very Satisfactory

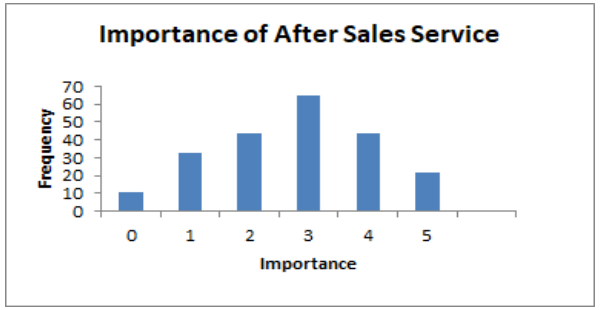
- The data is shown in *Mobile.xls,* and the distribution of the scores is shown overleaf
- It appears that some of these attributes are highly correlated

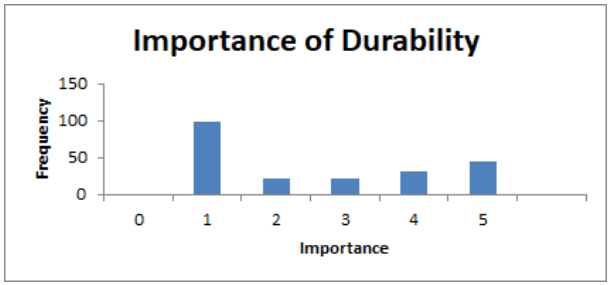
Distribution of Attributes

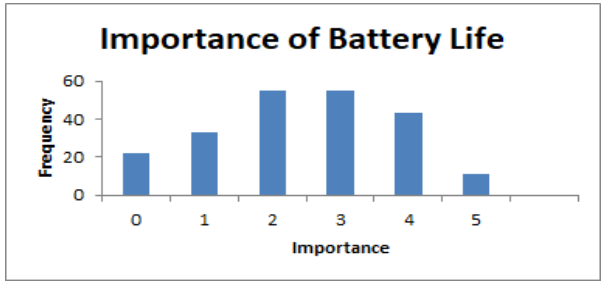


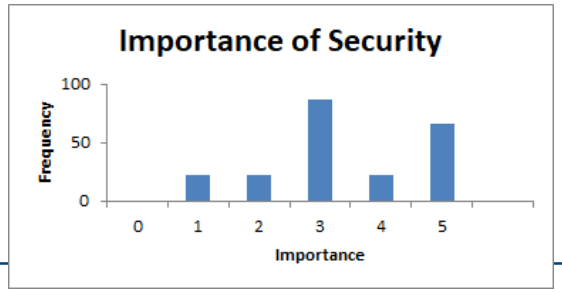












Back to Correlations between Attributes

- As can be seen, some of the satisfaction attributes are highly correlated

Correlations

	cost	Appearance	Features	Security	Affter sales support	Battery Life	Durability
cost	1.0000	0.8526	0.8224	-0.3651	0.0105	-0.0725	-0.0440
Appearance	0.8526	1.0000	0.9227	-0.3793	0.1775	0.0742	-0.0046
Features	0.8224	0.9227	1.0000	-0.4141	0.0402	0.0237	-0.0576
Security	-0.3651	-0.3793	-0.4141	1.0000	-0.3231	-0.4894	-0.3980
Affter sales support	0.0105	0.1775	0.0402	-0.3231	1.0000	0.8873	0.8469
Battery Life	-0.0725	0.0742	0.0237	-0.4894	0.8873	1.0000	0.7583
Durability	-0.0440	-0.0046	-0.0576	-0.3980	0.8469	0.7583	1.0000

Combining Attributes

- The advantage of having several attributes to assess the quality of a specific service is that all features of the service will be covered
- The disadvantage is that assessing, and making decisions based on a large number of attributes will be difficult
  - Also, many of these attributes will be highly correlated with each other
- So there is a need to create combined measures from the individual attributes where
  - These combined measures are few in number (ideally 2 or 3)
  - They are (as far as possible) independent of each other
- **This is called dimensionality reduction. Popular techniques are factor analysis and principal component analysis (PCA).**

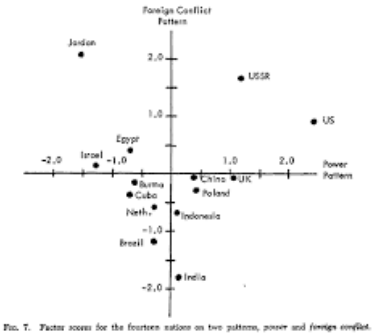
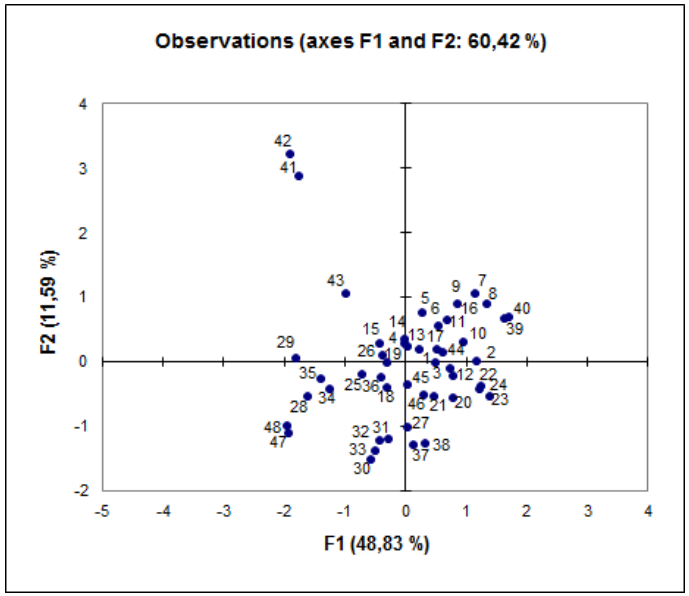


Fig. 7. Factor scores for the fourteen nations on two patterns, power and foreign conflict.

2. Dimensionality Reduction

Benefits of Dimensionality Reduction

- Can create Visual displays that will aid in analysis of customer data and will support decision making
- Will identify which attributes are
  - Closely related to each other, or
  - Independent of each other
  - Are not significant in customer preferences, and can be discarded
- Will allow definition of a smaller set of new attributes that will more easily depict customer behaviour



What is Factor Analysis?

- Textbook definition:
  - Factor analysis is a method of dimension reduction.
  - The key factor is the causes of customer satisfaction are due to underlying latent factors, which manifests themselves in the satisfaction (observables) survey.

- Factor Analysis takes the observable variables together, and try to unearth the underlying factors through looking at the importance (loadings) of each factor and correlations.

Underlying Theory of Factor Analysis

- Consider observable variables $X_1, X_2, \ldots X_p$ in some experiments or survey
- We want to replace this with new set of factors - $F = (F_1, F_2, \ldots F_p)$ which are
  - Linear combinations of $X_1, X_2, \ldots X_p$
  - But uncorrelated with one another
  - The variances of successive factors is decreasing , i.e.

$$V(F_1) > V(F_2) > V(F_3) > \ldots\ldots\ldots V(F_p)$$

- Communality is the variance in observed variables accounted for by common factors.
- Factor loadings λ represent how much a factor explains a variable in factor analysis (>0.5)

Underlying Theory of Factor Analysis

Mathematics behind factor analysis:

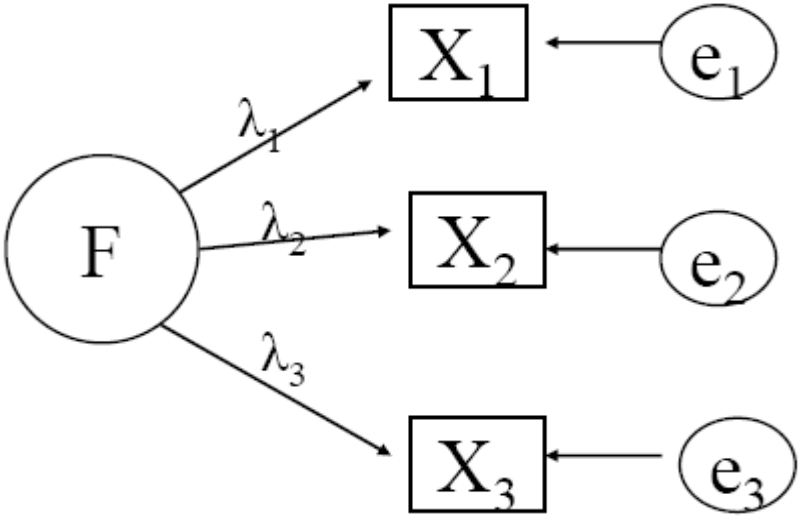
$$\begin{aligned} x_i &= \lambda_{i1}F_1 + \ldots + \lambda_{in}F_n + \epsilon_i \\ &\vdots \\ x_n &= \lambda_n F_1 + \ldots + \lambda_{nn}F_n + \epsilon_n \end{aligned}$$

Or in matrix form. For n x's variables, there will be n factors maximum.

$$x = LF + \epsilon$$

Conceptual Model

F: Latent variables qualities that you cannot measure directly.



X_j: Observed variables qualities that you can measure directly.

- X's are only related to each other through their common relationship with F.
- A factor consist of relatively homogeneous variables.

Underlying Theory of Factor Analysis

Assumptions:

- F and ε are independent
- E[F]=0
- Cov(F) = I (normalised to 1)

Hence, L → loading matrix.

The factors can be correlated or uncorrelated with one another (thence the rotation and arbitrary (later…)).

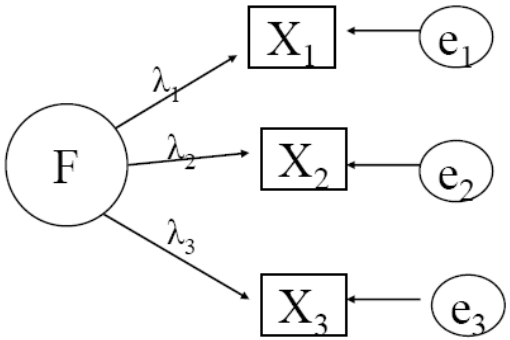
Communalities

- The communality of an observed variable X_j is the proportion of the variance of X_j explained by the m common factors by their loadings λ:

$$Comm(X_j) = \sum_{i=1}^{m} \lambda_{ij}^2$$

- In other words, it can be thought of as the sum of squared multiple-correlation coefficients between the X_i and the factors.

- Uniqueness(X_j) = 1 - Comm(X_j)



Communality of X_j

- "Common" part of variance
  - covariance between X_j and the part of X_j due to the underlying factors
  - For X_j :
    - » Var(X) = Var(F) + Var(e)
    - » Var(X) = Communality + Uniqueness
    - » Communality ≈ Var(F)
    - » Uniqueness ≈ Var(e)

- If X_j is informative, communality is high
- If X_j is not informative, uniqueness is high

- Intuitively, variables with high communality share more in common with the rest of the variables.

Interpretation of Communalities

- High communalities (> .5): Extracted factors explain most of the variance in the X variables being analysed

- Low communalities (< .5): X's variable has considerable variance unexplained by the extracted factors
  - May then need to extract MORE factors to explain the variance or remove these items

Explained variance

- Communality is about the X variables while explained variance is on the factors themselves. A good factor solution is one that explains the most variance with the fewest factors.

- Realistically, researchers are happy with 50-75% of the variance explained.

Steps in Factor Analysis

- Factor analysis usually proceeds in four steps:
  - 1st Step: the **correlation matrix** for all variables is computed
    - » Observe variables most correlated with each other
  - 2nd Step: Factor **extraction**
    - » Determine linear combinations of variables to explain the most variance.
    - » Use scree plot, % variance explained.
    - » Select / de-select factor

"Factor Analysis" Dr. Maher Khelif

Steps in Factor Analysis

- 3rd Step: Factor **rotation**
  - » Modify the linear combinations so that each combination contains as few possible original variables as possible

- 4th Step: Make final decisions about the number of underlying factors
  - » Determine the factors to explain a significant amount of the variance
  - » Compute the composite scores.
  - » Try to 'interpret' the factors. In CRM, do they account for a particular type of customer service? Location? Product features?

"Factor Analysis" Dr. Maher Khelif

PCA (Principal Component Analysis)

- PCA does an eigenvalue decomposition of the correlation matrix into independent eigenvectors.

- Eigenvectors are similar to factor loadings.
  - (for assessment purpose, the factor loadings will be given without need to know the PCA mechanism)

- These eigenvectors comprises composite variables called principal components.

- The variance explained by each eigenvectors is their eigenvalues (EVs). The sum of eigenvalues sum to the no of X's variables.

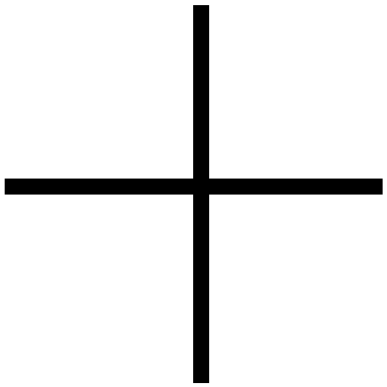
Factor Analysis vs Principal Components Analysis

Factor Analysis	PCA
• Both are dimension reduction techniques. • Both start by looking at the correlation matrix but are conceptually different.	
Does so through a eigenvalue analysis of correlation and a search and rotate of 'conceivable' variables	Does so through maximising variance sequentially.
Variables are reflective. Reflective in the sense that it reflects the underlying causes.	Variables are formative. Forms from wanting to explain the variance amongst the X's.

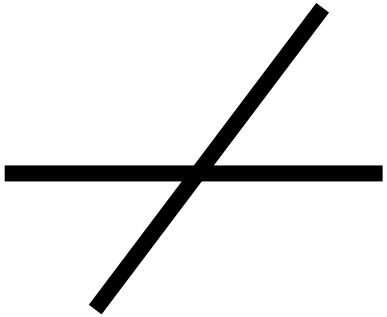
Number of factors selection

- Depicts amount of variance explained by each factor.
- Cut-off: point of additional factors fail to add appreciably to the cumulative explained variance.
- De-select factors with EV<1. 'Kaiser' criterion

Rotating factors



Orthogonal (Varimax)
minimises factor covariation, produces factors which are uncorrelated



Oblique (Oblimin)
allows factors to covary, allows correlations between factors

Interpreting the factors

- A factor structure is most interpretable when:
  - A set of variables loads strongly (> +.40) on one factor.
  - Look at this set of variables – what do they represent?

    Eg. camera resolution, camera display, camera focus… these have a *common underlying factor*…
  - Loadings across X's variables are either high or low, few intermediate values, giving rise to a 'distinctive' factor structure.

Advantages and Disadvantages of Factor Analysis

- Advantages
  - Reduction of dataset to a (hopefully) smaller set of uncorrelated variables
    - » Removal of irrelevant or repeated data
  - Easier to visualize the data and relationships between the data
  - Easier to fit models that relate the dataset to some other response variable
  - Deeper understanding of the relative importance of the variables that comprise a dataset
- Disadvantages
  - Not an exact statistical technique – there is no accepted way to say what the “best “ factor analysis is
  - It can be heuristic
    - » There are a number of rotation methods (Varimax, Oblique)
    - » No strong rule on the number of factors to extract;
      - However we can use devices like scree plots

3. Practical Case Study

Car Rating Attributes

- A survey has been conducted on the satisfaction of motorists who purchased a car in the last twenty four months
- In this survey the respondents were asked to rate the attribute on a sliding scale between 10 and 1 , where
  10 =Excellent;…… 1 =Awful
- The ratings were for
  - The Warranty/Support arrangements
  - The utility of the Finance Plan agreed to purchase the car
  - The Size of the car i.e. the number of passengers it could take
  - The car Power/maximum acceleration
  - The quality of the car safety features
  - The car economical performance (i.e. the mpg)
  - The ongoing through life costs of the car
  - The car appearance
  - The utility of the Sun Roof (if the car had one)

- The data is stored in Car ratings. xls
- Analyze this data and determine whether the attributes above can be represented by a smaller number of factors?
  - Also can you **interpret** these factors; i.e. are they combinations of similar attributes?

CRM in Excel Sheet

Refer to excel sheet Day 3 –CRM satisfaction factor analysis.xls

CRM in Excel Sheet: Qns

- How much is explained by the first factor?
- What is the communality of the X's variables?
- What is the significance of the first, 2nd … original factor?
- By doing an oblique rotation such that the correlations are reduced, the factors are better 'enhanced'. What do they correspond to now?

Business Conclusions

- The most important factor for customer satisfaction is the first factor which accounts almost 30% of the 'satisfaction'. This first factor is primarily proxied by Warranty/Support.

- The second factor which together contribute 21% of customer satisfaction is formed through a composite of size and fuel economy (mpg). . Notice that this factor can be perceived as customer's concern on fuel usage.

- The 3rd factor is safety which constitutes 19% of customer satisfaction.

If warranty/ support, fuel usage and safety are well taken care of, the company can be certain of customer satisfaction most of the time.

Sentiment Analysis in CRM

- **Next change! New Media and Sentiment Mining!**
- Uses sentiment analysis on customers' comments to gauge satisfaction.
- Also use aspects and topic mining to extract attributes the customers are talking about.
- Can be used in conjunction with CRM + factor analysis.