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CERTIFICATION COURSE

# Project Management for Managers

Lec – 12

Methods of Project Selection (MCDM – III)

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# Solve by TOPSIS

## Fighter Aircraft Selection

	Speed	Range	Payload	Cost	Reliability	Maneuverability
	X1	X2	X3	X4	X5	X6
A1	2	1500	20000	5.5	5	9
A2	2.5	2700	18000	6.5	3	5
A3	1.8	2000	21000	4.5	7	7
A4	2.2	1800	20000	5.5	5	5



# Data available

	Speed	Range	Pay load	Cost	Reliability	Maneuverability
	X1	X2	X3	X4	X5	X6
A1	2	1500	20,000	5.5	5	9
A2	2.5	2700	18,000	6.5	3	5
A3	1.8	2000	21,000	4.5	7	7
A4	2.2	1800	20,000	5	5	5

m = 4 alternatives ( Aircraft models)

n = 6 attributes/criteria



# Step 1: Obtain the decision matrix

- In-order to make calculations easier, replace the higher values with its equivalent power

	Speed	Range( $\times 10^3$ )	Pay load ( $\times 10^4$ )	Cost	Reliability	Maneuverability
	X1	X2	X3	X4	X5	X6
A1	2.0	1.5	2.0	5.5	5	9
A2	2.5	2.7	1.8	6.5	3	5
A3	1.8	2.0	2.1	4.5	7	7
A4	2.2	1.8	2.0	5.0	5	5



$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}$$

Step 1(a): calculate  $(\sum x_{ij}^2)^{1/2}$  for each column

	X1	X2	X3	X4	X5	X6
A1	4.0	2.25	4.0	30.25	25	81
A2	6.25	7.29	3.2	42.25	9	25
A3	3.24	4.0	4.4	20.25	49	49
A4	4.84	3.24	4.0	25.0	25	25
$\sum x_{ij}^2$	18.33	16.78	15.65	117.75	108.00	180.00
$(\sum x_{ij}^2)^{1/2}$	4.28	4.096	3.956	10.851	10.392	13.416



Step 1 (b): divide each column by  
 $(\sum x_{ij}^2)^{1/2}$  to get  $R_{ij}$

	X1	X2	X3	X4	X5	X6
A1	0.4672	0.3662	0.5056	0.5063	0.4811	0.6708
A2	0.5839	0.6591	0.4550	0.5983	0.2887	0.3727
A3	0.4204	0.4882	0.5308	0.4143	0.6736	0.5217
A4	0.5139	0.4392	0.5056	0.4603	0.4811	0.3727



**Step 2 : Obtain the weighted decision matrix  $V_{ij}$  by multiplying each column of  $R_{ij}$  by the corresponding weight**

$$V_{ij} = W_{ij} \times R_{ij}$$

Weight	0.2	0.1	0.1	0.1	0.2	0.3
	X1	X2	X3	X4	X5	X6
A1	0.0934	0.0366	0.0506	0.0506	0.0962	0.2012
A2	0.1168	0.0659	0.0455	0.0598	0.0577	0.1118
A3	0.0841	0.0488	0.0531	0.0414	0.1347	0.1565
A4	0.1028	0.0439	0.0506	0.046	0.0962	0.1118



# Ideal and Negative Ideal solution

- Step 3: Obtain the ideal ( $A^*$ ) and the negative ideal ( $A^-$ ) solutions from the weighted decision matrix  $V$ .

	X1	X2	X3	X4	X5	X6
A1	0.0934	<b>0.0366</b>	0.0506	0.0506	0.0962	<b>0.2012</b>
A2	<b>0.1168</b>	<b>0.0659</b>	<b>0.0455</b>	<b>0.0598</b>	<b>0.0577</b>	<b>0.1118</b>
A3	<b>0.0841</b>	0.0488	<b>0.0531</b>	<b>0.0414</b>	<b>0.1347</b>	0.1565
A4	0.1028	0.0439	0.0506	0.046	0.0962	0.1118

- $A^* = (0.1168, 0.0659, 0.0531, 0.0414, 0.1347, 0.2012)$
- $A^- = (0.0841, 0.0366, 0.0455, 0.0598, 0.0577, 0.1118)$





## Step 4 : Separation Measures

Determine **separation** from ideal solution

$$A^* = (0.1168, 0.0659, 0.0531, 0.0414, 0.1347, 0.2012)$$

$$S_i^* = [ \sum (v_i^* - v_{ij})^2 ]^{1/2} \text{ for each row}$$

Ideal solution	Ideal solution
$S1^* = 0.0545$	$S1^- = 0.0983$
$S2^* = 0.1197$	$S2^- = 0.0439$
$S3^* = 0.0580$	$S3^- = 0.0920$
$S4^* = 0.1009$	$S4^- = 0.0458$



## Step 5: Relative closeness to the Ideal Solution

For each alternative, calculate the relative closeness to the ideal solution

$$C_i^* = S'_i / (S_i^* + S'_i)$$

$S'_i / (S_i^* + S'_i)$	$C_i^*$	← <b>BEST</b>
0.0983/(0.0545+0.0983)	<b>0.6433</b>	
0.0439/(0.1197+0.0439)	<b>0.2683</b>	
0.092/(0.058+0.092)	<b>0.6133</b>	
0.0458/(0.1009+0.0458)	<b>0.3122</b>	

# Ranking/Preference Order

**NOTE : The closeness rating is a number between 0 and 1, with 0 being the worst possible and 1 the best possible solution)**

Thus the ranks for the alternatives in the fighter aircraft selection problem using TOPSIS as

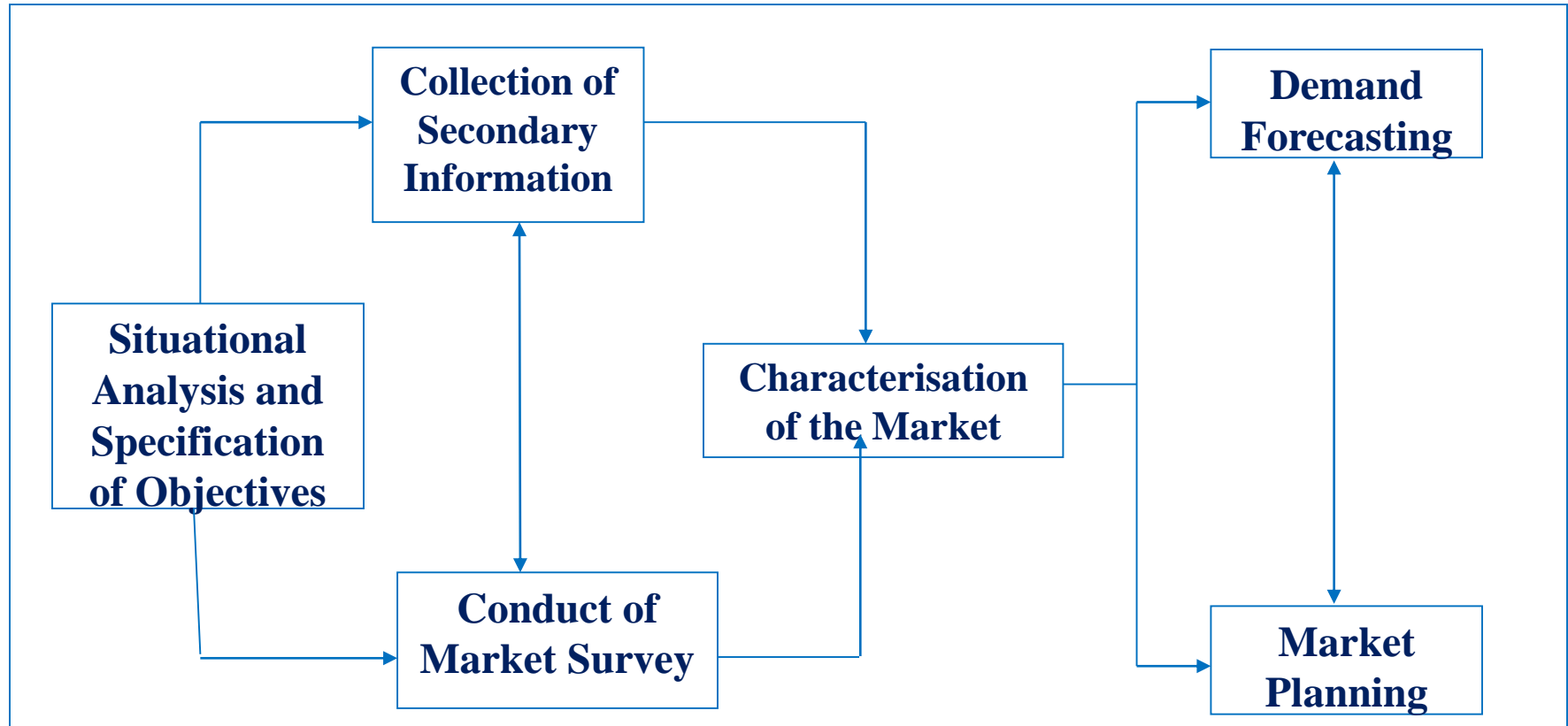
**A1, A3, A4, A2**



# Market and Demand Analysis



# *Key Steps in Market and Demand Analysis and their Inter-relationships*



# Situational Analysis

In order to get a “feel” of the relationship between the product and its market, the project analyst may informally talk to customers, competitors, middlemen, and others in the industry.

Wherever possible, he may look at the experience of the company to learn about the preferences and purchasing power of customers, actions and strategies of competitors, and practices of the middlemen.



# Collection of Secondary Information

- Secondary information is information that has been gathered in some other context and is readily available.
- Secondary information provides the base and the starting point for the market and demand analysis. It indicates what is known and often provides leads and cues for gathering primary information required for further analysis.



# Sources of secondary data??????????





# Evaluation of Secondary Information

Criteria	Issues	Remarks
Specifications & Methodology	Data collection method, response rate, quality & analysis of data, sampling technique & size, questionnaire design, fieldwork.	Data should be reliable, valid, & generalizable to the problem.
Error & Accuracy	Examine errors in approach, research design, sampling, data collection & analysis, & reporting.	Assess accuracy by comparing data from different sources.
Currency	Time lag between collection & publication, frequency of updates.	Census data are updated by syndicated firms.
Objective	Why were the data collected?	The objective determines the relevance of data.
Nature	Definition of key variables, units of measurement, categories used, relationships examined	Reconfigure the data to increase their usefulness.
Dependability	Expertise, credibility, reputation, & trustworthiness of the source.	Data should be obtained from an original source.



# Evaluation of Secondary Information

While secondary information is available economically and readily (provided the market analyst is able to locate it), its reliability, accuracy, and relevance for the purpose under consideration must be carefully examined.



# Market Survey

- Secondary information, though useful, often does not provide a comprehensive basis for market and demand analysis.
- It needs to be supplemented with primary information gathered through a market survey.
- The market survey may be a census survey or a sample survey; typically it is the latter.



# What Information is Sought in a Market Survey?????



## Information Sought in a Market Survey

The information sought in a market survey may relate to one or more of the following:

- Total demand and rate of growth of demand
- Demand in different segments of the market
- Income and price elasticities of demand
- Motives for buying
- Purchasing plans and intentions
- Satisfaction with existing products
- Unsatisfied needs
- Attitudes toward various products
- Distributive trade practices and preferences
- Socio-economic characteristics of buyers



# Steps in a Sample Survey

Typically, a sample survey involves the following steps:

1. Define the target population (elements, sampling unit, extent,time: Men's DO).
2. Select the sampling scheme and sample size.
3. Develop the questionnaire.
4. Recruit and train the field investigators.
5. Obtain information as per the questionnaire from the sample of respondents.
6. Scrutinize the information gathered.
7. Analyze and interpret the information.



## Characterization of the Market

Based on the information gathered from secondary sources and through the market survey, the market for the product/service may be described in terms of the following:

- Effective demand in the past and present
- Breakdown of demand
- Price
- Methods of distribution and sales promotion
- Consumers
- Supply and competition
- Government policy

