

Artificial Intelligence

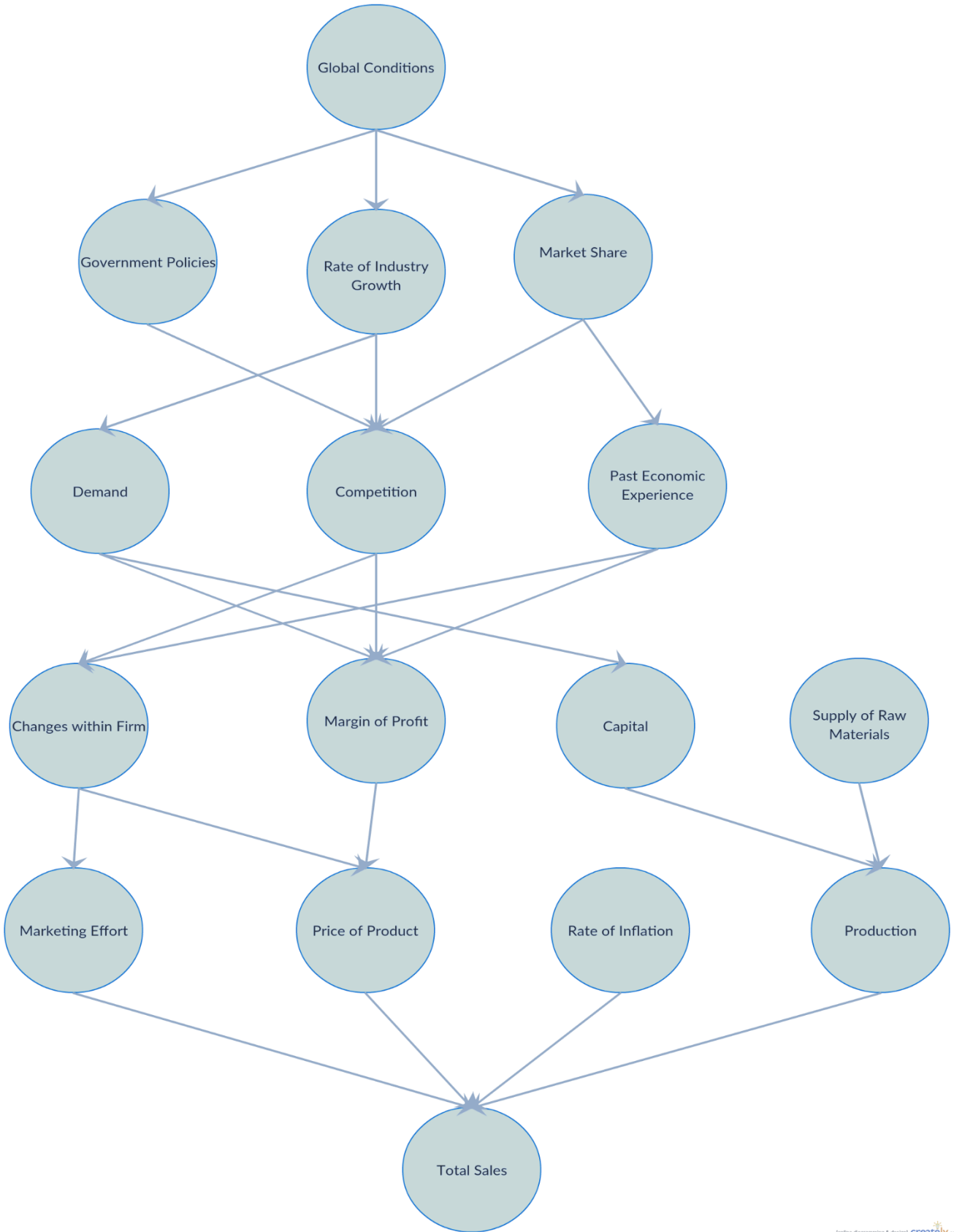
Assignment-3

Topic 7

Business Sales Predication

Tirth Maniar | 201501051

Krishn Bera | 201556009



Key:

GC	Global Conditions	Favourable, Not Favourable
GP	Government Policies	Favourable, Not Favourable
RG	Rate of growth in our industry	High, Low
MS	Market share within that sector	High, Low
D	Demand	High, Medium, Low
C	Competition	High, Medium, Low
PEE	Past Economic Experience	High, Low
CF	Changes within firm	High, Low
MP	Margin of Profit	High, Low
Cpt	Capital	More, Medium, Less
S	Supply of raw materials	Enough, Not enough
ME	Marketing Effort	High, Low
PP	Price of Product	High, Medium, Low
I	Rate of Inflation	High, Low
P	Production	High, Medium, Low
TS	Total Sales	High, Low

Conditional Probability Tables:

Global Conditions

GC	Favourable	Not Favourable
P(GC)	0.5	0.5

Government Policies

GC	GP.Favourable	GP.Not Favourable
Favourable	0.75	0.25
Not Favourable	0.25	0.75

Rate of Growth

GC	RG.High	RG.Low
Favourable	0.75	0.25
Not Favourable	0.25	0.75

Market Share

GC	MS.High	MS.Low
Favourable	0.75	0.25
Not Favourable	0.25	0.75

Demand

RG	D.High	D.Medium	D.Low
High	0.45	0.35	0.2
Low	0.2	0.35	0.45

Competition

GP	RG	MS	C.High	C.Medium	C.Low
Favourable	High	High	0.8	0.15	0.05
Favourable	High	Low	0.5	0.35	0.15
Favourable	Low	High	0.6	0.3	0.1
Favourable	Low	Low	0.25	0.45	0.3
Not-Favourable	High	High	0.3	0.45	0.25
Not-Favourable	High	Low	0.1	0.3	0.6
Not-Favourable	Low	High	0.15	0.35	0.5
Not-Favourable	Low	Low	0.05	0.15	0.8

Past Economic Experience

MS	PEE.High	PEE.Low
High	0.8	0.2

Low	0.2	0.8
-----	-----	-----

Changes Within Firm

C	PEE	CF.High	CF.Low
High	High	0.6	0.4
Medium	High	0.4	0.6
Low	High	0.2	0.8
High	Low	0.8	0.2
Medium	Low	0.6	0.4
Low	Low	0.4	0.6

Margin Of Profit

D	C	PEE	MP.High	MP.Low
High	High	High	0.4	0.6
Medium	High	High	0.3	0.7
Low	High	High	0.2	0.8
High	High	Low	0.5	0.5
Medium	High	Low	0.3	0.7
Low	High	Low	0.1	0.9
High	Medium	High	0.6	0.4
Medium	Medium	High	0.4	0.6
Low	Medium	High	0.2	0.8
High	Medium	Low	0.8	0.2
Medium	Medium	Low	0.6	0.4
Low	Medium	Low	0.4	0.6
High	Low	High	0.9	0.1
Medium	Low	High	0.7	0.3
Low	Low	High	0.5	0.5
High	Low	Low	0.8	0.2
Medium	Low	Low	0.7	0.3
Low	Low	Low	0.6	0.4

Capital

D	Cpt.High	Cpt.Medium	Cpt.Low
High	0.6	0.3	0.1
Medium	0.3	0.4	0.3
Low	0.1	0.3	0.6

Supply of Raw Materials

S	Enough	Not Enough
P(S)	0.5	0.5

Production

Cpt	S	P.High	P.Low
High	Enough	0.8	0.2
Medium	Enough	0.6	0.4
Low	Enough	0.4	0.6
High	Not Enough	0.6	0.4
Medium	Not Enough	0.4	0.6
Low	Not Enough	0.2	0.8

Rate of Inflation

I	High	Low
P(I)	0.5	0.5

Price of Product

CF	MP	PP.High	PP.Medium	PP.Low
High	High	0.7	0.2	0.1
High	Low	0.5	0.3	0.2
Low	High	0.3	0.5	0.2
Low	Low	0.1	0.2	0.7

Marketing Effort

CF	ME.High	ME.Low
High	0.3	0.7
Low	0.7	0.3

Total Sales

ME	PP	RI	P	TS.High	TS.Low
High	High	High	High	0.3	0.7
Low	Medium	High	High	0.4	0.6
High	Low	High	High	0.7	0.3
Low	High	High	High	0.1	0.9
High	Medium	High	High	0.7	0.3
Low	Low	High	High	0.3	0.7
High	High	Low	High	0.5	0.5

Low	Medium	Low	High	0.6	0.4
High	Low	Low	High	0.9	0.1
Low	High	Low	High	0.3	0.7
High	Medium	Low	High	0.7	0.3
Low	Low	Low	High	0.7	0.3
High	High	High	Low	0.2	0.8
Low	Medium	High	Low	0.3	0.7
High	Low	High	Low	0.6	0.4
Low	High	High	Low	0.05	0.95
High	Medium	High	Low	0.6	0.4
Low	Low	High	Low	0.2	0.8
High	High	Low	Low	0.4	0.6
Low	Medium	Low	Low	0.5	0.5
High	Low	Low	Low	0.8	0.2
Low	High	Low	Low	0.2	0.8
High	Medium	Low	Low	0.6	0.4
Low	Low	Low	Low	0.6	0.4

Justification

- If Global Conditions are favourable then government has no impact due to global reasons hence Government Policies should also be favourable (Less tax, etc).
- If Global Conditions are favourable then industry has no impact due to global reasons hence industry should grow at faster pace.
- If Global Conditions are favourable then sector of industry gets a lot of benefit at global level and due to globalization Market Share of this sector should also increase in this sector.
- If our industry is growing at faster pace than demand for this industry and products should also increase. (Eg: Current IT industry)
- If government policies are favourable then a lot of people will invest in this which will create a good competition.
- If rate of growth in this industry then a lot of people going with the flow will start their own industry and creates heavy competition.
- If market share in this sector is high then relatively with respect to other sectors there should be high competition.
- If market share is high in this sector then there are a lot of industries from which we can get their Past Experience.

- Changes within firm depends on how tough is the competition. For eg: If our competitors release a new product and takes a lot of market we should make some change in our firm.
- Changes within firm also depends on Past Economic Experience which help us guide to how our firm should behave in different conditions.
- If there is high demand for product than we will keep high margin of profit for more benefit.
- If there is high competition than to remain in market we should keep less margin of profit.
- From past economic experience we can also learn that initially if we keep less margin of profit than once settled in market we can slowly increase the margin of profit.
- Higher the demand for product we should try to invest more and increase the capital for our firm.
- Changes in the firm decides on major issues like marketing efforts, price of product. We can do less marketing if there are less competitors and high demand.
- If we have decided to have high margin of profit than automatically our price of product will increase.
- Changes in firm decides on how much price of product should be kept. If there are less competitors and high demand we can take advantage of situation and keep high price of product.
- If we have high capital and good supply of raw materials than we can produce a lot of goods and hence high production.
- If we have done high marketing effort than our sales will also increase.
- If price for our product is high than less customers would buy thinking of worth for money. Hence our sales may decrease.
- If Inflation is going in our industry than obviously our sales will also decrease.
- If our production of goods is greater than demand we could sale a lot of goods. Hence total sales will increase.
- Hence the ideal situation for best sales is high marketing effort, low price of product, no inflation, high production.

Sample Query

- $P(\text{Total Sales} = \text{High} \mid \text{Price of Product} = \text{Low}, \text{Changes with firm} = \text{Low})$

$$P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{CF} = \text{Low}) = P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{CF} = \text{Low}, \text{ME}) * P(\text{ME} \mid \text{CF}, \text{PP})$$

Marketing Effort does not depend on Price of Product.

Total Sales does not depend on Changes with Firm.

$$\begin{aligned}
 P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{CF} = \text{Low}) &= \sum P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{ME}) * P(\text{ME} \mid \text{CF}) \\
 &= \sum \sum P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{ME}, \text{I}) * P(\text{ME} \mid \text{CF}) * P(\text{I}) \\
 &= \sum \sum \sum P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{ME}, \text{I}, \text{P}) * P(\text{I}) * P(\text{P}) * P(\text{ME} \mid \text{CF})
 \end{aligned}$$

- $P(\text{ME} = \text{High} \mid \text{CF} = \text{Low}) = 0.7$
- $P(\text{ME} = \text{Low} \mid \text{CF} = \text{Low}) = 0.3$
- $P(\text{I} = \text{High}) = 0.5$
- $P(\text{I} = \text{Low}) = 0.5$
- $P(\text{S} = \text{Enough}) = 0.5$
- $P(\text{S} = \text{Not Enough}) = 0.5$
- $P(\text{GC} = \text{Favourable}) = 0.5$
- $P(\text{GC} = \text{Not Favourable}) = 0.5$
- $P(\text{RG} = \text{High}) = 0.5$
- $P(\text{RG} = \text{Low}) = 0.5$
- $P(\text{D} = \text{High}) = 0.5 * (0.45 + 0.2) = 0.325$
- $P(\text{D} = \text{Medium}) = 0.5 * (0.35 + 0.35) = 0.35$
- $P(\text{D} = \text{Low}) = 0.5 * (0.2 + 0.45) = 0.325$
- $P(\text{Cpt} = \text{High}) = 0.325 * 0.6 + 0.35 * 0.3 + 0.325 * 0.1 = 0.3325$
- $P(\text{Cpt} = \text{Medium}) = 0.325 * 0.3 + 0.35 * 0.4 + 0.325 * 0.3 = 0.335$
- $P(\text{Cpt} = \text{Low}) = 0.325 * 0.1 + 0.35 * 0.3 + 0.325 * 0.6 = 0.3325$
- $P(\text{P} = \text{High}) = (0.8 * 0.3325 + 0.6 * 0.35 + 0.4 * 0.3325) * 0.5 + (0.6 * 0.3325 + 0.4 * 0.335 + 0.2 * 0.3325) * 0.5 = 0.5045$
- $P(\text{P} = \text{Low}) = (0.2 * 0.3325 + 0.4 * 0.35 + 0.6 * 0.3325) * 0.5 + (0.4 * 0.3325 + 0.6 * 0.335 + 0.8 * 0.3325) * 0.5 = 0.5045$

$$\begin{aligned}
 &P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{CF} = \text{Low}) \\
 &= \sum \sum \sum P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{ME}, \text{I}, \text{P}) * P(\text{I}) * P(\text{P}) * P(\text{ME} \mid \text{CF}) \\
 &= (0.7 * 0.7 + 0.3 * 0.3 + 0.9 * 0.7 + 0.7 * 0.3 + 0.6 * 0.7 + 0.2 * 0.3 + 0.8 * 0.7 + 0.6 * 0.3) * 0.5 * 0.5045 \\
 &= 0.66594
 \end{aligned}$$

- **$P(\text{TS} = \text{High} \mid \text{PP} = \text{Low}, \text{CF} = \text{Low}) = 0.66594$**