OM530 24-8-2025

AI policy → can be encouraged

Green zone

Orange zone

↳ check references

red zone

↳ no disclose of AI usage

Research process

Journal → editors (senior)
and reviewer → blind
OR
not blind

Business analytics

↳ can still control due to simplifications

need to have the concepts down from the course

definitions might not be important but concepts are

05 97055486

discussion on whatsapp should continue on

Some group

supply chain Management Strategy Planning and operations

Survival Chapter and Relevant Mindset

Not strict in attendance but need to be displine need in class

One person should not be late everyday

Class participation → quiz
Class quiz

Case study participation → relevant
↳ Final
↳ Slides + cases

Simulation

Assignment 1 → Present case study

Case Study should be read

Case Study Purchase
↳ interactive Simulations

12 oct exam

10

Case Study 1 Presentation

You will learn from errors

Before

Industry integrated supply chain into one

Seasonal vs constant demand (customer centric)
↳ take care of cost
↳ more efficient supply chain
↳ speed

Tech driven → blockchain (know where product is)

Sustainability

Global interconnectedness

24-8-2025

OM 514 Supply chain inventory management

Still finding opportunities

Ahmed Nasser 9 years exp

Theory + Practical
↳ calculation

Practical knowledge
tools
current and future challenges

Implement in your job

Why assets

Digital twin

Inventory (more)
↳ holding cost
↳ inefficient

Inventory (less)
↳ if fault happen you have no backup
↳ may jeopardize revenue if fail happen

Companies are shifting to SCM as a C-suite position

Vision 2030
↳ read it

Read time

2030
↳ need Saudi arabia to be ~~a~~ a regional logistic hub

Ros al khair sea port
tanmak

good company → Business ~~continuing~~
SCM → Corporate risk
→ training

Toyota
↳ Just in time
resilience and ajility
↳ zero inventory

Toyota can do this due to ecosystem as manufacturing companies are close to factory

More mature market leads to companies offloading product manufacturing to different companies

Toyota JIT → distant hubs
INo account earth quake 2011
as no buffer stock
↳ lost 1 billon dollar in output
↳ no business continuity IN extreme case

Amazon largest inventory of 46 billon $

How to decide inventory is good inventy
↳ turnaround
↳ ROI
↳ Managing inventy by advanced algorithms
demand forcast
route optimizing
efficient warehousing

29/2015

Mike

Zara
↳ produce limited stock items
↳ Shirt only come in small
↳ customers think it is unique item

All company have different ~~strategy~~ supply chains
↳ different strategies

Also need to measure it if cannot measure it not important

Next class
Inventory
Classification
Demand/forecasting
MRP
Procurement
Tech AI
Risk MGT
Master Scheduling
Aggregate planning

Simulation → group based
↳ 3 to 4 sessions
↓
Presentation based on simulation

Practical session using excel
2 practical ~~in~~ weeks before mid and 2 practical ~~before first~~ after mid

Forecasting MRP
↳ practical

OM 530 24-8-20~~15~~
Management Science
Linear programming
Optimization models
Fedric Talayor work with factory ford
First industrial revolution
↳ factories steam engine to work textile
Second industrial revolution
↳ car engine
↳ assembly line

Second industrial revolution
↳ assembly line

Third industry revolutions

Fourth
↳ internet

Fifth
↳ chat gpt
virtual agent

Minitab

Management science
relearn concepts
of
relearn practical
concepts of operations
management

Name
age
origin
studies
work exp

SCI hub = Robin Hood

Oct 21 tuesday

Mid on blackboard

Final on paper
↳ Laptop excel solver
↳ 80% based on MIS 311

20% python coding

Assignments 2 weeks

final project 30%

Teams team communication channel

textbook 14 edition
↳ tools

excel (80%)
chatgpt
python
Jupyter
Anaconda
R studio

1/29/2015

How to manage science

Scientific Method

4 steps

Hypothesis formulating
Collect data
Test hypothesis (validating)
Conclusion

Plan
do
verify
Act

Apply scientific method to run company

Empirical
↳ word to mouth experience
↳ learning from old past members

FW Taylor
↳ father of scientific method

Apply Scientific Method for management of campuses
↳ Management Science

Management Science

Most scientific progress happen in World War II

George Dantzig
↳ food distribution for Army personal
↳ Simplex method

26-8-2025

OM530

Chapter 1 understanding the supply chain

SCM connected view

Which practices to outsource what to insource

Customer experience → most important
↳ cost
quality
innovation

SCM value → not only about minimize cost also about quality and innovation

1/29/2015

Supplychain

↳ purpose to

Statisfy demand of

Custmer

↳ to get demand

Compenes use algorithms,

Softwares, and other

tatics

Need to achive right

cost

demand

Detergent supply chain

Mobile Phone

Raw mtrls

↳ cobalt

nickel

gold

Components

↳ TMSC

Intel

BOE

LG

Assembly

↳ Foxxcon

Distributors

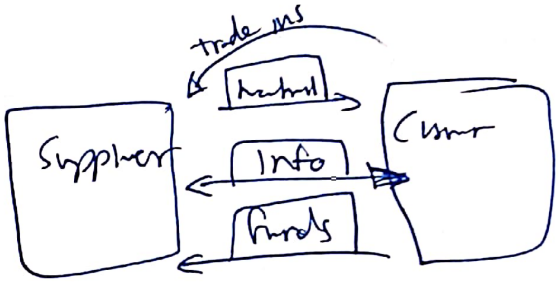
↳ Air shipping

Retail

↳ Pardes

Custmer

Flows in Supply chain



SCM is goloal

SCM

↳ main achivment is cstmer

request fullfilment

Think of what level to cstmize

products

SCM objective → Maxmize net value

generated

SCM → Cstmer is only source of

funds

Decision Phases in a supply chain

3
- Strategy
  - 4 to 6 years
  - distribution center or online
  - outsource / insource
  - long term
  - location
  - omni channel
- Planning
- operations

SCM Demand is most uncertain parameter

Selling directly to customer gives company direct demand forecast
- Customer needs
- Inventory knledge

SCM Planning
- over next year

Zara
- Trend efficient products
- Regular products

SCM operations
- weekly operations

Smooth operations need good Planning and good Strategy of SCM

Strategy

Planning → policys
- → forcast next years demand
- → Inventory fill up

Operations → individual customer orders

2 types of SCM views
1. Cycle view
2. Push/Pull view

Push → forcast demand

Pull → produce when customer order

Cycle view

Supplier stage → Manufacturer → Product

↓

Buyer stage place order

Pull → reactive

Push → speculative

SC Macro Processes

1. CRM customer relationship manage
2.

Project
- Budget
- Timebound

Manufacture to order
↳ Not in store, Care from manufacture

Standardized products
↳ keep in store

26-5-2025

Supply chain Inventory Managment

Supply chain structure
Vary on many factors
↓
Each sector has own Supply chain

~~Geography~~
geography plays key role in SCM
↳ what is applicable in Japan is not applicable in KSA

Inventory = Buffer

Customization of SCM is essential to align with
business goals
Customer expectations
market conditions

No 40 attendance

What is Inventory
↳ most valuable assets
↳ are taking care of it
↳ raw materials
creating production

Inventory Managment
Inventory control
→ supply relationship
→ Strategic aspect
How much items to keep
location of warehouse
big decisions

Inventory control → Tactical
↳ day to day operations
↳ counting inventory
↳ accurate stock levels
↳ condition of how to stock product

MRP → inventory Managment

Warehouse Managment → inventory control

~~Economic order quantity~~

Raw mtrls
↳ Supplier
↳ Manufacture
↳ Distributor
↳ Retailer
↳ customer

Manufacture → factory
~~Retailer~~ → dont deal with end user

Walmart
↳ low cost every day
↳ ~~cost~~ is a retailer

Types of inventory
① Raw matril
② Workin progress
③ Finished goods
④ MRO
~~Maintenance~~ Repair operations
↳ Maintance
↳ spare parts to support finished opens
↳ grease, ball bearing
⑤ Packaging Matrls
↳ masking tape
↳ Support operations
⑥ Retailers → unsold items in store

Manufacture
↳ produce items

Wholesalers (Distributor)
↳ Buy in bulk from Manufacture

Manufacture → Nova water

Distributor → Timimi logistic
+
Nova logistics fleet

Wholesaler → Bindaraad

Retailer → Panda, Tarimini, Baqala

Distributor and wholesaler buy in bulk

Inventory costs

ordering cost

~~Handling cost (Holding cost)~~

↳ every time order is placed
↳ any cost to fulfill order
↳ salary of procurement officer
↳ shipping fees
↳ administrative cost
↳ few orders reduce order cost

Total ordering cost = number of orders per period × cost per order

1/29/2015

Holding cost
↳ cost of storing inventory
↳ Warehouse rent
↳ AC Maintance
↳ Electricity
↳ Utilities
↳ Depreciation

OM 511 26-8-2025
Management Science

Fredric Taylor
1895 first industrial revolution
100 TB Nimbus Data
ExaDrive

Henry Ford funded the assembly line

What is Management Science

Management Science Like feet and jumping distance

Simplex Method
we will use chat gpt
7 step linear algebra
Simplex method by hand

Management science
↳ mid exam on what is management science
↳ Interdisciplinary

How to do Management science

Problem solving in decision Making
↳ find project go through them
① Identify and define the problem
② Determine set of Alternate solutions
③ Determine criteria for alternate
④ Evaluate alternative
⑤ choose alternate
⑥ Implement alternate
⑦ Evaluate results

Calculating the shortest path

quantitive model

Solve linear optimization problem
final exam

29/2015

- optimal value
- Mathematical expression

Quantitative model

- optimal value
- Mathematical expression / objective function
- Constraints

optimal value
↳

objective function

$1.30W + 0.50R + 1.80C \Rightarrow \$/N$

objective

$\$/N$

Constraints

$40W + 20R + 20C \geq 27$

$20W + 25R + 21C \geq 240$

$90W + 110R + 110C \leq 1250$

objective → minimize
→ maximize
→ value

at least $\geq$

no more than $\leq$

Nutrition	Wheat	Rice	Corn	
protein	40	20	20	at least 27
carb	20	25	21	at least 240
calories	90	110	110	No more than 1250
cost per oz	1.3	0.8	1.8	

optimization

lower optimization elements

Next class first assignment

/29/2015

	Cutting	Sewing	Finishing	Inspection
medium	7/10	1/2	1	1/10
deluxe	1	5/6	2/3	1/4
Hours Constraint limited	630	600	708	135

Hours

Cutting

$\frac{7}{10}m + 1d \leq 630$

$\frac{1}{2}m + \frac{5}{6}d \leq 600$

$1m + \frac{2}{3}d \leq 708$

$\frac{1}{10}m + \frac{1}{4}d \leq 135$

$m \geq 0$

$d \geq 0$

m and d → decision variables

→ Profit

$P = 10m + 9d$

Max Profit = 10medium + 9deluxe ← objective function

goal maximize profit

Nonnegativity constraints $S, D \geq 0$

linear function → power of 1 x^1 → linear

$\frac{7}{10}m + 1d \leq 630$

Inequalities

~~$x - 2y \geq 4$~~

$5 - 3x \geq -4$

$5x + 3y = 15$

$-3x \geq -4 - 5$

$-3x \geq -9$ → change sign if divide by neg number

$x \leq \frac{-9}{-3}$

$x \leq 3$

x int → $y = 0$ $(3, 0)$

y int → $x = 0$ $(0, 5)$

$5x + 3(0) = 15$

$5(0) + 3y = 15$

$5x = 15$

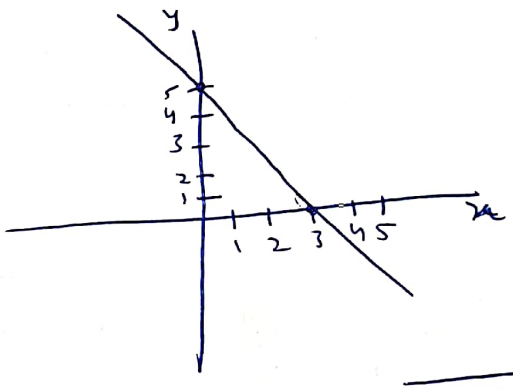
$3y = 15$

$x = \frac{15}{5}$

$y = \frac{15}{3}$

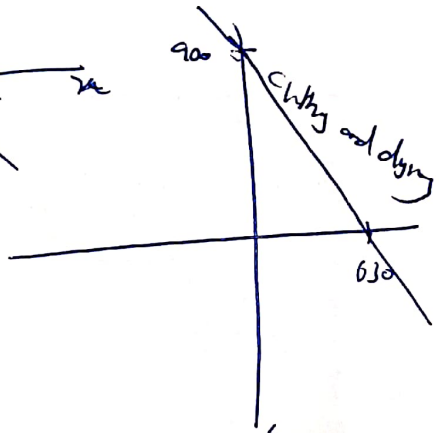
$x = 3$

$y = 5$



$$\begin{array}{r} 900 \\ 7\overline{)6300} \\ 63 \\ \hline 0 \\ 0 \\ \hline 0 \\ 0 \end{array}$$

$$\begin{array}{r} 630 \\ 10 \\ \hline 000 \\ 630\times \\ \hline 6300 \end{array}$$



$\frac{7}{10}m + 1d \leq 630$

m int $d = 0$ $(900, 0)$

d int $m = 0$ $(0, 630)$

$\frac{7}{10}m + 1(0) \leq 630$

$\frac{7}{10}(0) + 1(d) \leq 630$

$\frac{7}{10}m \leq 630$

$d \leq 630$

$7m \leq 630 \times 10$

$7m \leq 6300$

$m \leq \frac{6300}{7}$ $m = 900$

1/29/2015

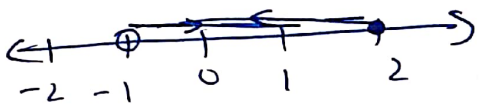
$-12 < 7x - 5 \leq 9$

$-12 + 5 < 7x \leq 9 + 5$

$-7 < 7x \leq 14$

$-\frac{7}{7} < 7x \leq \frac{14}{7}$

$-1 < x \leq 2$

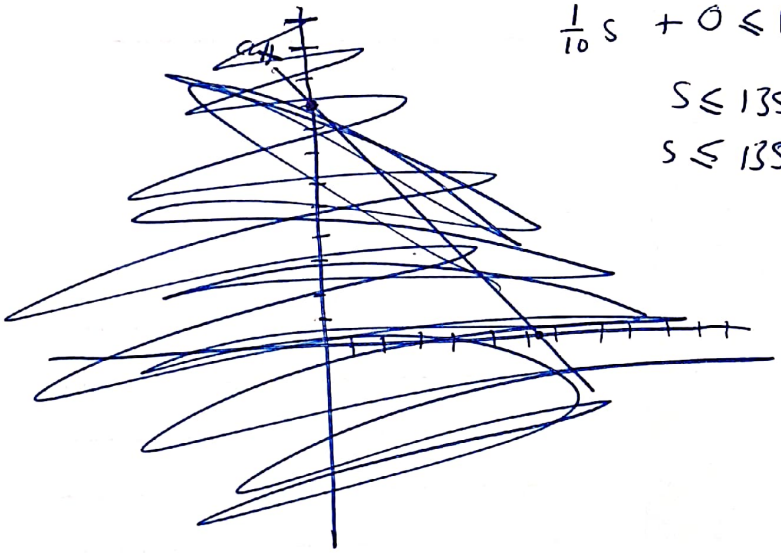


Cutting (900, 0) (0, 630)

Sewing (1200, 0) (0, 700)

Finishing (708, 0) (0, 712)

Inspection (1350, 0) (0, 540)



$\frac{1}{2}m + \frac{5}{6}d \leq 600$

(1200, 0) (0, 700)

$\frac{1}{2}m \leq 600$

$m \leq 600 \times 2$

$m \leq 1200$

$\frac{5}{6}d \leq 600$

$5d \leq 600 \times 6$

$d \leq \frac{3600}{5}$

$d \leq 700$

$1s + \frac{2}{3}d \leq 708$

$s + 0 \leq 708$

$s \leq 708$

$\frac{2}{3}d \leq 708$

$2d \leq 708 \times 3$

$d \leq \frac{1424}{2}$

$d \leq 712$

$\frac{1}{10}s + \frac{1}{4}D \leq 135$

$\frac{1}{10}s + 0 \leq 135$

$s \leq 135 \times 10$

$s \leq 1350$

$0 + \frac{1}{4}D \leq 135$

$D \leq 135 \times 4$

$D \leq 540$

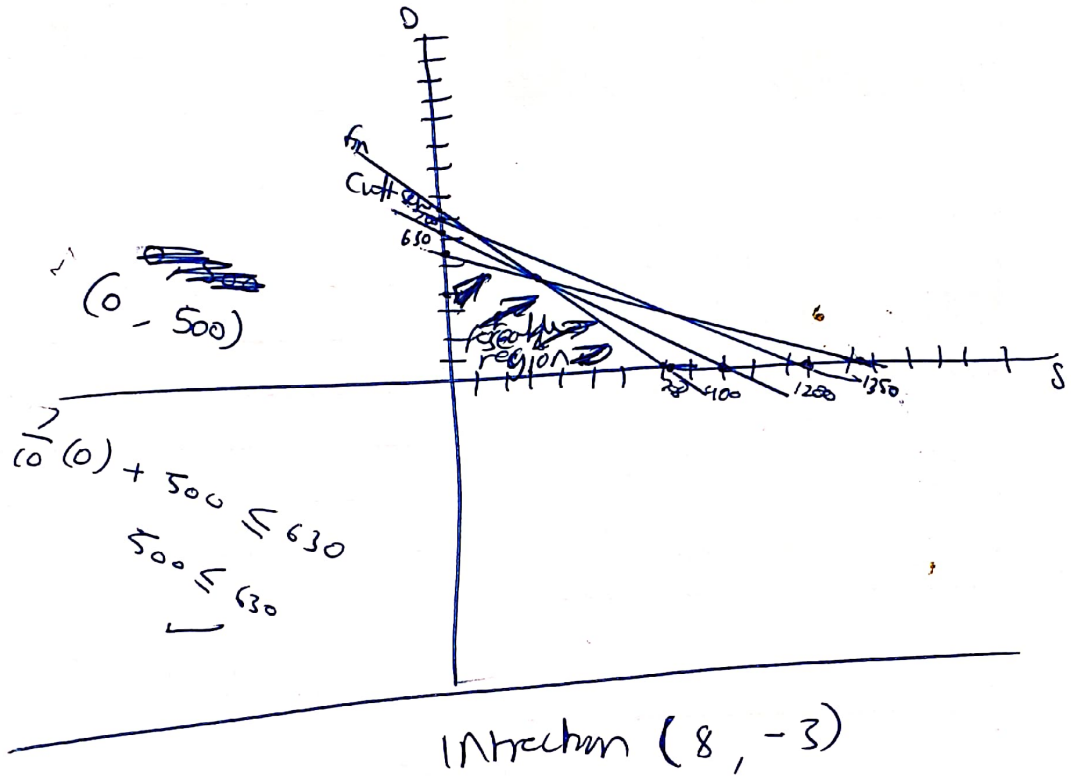
/29/2015

Cutt (900, 0) (0, 630)

Sewing (1200, 0) (0, 700)

finish (708, 0) (0, 712)

Insp (1350, 0) (0, 540)



$(0)(0) + 500 \leq 630$

$500 \leq 630$

Intersection (8, −3)

$y = \frac{1}{2}x - 7$

$y = x - 11$

$\frac{1}{2}x - 7 = x - 11$

$\frac{1}{2}x - x = -11 + 7$

$-\frac{1}{2}x = -4$

$-x = -4(2)$

$-x = -8$

$x = 8$

$y = 8 - 11$

$y = -3$

$y = \frac{1}{2}x - 7$

$y = \frac{1}{2}(8) - 7$

$y = \frac{8}{2} - 7$

$y = 4 - 7$

$y = -3$

2 $-1 + \frac{1}{2}$

29/2015

$y = -2x + 2$

$3x + 2y = 1$

$3x + 2(-2x + 2) = 1$

$3x - 4x + 4 = 1$

$-1x + 4 = 1$

$-x = 1 - 4$

$-x = -3$

$\boxed{x = 3}$

Intersection is $(3, -4)$

$y = -2(3) + 2$

$y = -6 + 2$

$\boxed{y = -4}$

$3x + 2y = 1$

$3(3) + 2y = 1$

$9 + 2y = 1$

$2y = 1 - 9$

$y = \frac{-8}{2}$

$\boxed{y = -4}$

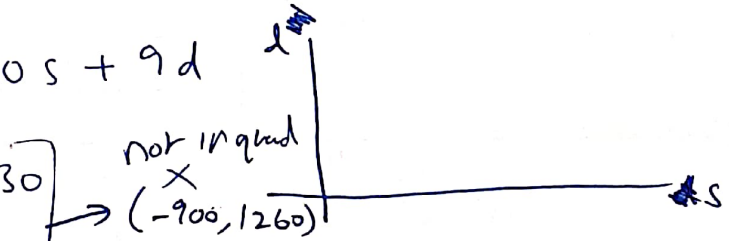
Maximise $Z = 10s + 9d$

cutt $\frac{7}{10}s + 1d \leq 630$

sew $\frac{1}{2}s + \frac{5}{6}d \leq 600$

finish $1s + \frac{2}{3}d \leq 708$

insp $\frac{1}{10}s + \frac{1}{4}d \leq 135$



cutt and sew intersect $\rightarrow (380, 492)$

$\frac{7}{10}s + 1d = 630$

$d = 630 - \frac{7}{10}s$

$d = 630 - \frac{7(-900)}{10}$

$d = 630 - \frac{-6300}{10}$

$d = 630 + 630$

$d = 1260$

$\frac{7}{10}s + d \leq 630$ (0, 630) (, 0)

when $s = 0$ $d = 630$

when $d = 0$ $s =$

$\frac{7}{10}s = 630$

$7s = 6300$

$s = \frac{6300}{7}$

$s = 900$

$\frac{1}{2}s + \frac{5}{6}(630 - \frac{7}{10}s) = 600$

$\frac{1}{2}s + 525 - \frac{7}{12}s = 600$

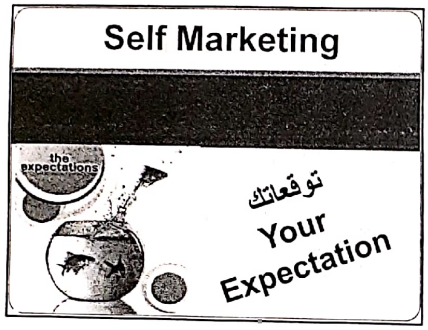
$-\frac{1}{12}s = 600 - 525$

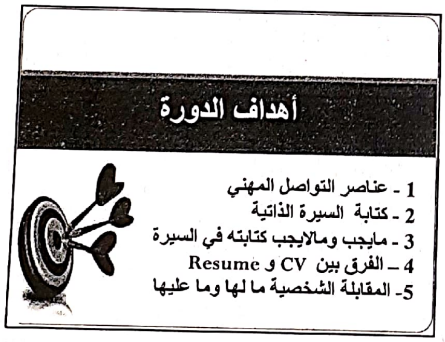
$-s = 75 \times 12$

$\boxed{s = -900}$

1

1/29/2015





$\frac{5 \times 630}{6}$ $\frac{3150}{6}$ 525

$6 + \frac{6}{2}s - \frac{7}{12}s$

$6 + \frac{6}{2} = -\frac{7}{12}s$

$\frac{6}{12} - \frac{7}{12}$

$\frac{5}{6}\left(\frac{7}{10}\right) = \frac{35}{60}$

$\frac{7}{12}$

1

$y = -2x +$

$3x + 2y =$

$3x + 2(-2$

$3x - 4x +$

$-1x + 4 =$

$-x = 1 -$

$-x = -3$

$x = 3$

Maxime 2

cutt $\frac{7}{10}s + 1d$

cw $\frac{1}{2}s + \frac{5}{6}d \leq$

finish $1s + \frac{2}{3}d \leq$

Insp $\frac{1}{10}s + \frac{1}{6}d \leq$

$\frac{7}{10}s + d \leq 630$ (0, 630) (, 0)

when $s = 0$ $d = 630$

when $d = 0$ $s =$

$\frac{7}{10}s = 630$

$7s = 6300$

$s = \frac{6300}{7}$

$s = 900$

Sew $\frac{1}{2}s + \frac{5}{6}d \leq 600$

Finish $1s + \frac{2}{3}d \leq 708$

→ Intersection

(380, 492) → (474.55, 350.18)

Finish $1s + \frac{2}{3}d \leq 708$

Insp $\frac{1}{10}s + \frac{1}{4}d \leq 135$

Substitute method

$s + \frac{2}{3}d = 708$

$s = 708 - \frac{2}{3}d$

$\frac{1}{2}(708 - \frac{2}{3}d) + \frac{5}{6}d = 600$

$\frac{708}{2} - \frac{2}{6}d + \frac{5}{6}d = 600$

$\frac{3}{6}d = 600 - 354$

$\frac{1}{2}d = 246$

$d = 246 \times 2$

$\boxed{d = 492}$

$s + \frac{2}{3}(492) = 708$

$s + \frac{984}{3} = 708$

$s = 708 - \frac{984}{3}$

$s = 708 - 328$

$\boxed{s = 380}$

Substitute method

$s + \frac{2}{3}d \leq 708$

$s = 708 - \frac{2}{3}d$

$\frac{1}{10}(708 - \frac{2}{3}d) + \frac{1}{4}d = 135$

$\frac{708}{10} - \frac{2}{30}d + \frac{1}{4}d = 135$

$-\frac{2}{30}d + \frac{1}{4}d = 135 - \frac{708}{10}$

$\frac{11}{60}d = \frac{642}{10}$

$11d = \frac{642 \times 60}{10}$

$11d = \frac{38520}{10}$

$11d = 3852$

$\boxed{d = \frac{3852}{11}}$

$\frac{1}{10}s + \frac{1}{4}(\frac{3852}{11}) = 135$

$\frac{1}{10}s + \frac{3852}{44} = 135$

$\frac{1}{10}s = 135 - 87.5455$

$s = 47.4545 \times 10$

$\boxed{s = 474.545}$

6-صاحب الاحاديث الجانبيه

ربما كان يوضح أو يستوضح
أو يتكلم في موضوع جانبي
أو قد يكون يمدحك

التعامل معه

لا تحرجه
إسأله عن رأيه
حاول الذهاب بإتجاهه دون أن يشعر

7- المعاند

لا يتنازل عن رأيه
لا يستوعب قولك
متحيز

التعامل معه

إطرح كلامه على الحضور
أخبره عن ضيق الوقت
أطلب مناقشته لاحقا

$$10\overline{)38520}\quad 3852$$

$$11\overline{)3852}\quad 35.1998$$

$$10\overline{)642}\quad 64.2$$

$$10 \times \frac{135}{1} - \frac{708}{10}$$

$$10 \times \frac{1350}{10} - \frac{708}{10}$$

$$\frac{642}{10}$$

$$-\frac{2}{30}d + \frac{1}{4}$$

$$4 \times \frac{1}{4 \times 15}d + \frac{1}{4 \times 15}$$

$$-\frac{4}{60}d + \frac{15}{60}$$

$$\frac{11}{60}d$$

$$\frac{1}{2}s + \frac{5}{6}d$$

$$1s + \frac{2}{3}d$$

Substitute metho

$$s + \frac{2}{3}d = 70$$

$$s = 708 - \frac{2}{3}d$$

$$\frac{1}{2}(708 - \frac{2}{3}d)$$

$$\frac{708}{2} - \frac{2}{6}d$$

$$\frac{3}{6}d =$$

$$\frac{1}{2}d =$$

$$d = 4$$

$$s + \frac{2}{3}(492$$

$$s + \frac{984}{3} =$$

$$s = 708 -$$

$$s = 708 - 3$$

$$s = 380$$

Intechon

(A) (380, 492) point

(B) (474.545, 350.18) point

Corner

(C) (708, 0) → finish ~~finish~~ point

(D) (0, 540) insp point

Maximize function → $Z = 10s + 9d$

(A) $Z = 10(380) + 9(492)$

$Z = 3800 + 4428$

$Z = 8228$

(B) $Z = 10(474.545) + 9(350.18)$

$Z = 4745.45 + 3151.62$

$Z = 7897.07$

(C) $Z = 10(708) + 9(0)$

$Z = 7080$

(D) $Z = 10(0) + 9(540)$

$Z = 4860$

~~Maximize point at 380, 492~~

Maximize profit if make 380 medium and 492 deluxe

OMS414

Number is 40

Next week calculation with excel

Inventory Managment vs control

Strategic

day to day activities

Focus on

Inventory types

↳ Raw, work in progress finished goods MRO

Packaging Materials

Toyota

↳ Raw → Steel sheets

WIP → car not yet painted

MRO

Packaging → final assembly Plastics

Main players in SCM

↳ MFR – Distributors Retailers & customers

Types of inventory costs

Ordering costs

↳ overhead cost

↳ everytime we placed order

↳ shipping

↳ machine startup

↳ order processing

↳ receiving

Impact

↳ more order = more costs

↳ need to place fewer large orders reduce order cost but increase holding cost

Order costs

Buyer prepare PO 0.5hr × $40/hr 20$

Why order cost important

↳ look at them for efficiencies

~~for supply chain~~ performing for automating purposes

Holding (carry) cost

↳ anything we pay for Products to be stored in right way

CAC warehouse, Shaded region

Higher inventory level lead to higher carrying costs

Carrying cost
↳ 15 - 35% of value of product

Begging Inventory = 100 000
Ending inventory = 120 000
Avg inventory = $\frac{100\,000 + 120\,000}{2}$
= 110 000

Carrying cost rate = 20%

Carry cost = 110 000 × 20% = 22000

Stockout cost
↳ inventory runs out
↳ Impact revenue of company
↳ will be blamed to procurement and supply chain
↳ can lead to lost revenue brand reputation
↳ need to maintain safety stock

Stockout Real case Toyota
2021 Tsunami Earthquake
↳ Single suppliers
↳ critical suppliers
↳ Trust in trade
↳ electronic chips
↳ paint pigments

No enough cars
↳ major stockouts

Impact
↳ lost 300000 vehicles
↳ costing billions

future
↳ Business continuity plan
↳ Just in time use but there is no single source → there is plan A, B, and C
↳ quota arrangements
50% , 10% , 10%
A B C
↳ go international
↳ increase safety stock
Buffer stock
↳ Supplier diversification
↳ monitor supplier globally
Risk mitigation

Purchase cost
↳ how much [redacted] pay for the material
↳ walmart go to supplier and say I will buy from you
↳ allow competitive pricing

1/29/2015

Shrinkage cost
↳ lost
↳ theft
↳ damage
↳ inaccurance

Start reading chapter 1

fuel additive f

solvent base s

$P = 40f + 30s$

$40 \geq \frac{2}{5}m_1 + \frac{3}{5}m_3$

$30 \geq \frac{1}{2}m_1 + \frac{1}{5}m_2 + \frac{3}{10}m_3$

$m_1 \leq 20$

$m_2 \leq 5$

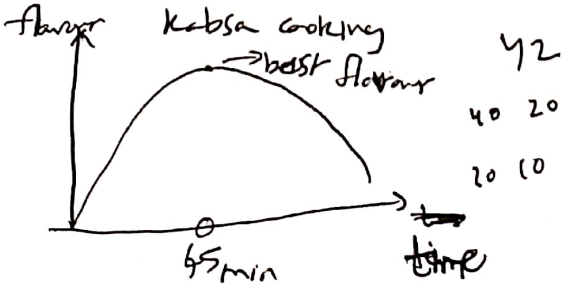
$m_3 \leq 21$

$5\overline{)3780}$ → 756

35
28
25
30
30
0

630
6
3780

Convex vs Non convex



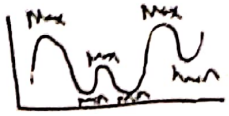
42
40 20
20 10

Convex → Max, Min

↳ one minimum or one maximum

Non convex

↳ many minimum or many maximum



Neural networks are Non convex

↳ Highly convex

Sigmoid, ReLEU

$\frac{2}{5}m_1 + \frac{3}{5}m_3 \leq 40$

$\frac{1}{2}m_1 + \frac{1}{5}m_2 + \frac{3}{10}m_3 \leq 30$

the solution of linear optimization problem lies on the intersection of lines

$\frac{7}{10}y + \frac{5}{6}x \leq 630$

$\frac{5}{6}x = 630 - \frac{7}{10}y$

$5x = 630 - \frac{7}{10}y$

$x = (630 \times 6) - \frac{7 \times 6}{10}y$

$5x = 3780 - \frac{42}{10}y$

$x = 756 - \frac{21}{5}y$

$$\frac{7}{10}y + \frac{5}{6}x = 630$$

$$\frac{7}{10}y = 630 - \frac{5}{6}x$$

$$y = 630 \times 10 - \frac{5 \times 10}{6}x$$

$$7y = 6300 - \frac{50}{6}x$$

$$y = \frac{6300}{7} - \frac{50}{42}x$$

$$y = 900 - 1.19x$$

$$y =$$

$$\frac{1}{2}s + \frac{5}{6}d \leq 600$$

$$\frac{1}{2}s = 600 - \frac{5}{6}d$$

$$s = (600 \times 2) - \frac{5 \times 2}{6}d$$

$$s = 1200 - \frac{10}{6}d$$

$$s = 1200 - \frac{5}{3}d$$

630
10
000
630x
6300

900
7 | 6300

Need excel solver

add
add-ins
↳ click add all items

600
2
1200

Shrinkage cost
↳ lost
↳ theft
↳ damage
↳ inaccurance

Start reading chapter 1

final additive f

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$M_2 \leq 5$

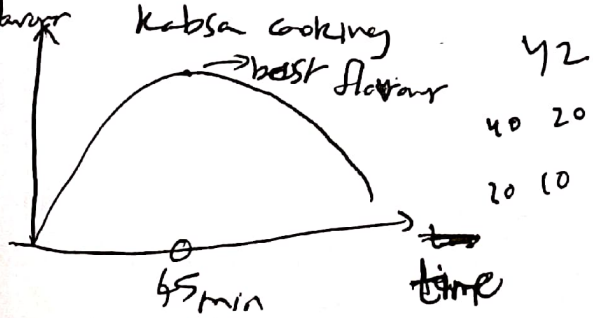
$M_3 \leq 21$

756
$5 \overline{)3780}$
35
28
25
30
30

630
6
3780

OPTIMIZATION

Convex vs Non convex



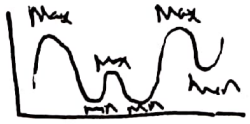
y_2
40 20
20 10

Convex → Max, Min

↳ one minimum or one maximum

Non convex

↳ many minimum or many maximum



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$5x = 3780 - \frac{42}{10} y$

$x = 756 - \frac{21}{5} y$

S D op value

ob fun 10 9 = 10 S + 9 D

Multiple Merchandising required

C1 D & D

C2 Sv

C3 Fin

C4 1 & P

9 11 ✻ 9 8 + H 11 ✻ H 8

objective funcn

Constraints

Next tuesday slide chap 2 andersen pp 70 #14

2 weeks

1/29/2015

OM 530 2-9-2025

Previous class
Hier case

Competitive Strategy

Walmart → high availability many products low prices
7-11 → 24/7 open easy to grab
Blue nile jwlery → online purchase, variety and cost

Achive strategic fit

2 products → functional → nature demand → Salt → Sugar
→ innovative → mobile phone
→ Pharma drugs
→ high → implied demand uncertainty

Implied demand uncertainty

Responsive → cost not primary objective

efficient → Salt

Which type of supply chain is most appropriate
Chain for TCL reason why
↳ responsive due to a tech company
↳ not a regular company like Kelly steel
↳ need
↳ innovative needs

Simulation buying laptop

2015

OM 530 2-9-2025

Previous class
Hier case

Competitive Strategy

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Active Strategic fit

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→ innovative → mobile phone
Pharma drugs
high
Implied dumd uncertainty
Implied dumd uncertainty

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Which type of supply chain is most appropriate
Chain for TCL reason why
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↳ not a regular company like Kelly steel
↳ need
Simulation buying laptop
↳ innovative needs

~~Strategy [illegible]~~

OM 514 Lead time

Previous session

From time to order to time customer ~~you receive~~ receive final order

total supply chain lead time

lead time manufacture
recruitment
inventory

↳ need to know due to know level of inventory

Engineer to order (ETO)
Make to order (MTO)
Configure to order (CTO)
Assembly to order (ATO)

ETO
not react until design is approved and ready
↳ designed products from scratch
↳ Basic order
↳ longest lead time
↳ concept, design, engineering, Rd prototyping
↳ no stock held

MTO
↳ 90% ~~[illegible]~~ design and components are standard
↳ Ball valve
↳ machinery parts
↳ machinery (industrial parts)
↳ raw materials held in inventory

ATO
↳ Straight forward
bicycles
assembly required

CTO
↳ Predefined modules
↳ servers, cars, Subway
↳ Preset options
↳ can manufacture certain manufacture
↳ Increase horsepower of engine
customized features
↳ IT is configure to order
↳ changing RAM, storage options

Make to Stock
↳ customer go to retailer to buy Iphone 14

Make to order
↳ Forging
↳ welding

ETO → Boing plane maker
MTO → caterpiller Heavy equipment
CTO → HP, Dell, Cars
ATO → Bicycles

Marketing → High customer service
Many disruptions to product
High inventories (excess inventory) scrapping

Production → low production cost
↳ minimize startup/end cost
No care about customer service
High inventory
few distribution to product

finance → don't care about customer service
don't care about production
care about inventories (need to lower cost

Inventory Valuation Methods

Moving average price (MAP) → SAP
Weighted average cost (WAC)
↳ every quarter change
↳ fixed for certain period

continuous changing
per transaction

FIFO } first in first out
LIFO } not actable by IFRS

Inventory ~~is~~ MAP → SAP

WAC → Periodic usage

FIFO → food products

↘ food, Pharma, shelf life

kiwi knife

Map → instant price change ~~is~~ applied

FIFO

Inventory classification

↳ optimize Resources

↳ no need to classify un important items

ABC analysis → Based on Value of the demand against item

→ annual demand in a specific period

80/20 rule

80% cost come from 20% material

A items (products) → High value, low quantity (strict control needed)

B items → moderate

C items → low value, high quantity (less strict control)

Annual Consumption Value = annual demand × unit cost

~~80-20~~

Cumulative

0 → 80 (A) → 90 (B) → 100 (C) → not fixed

OM 511

trade off cost/benifit

Mathematical model

Graphical method

Excel solver

Maximize F and S

≤ 20

objective function

~~$40f + 30s = max$~~

M1	$\frac{2}{5}f + \frac{1}{2}s$	≤ 20
M_2	$0f + \frac{1}{5}s$	≤ 5
M_3	$\frac{3}{5}f + \frac{3}{10}s$	≤ 21

F S = optimal value

Q42 assignment

Ounce and pounds → need to convert

handle everything in ounces

2 variables

20% of weekly

$1.64S + 1.93B \Rightarrow Max$

240

Meat	0.5	0.70	280 pounds
Grain	0.3	0.10	130
Veg	0.2	0.2	100
		100%	

Convert everything to pounds

Each taco order req 10 ounces → convert to pounds

ounce ⇔ pound

1 ⇔ 0.0625

⇓

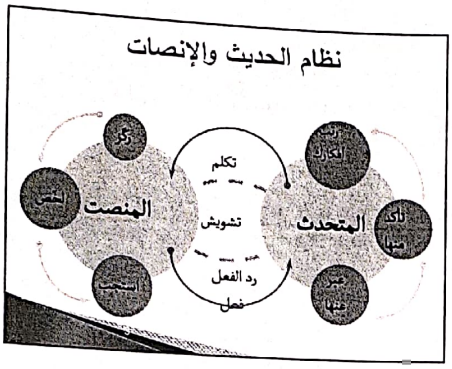
0.625 pounds

excel file

Sheet 2 → graphical method

1/29/2015

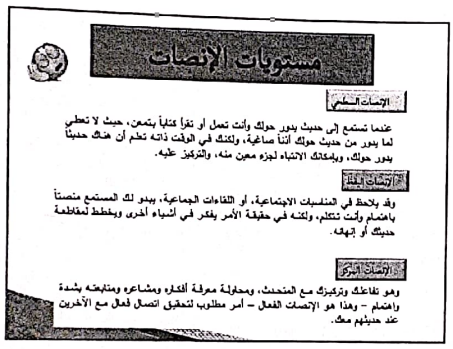
16 (0.7)
11.2



0.5t + 0.7b = 4480

4480 − 0.7b / 5

Cost of heat



0.1
0.02
0.03
0.15

use everything in ounces

Max = 1.64 T + 1.93 B

pounds to ounces
↳ 1 pound = 16 ounces
P = 16(280)
P =

	T	B		
meat	0.5	0.7	280	4480
Sauce	0.3	0.1	130	2080
Veg	0.2	0.2	100	1600

↳ in ounces → pounds → ounces

3 Paragraph
convert 280 lbs to 100 ounces
?.25

Max 1.64 T + 1.93 B

	T	B	constraint
meat	5	7	≤ 4480
Sauce	3	1	≤ 2080
Veg	2	2	≤ 1600

1.64 × 16
1.93 × 16
then subtract

Profit = Revenue − cost

Rev = 1.64 for T

additional Cost for T → 0.1 + 0.02 + 0.03 = 0.15

Cost for T meat →

$5t + 7b \leq 4480$

$3t + 1b \leq 2080$

$2t + 2b \leq 1600$

$1.64(560) + 1.93(240)$

=

1881

$x = T$ Supreme taco $\quad y = B$ Baja taco

Each order weight 10 ounces $\Rightarrow \frac{10}{16} \Rightarrow 0.625$ pounds

$\frac{\text{Price}}{\text{pound}} = 0.96$

Price per pound = Price per ounce $\times 16$

Price per ounce $= \frac{\text{Price per pound}}{16}$

$= \frac{0.96}{16} = 0.06$

$\frac{10}{16}$

0.06 price per ounce

$0.5(0.625) = 0.3125$

50% of 0.625 $\Rightarrow$

0.625

OM530 7-9-2025

Ch 2 Achieving strategic fit in a supply chain

last class case of TCL

Competitive strategy

Responsive / Efficient

↓ high cost, innovative, high demand

↓ mature demand → paradox → steel manufacturing

7-11

↳ New drug → ozempic

one company can have both

innovative products

High efficient ——— Highly responsive

Seasonal products → see demand

winter jackets

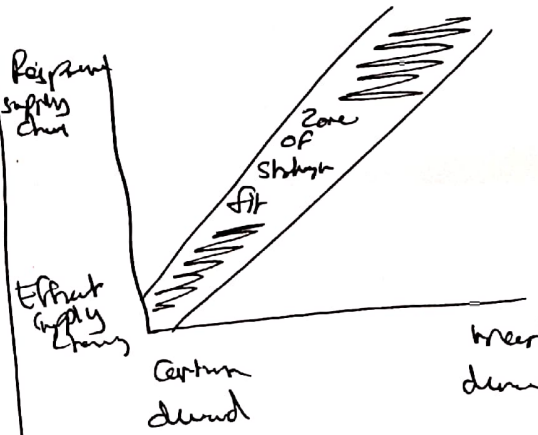
9 months (forecast, make product) | 3 months (sell product)

7-11

↳ changing merchandise every day

Achieve strategic fit

- Supply chain responsiveness is consistent with implied uncertainty



No stock kept

Efficient supplier → mature → responsive retailer — 7-11

Supplier → mature → retailer → walmart

not that efficient

Efficient supply chain → keep stock

Responsive

↳ respond quickly to demand

↳ modular design → Dell, Dell → different products

↳ High margins

↳ flexibility on keeping buffer

↳ maintain buffer inventory

↳ demand / supply inventory

↳ speed, flexibility, reliability, and quality

Efficient
↳ Supply demand at lowest cost
↳ Maximize performance at minimum cost
↳ Price lower margins
↳ Manufacture at low cost for high utilization
↳ Minimize inventory
↳ lead time less but not as much as responsive
↳ supplier strategy → based on cost and quality

One company can use both based on product type

Lead time
↳ change means
change delivery type from ship to airplane

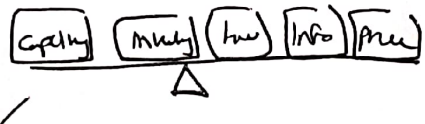
Toyota supply chain
↳ cannot design single supply chain for all products
Product life cycle also affect supply chain efficient or responsive

~~Order Qualifiers~~

Early stages
↳ availability over cost

Later Stages
↳ demand is more forecastable

Supply chain Levers
- Capacity → capacity of manufacturing → flexibility vs excess capacity
- inventory → how much to keep
- Time → speedy vs wait (high cost / low cost)
- Interface → forecasting
- Price → supplier capability



↳ can balance them

Expand Strategic Scope
↳ Reengineering

Intrafunctional scope → departments
↳ minimize functional
~~Inter~~ Inter functional →
Inter company → whole company
Agile Intercompany

S
S → M – R
S

↳ need all to communicate

2015

Effective Partnership

⇓

Shared

↙ resources ↘ Information

→ Factors to consider

① Add value
② Improve market access
③ Strengthen operations
④ Add technological strength
⑤
⑥
⑦

Key accounts → merchandise → product → clearance
Occasional buyer ↗ → retail
↘ catalog

→ categories measured for innovative vs functional products

Product life cycle

Contribution margin

Sales forecast error

Product variations

observed stock out rates

[redacted]

Innovation → Buffer inventory
→ Differentiation

↑

unpredictable demand

→ low inventory
Functional ← predictable demand
↘ short lead time

Commodity → low supply risk, low profit impact
↳ priority cost reduction

Bottleneck materials → high supply risk
→ low profit impact
↳ high supply chain delivery

Leverageable materials → Bulk purchase
→ high ~~[struck]~~ profit impact, low supply risk

Direct/Core competency materials → Semiconductor material
↳ long term

Supply chain strategy
vs
~~[struck]~~
organizational strategy

Decisions
- customers & markets
- Tech
- key process
- Sourcing

Prepare for exam
↳ read the book
Concepts should be clear

OM 514 7-9-2025

Previous session

ABC

Inventory classification types
" valuation methods

Stakeholder interests

ABC → Based on value

80/20 rule

A → High Value items
B → Moderate value
C → Low time

FSN

↳ Fast/slow/Non moving
↳ based on consumption rate
↳ efficiency of warehouse
location of product
↳ control for forecasting purposes

Fast → high demand
↳ rapid movement

Slow → medium demand

Non moving → obsolete/rarely used
↳ Stagnent
Stagnent investment

Non moving
↳ consult with engineering team
to see if there is a possible use
for this item
↳ can scrap → can generate some
cash for company

XYZ

look at demand pattern
easy to predict/not/variable

X → Stable demand → milk
Y → Variable demand → seasonal clothes
Z → Highly unpredictable demand
↳ fusion trends

APEX → certifications
↳ ABC + XYZ
Value + Demand

VED

Based on usage
used Healthcare and Manufacturing
Vital → ventilator
Must always in stock
Essential → Needed, alternate exist
↳ gloves
Desirable → Optional items
↳ Can be from manufacture
Sometimes
↳ Vitamins in healthcare

2015

SDE

Scarcity
Availability in Market
Scarce → Imported or rare items
Difficult → limited suppliers
Easy → widely available
↘ Off the shelf
reuse parts
if parts have copy right
↙
cannot use different parts on the machine
Need government approval
~~Part~~ part is single source
~~Distributor~~ Manufacture dont deal with Customer directly
↳ abdul latif jameel for toyota

FSN

↳ who decides demand
If item is one month moving then fast moving
Slow moving → 6 months
Non moving 12 months +
~~Cyclic~~
→ Variable
Oil and gas → yearly consumption
large consumption periods

FSN

↳ dynamic
↳ might be one year fast moving
next year Non moving
↳ upgrade machine
↳ spare parts of retired machine
↙
need to be written off

Consumption need to take care of outliers
↘ ramadan
↘ Hajj
↘ dual engine bird fallin
Strike on plane
Committee FSN decide on what to do with items

~~SDE~~ ABC - XYZ Matrix

AX High value Stable demand
↳ Stable demand
Jet engines → 10 planes 2 engines 2 filters = 20 filters
↳ Semiconductors
Straight forward
AY High value seasonal demand
↳ clothesmen/trend
↳ premium smartphones
↳ Pre order strategy to minimize unknown

1/29/2015

A Z
↳ High value creative Demand
↳ sepcilized turbines
↳ based on order

B X
↳ Predictable demand
Medium value
↳ Lubricants

Criteria used for Classification

Money
↳ ABC

Usage/consumption
↳ ABC/FSN

Criticality / operations impact
↳ VED

Availbily
↳ SDE

Incoterms

- International terms during shipping
↳ determines lead time
International Commercial Commerce terms
latest 2020

Ch → 7 complete

Incoterm
↳ tell us who pay for shipping
Insurance
goods damaged during transportation
when goods transfered or ownership

Incoterm types → FOB (Free on board)

FOB seller take to nearest port
↙ ↘ ↘
huston shanghai hamburg

~~FOB good if deal with one vendor~~

Supplier have strong logistic arm
Supplier sells to single buyer
Foxxcon → Apple
Apple buy company Foxxcon in china on FOB Shanghai
Apple manage shipping from Shanghi to calafornia

29/2015

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Terminator

Artificial Intelligence is here

Tokens

Introduction to large language Models (LLMs)

token is fundamental unit of text

One word is a token

0.75

OM 619 Project

Intro

Literature review

Methodology

Results

Conclusions

10 000 words

↳ 10 to 11 pages

Thesis

Scalability vs Cost

what to select

↙ ↘

Know it | Calculate cost/benefit

Scalability vs cost

CRT

Cognitive Reasoning test

Online survey with bonus incentive

3456 test

↳ 5 pts

① 0.10

weights

80

20

5000 — 0%

2000 — 5%

1000 — 60%

500 — 80%

100 — 99%

Slider

→ my preference

reduce consumer

→ 260 → 0

→ prefered

bat + ball = 1.1

bat

1 + ball = 1.1

ball = 1.1 − 1

0.1

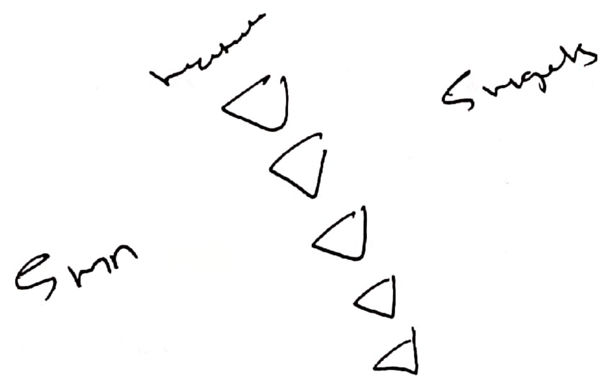
100k to 500k

0.0 − 260 co

more years

90]

10]



100 cars
Same brand model

100   100   100

24
2 ⟌ 48
4

3 boys 1 hour

3 el   6t   2 h

6e

15 longest & 15 less

tall 3x more than short

60 total

3x + 1y = 60

20
3 ⟌ 60
6

OM 530

Ch 3

Supply chain drivers & metrics

~~[illegible]~~

- Financial drivers

6 drivers

Inventory

transport

$$ROE = \frac{\text{Net Income}}{\text{Average shareholder Equity}}$$

Return on Equity

↳ shareholder equity

ROA

Return on Assets

Avg shareholder equity

$$APT = \frac{\text{Cost}}{\text{accounts payable}}$$

Accounts payable turnover

~~[illegible]~~

C2C → cash 2 cash cycle

Avg inventory turns

↳ 2 → inventory restock 2 times

High average operating margin

↳ innovative products sold

Lost sales

↳ sales did not materialize

Markdowns

↳ discounts

Framework SC Decisions

Logistical drivers

- Facilities → product stored, assembled
- Inventory
- Transportation

Cross functional

- information
- Sourcing
- Pricing

Facilities

↳ production sites/storage sites

↳ more responsive more facilities

more flexibility

more flexibility

2015

OM 530

Ch 3

Supply chain drivers & metrics

~~[illegible]~~

- Financial drivers

6 drivers

Inventory

transport

$$ROE = \frac{\text{Net Income}}{\text{Average shareholder Equity}}$$

Return on Equity

↳ shareholder equity

ROA

Return on Assets

Avg shareholder equity

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Accounts payable turnover

~~[illegible]~~

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Framework SC Decisions

Logistical drivers

- Facilities → product stored, assembled
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Cross functional

- information
- Sourcing
- Pricing

Facilities

↳ production sites/storage sites

↳ more responsive more facilities

more flexibility

more flexibility

Facility

↳ Manufacturing is included in facilities

↳ more facilities more cost

↳ more inventory cost
decrease transportation costs

grossery shop
↳ more facility

facility include location

↙

where should be
Crent factory be

Mille — Capacity
Cheese ↳ excess capacity
oil — more costly

Demand Allocation

- capacity
- utilization
- quality issues
- product cat per unit

Inventory

↳ crucial

↳ finished goods

↳ more inventory ⇒ more responsive

⇒ ↳ more holding cost

Perishible products

Through put

$I = DT$

↙ ↓ ↘

flowtime — demand — Through put

Components of inventory

↳ cycle inventory → inventory case between shipments

↳ safety inventory

↳ seasonal inventory → cost on additional inventory

↳ level of product availability

↓

is it possible to change product
(flexible production)

Sourcing

↳ when internal when external

↳ logistic outsource

↳ innovation their own

↳ manufacturing outsource (Foxconn)

OM514 9-Sep-2025

ch 2 in 9th edition
finish ch 1 and 9 in 8th edn

Inventory Management
classification

ABC - XYZ matrix

AX
↳ long term agreement
↳ strict quality control
↳ premium grade lubricants

AY → dual sourcing
↳ buffer stock
↳ flexible agreements
↳ customizable spare parts

AZ → unpredictable demand
↳ purchase on confirmed orders
↳ subsea equipment

INCOterms
↳ transportation terms
↳ risk transference

FOB Free on board
- seller offload on ship/port
- only applicable to port/sea transportation

DDP Delivered Duty Paid
↳ ecommerce
↳ alibaba
↳ risk to seller
↳ send to door step
↳ handle everything
↳ shipping / insurance / customs / duties

EXW Ex Work
↳ seller have in warehouse
Buyer come and pick up
↳ opposite of DDP

CIF (Cost, insurance, Freight)
↳ pay for shipping, insurance → seller
↳ less transit risk
↳ Bangladesh → Hamburg Port → get product
seller

Insurance → due to piracy

FCA (Free Carrier)
↳ same as CIF but for planes

Incoterms

Control over logistics
↳ apple want control over shipping costs, carriers and reliability

Customs complexity
↳ DDP
↳ everything seller does

Risk Managment
↳ CIF → fragile, High value
↳ seller does insurance

Cash flow
↳ tight budgets
↳ EXW or FOB

Incoterm 2020

Air transport
↳ speed over the cost
↳ High value, urgent, Perishable goods

Qatar airways case
2 australia flights

Sea
↳ large, heavy, bulk shipts
2021 → ship blockade
↳ slow

Road Transport (Trucks, Vans)
↳ flexibility
↳ door to door
↳ ecomerce + Food delivery

Multimodal
↳ distribution
↳ air, sea, trucks

Rail
↳ conjested
↳ good for Heavy cargo

Risk Managment in SCM
↳ war
↳ cathersuphy
↳ change in laws (Not in our control)
↳ tax
↳ tarrifs
↳ sanctions
↳ stockout

- Supplier Risk
  - supplier fail to deliver
    - natural disasters
    - strikes
    - factory shut down
- Transportation Risk
  - delays or damage in transit
- Demand risk
  - changes in demand
    - economic downturn
    - consumer trends
    - preferences
- Financial Risks
  - cost/currency ~~fluctuations~~
- Regulatory risks
  - new laws

first assignment
- research paper
- 1 article
- other sources up to you

discuss on sunday

OM511

Buenos Noches

Bienvenidos a la clase
(welcome to the class)

Nelson sporting

Regular Models R
Catcher Models C

~~Raw hours of production~~

	Cutt	Finish	Packg	
r	1	1/2	1/8	5 $
c	3/2	1/3	1/4	8 $

$5R + 8C \geq MAX$

$C/S \leq 900$

$f \leq 300$

$Pk \leq 100$

$1R + 3/2 C \leq 900$

$1/2 R + 1/3 C \leq 300$

$1/8 R + 1/4 C \leq 100$

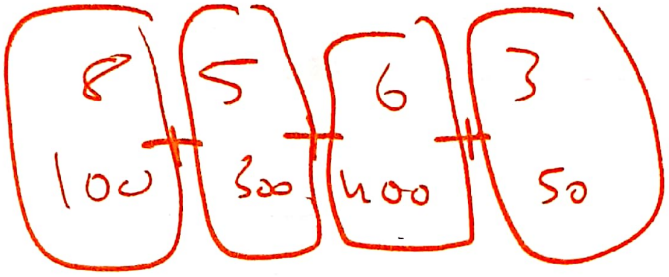
8 (C) + 5 (R) ≥ MAX → green

yellow

$\frac{3}{2}C + 1R \leq 900$

$\frac{1}{3}C + \frac{1}{2}R \leq 300$

$\frac{1}{4}C + \frac{1}{8}R \leq 100$



$(8 \times 100) + (5 \times 300) + (6 \times 400) + (3 \times 50)$

$= 800 + 1500 + 2400 + 150$

1500
800
2300

2300
2400
4700

4700
150
4850

~~8 * 100~~

$(8 + 100) * (300 + 5)$

$108 * 305$

4
305
108
2440
000x
305xx
32940

OM 530 ch3

Inventory

How much we should order
at what time
what quantity
what is the cost
what is lead time
what is holding cost of product
~~how~~ many types of products to store in one location

based on demand
based on supply

$I = DT$

Flow time — Throughput — demand

entry to exit from supply chain

Seasonal Inventory
↳ Jackets
↳ when to produce → Before the season

Safety inventory
↳ if demand is unknown
↳ additional inventory for ~~item~~ items to not stock out

C2C → cash 2 cash

C2C
↳ time it takes from when company Buy raw materials to time it receives money from customer

Basf ~~Hardwood~~ Verbund system

Dollar 12 EL

Transportation

Multimodal transport
↳ china to saudi to egypt to europe

Consolidation points
↳ one truck divided into

Supply chain Hardwood Business Institute
Hardwood Business Impact

HBR register

Information
↳ help in company

help → can also have fixed costs like machines, softwares, additional people to manage systems, downtime

Info related metrics
↳ forecast horizon → how much to set

015

Demand Planning

Sales and Operation Planning

Sourcing
- ↳ outsourcing → warehousing → logistics
- ↳ in house → design, R&D
  - ↳ New product development

OM 514 14/sep/2025

Assignment 1 Reaction Paper Toyota JIT Manufacturing

Reaction Paper
↳ your thoughts on paper

Summary 25%

Reaction
↳ your thoughts

Comparative case
↳ any example similar case where they implemented lean or JIT

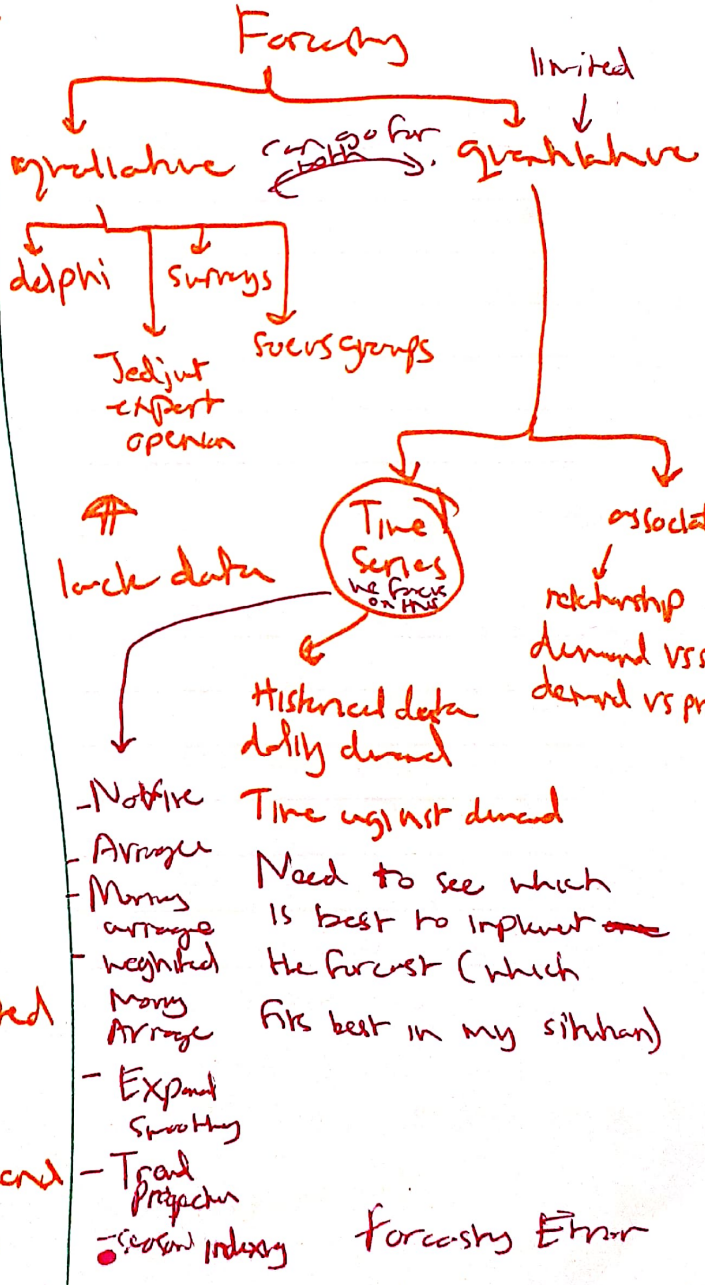
2 pages dont go beyond 12 lines new roman double spaced
PDF Sep 28 12AM

Practical sessions

Forecast
Product
Forecast demand
Sales

Planning tool

Can be very useful or not useful



- Naïve
- Average
- Moving average
- weighted Moving Average
- Expand Smoothing
- Trend Projection
- Seasonal Indexing

Naive

↳ what happened in past will happen in future

- need to make an educated guess

time horizon → the shorter the better

Average

↳ if data is stable go for average

↳ if spike then problem

Moving Average

↳ specify time window don't take all values in average (similar to average) take recent values

↳ need to choose data points

3 periods

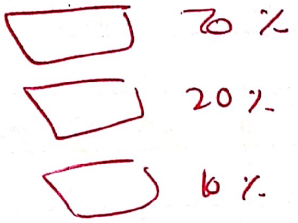
4 periods

take recent 3 data points to do average not all data points

Weighted moving average

moving average but recent points take more weight

3 points



Exponential Smoothing

↳ incorporate all data but old data ~~is~~ weight is going close to zero

$F_2 = F1 + Alpha(Actual1 - Forecast1)$

Incorporate error into my error

Alpha → constant value

↳ 0 and 1

higher alpha

↳ higher weight for most recent points

↳ 80% last point

20% all other points

MAD

MSE

$5x_1 + 6x_2 + 4x_3 + 8x_4 \Rightarrow MAX$

Objective function

→ $60x_1 + 40x_2 + 30x_3 + 15x_4 \Rightarrow MAX$

⇒ Revenues $60x_1 + 40x_2 + 30x_3 + 15x_4$

Meat	$1x_1 + 0.2x_2 + 0.3x_3 + 0x_4 \leq 50$
Veg	$0.5x_1 + 0.2x_2 + 0.3x_3 + 0x_4 \leq 60$
Sauce	$0.2x_1 + 0.1x_2 + 0x_3 + 0x_4 \leq 15$
herbs	$0.01x_1 + 0x_2 + 0.03x_3 + 0x_4 \leq 5$
Tahini	$0x_1 + 0.25x_2 + 0x_3 + 0x_4 \leq 5$
olive oil	$0x_1 + 0x_2 + 0.2x_3 + 0x_4 \leq 10$
honey	$0x_1 + 0x_2 + 0x_3 + 0.1x_4 \leq 10$
nuts	$0x_1 + 0x_2 + 0x_3 + 0.2x_4 \leq 10$
pita dough	$0x_1 + 0x_2 + 0x_3 + 0.2x_4 \leq 15$
directions	$0x_1 + 1x_2 + 0x_3 + 1x_4 \leq 20$
restrictions	

Falafel and Shakshuka not more than 20

03 → slide 13

JIT Paper

↳ Basic principle of cut cost by reduce inventory level

toyota well off after pandemic due to lessons learned before 1th 2011

Current companies can learn from toyotas resiliance

Toyota expanded in 70's reputation of low cost fuel efficient and reliable

TiT → have all parts at ~~assembly~~ manufacture plant just in time for use

↳ control timeliness of product and delivery of products

less raw materials and WIP inventories, less defects, stabilize

Product, simple production flows, create flexible workforce

raw material reduced to zero, deliveries small quantities

2011 tsunami → damage car plants but suppliers more affected

one company made large semiconductor that affected that

made many systems of car

Toyota recognized the need for strategic change when it encountered

significant problems when big disasters hit

Covid 19 → ~~Chip~~ chips demand grown in past decade

advanced chip manufacturing done by few manufacturers

Suppliers provided & produced in bulk

Chips/products held by denso part suppliers

toyota → lean strategy → get parts from part suppliers

Suppliers will have stockpiles like denso

2021 Sales 7 billion

Solution of toyota

↳ ensure suppliers buy raw matrl in bulk

↳ JIT good or bad

→ Problem → distribution of small but crucial parts

→ need to know which part is important and crucial

bcoz important ones

Companies need to adapt to changes in markets by changing strategies / playing by different rule books

↳ lean strategy

identify new essential capacity, choose suppliers business that can fulfill those positions, check (financial continuity plan) so supplier keep ↑ brave inventory for long time

toyota pay for additional inventories held by company

SAP Dual Study Program

15-9-2025

Intro to SAP
Digital skills center
Sap dual study program
Next steps

Career 23
Sap sf

SAP
↓
Software company

SAP → started with erp

Big companies use SAP

Need to be aware about SAP

SAP evolved with ERP
↳ different solutions
workflows

KFUPM Portal

SAP Business Suite
↳ finance Agents
Spend agents
Supply chain agents
HR agents
CX Agents

Eco system
Industry specific
Business transform

Financial
Spend
SCM
HRM
Customer exp

Cloud ERP

Business Data Cloud

Analytics Cloud

SAP AI

SAP professionals Job markets

AI training

Digital Skills Center
↳ regional team
Started in 2012
Program is free of cost

Dual Study Program (DSP)

↳ 3 days
↳ 9 to 6

Young Professionals Program

↳ doIT

Uni Students
Tech Business Talents
Self study
long Period
Virtual checkin
Participation diploma

Processes
Business data cloud 40
AI 20

Learning Hub – Student Edition
2 SAP certification Attempts

Tech/Business Talents
In first academic year/in months

① training
Business Processes SAP Dual Study Program
↳ Wearhouse
↳ bikes company
End to End

Access provision invites

↳ University email

② Business Data cloud
Data and visulize data for data analytics

3 days 40 students
↳ Virtual Bootcamp
Trainer support
Digital skill
Participation Diplora

③ AI Developer
↳ Structure

Online registration
↳ sep 25
assist → sep 26 to oct 9
Virtual training oct 27, 28, 29
Virtual checkin nov 19
learning Journey Dec 14

Test
↳ General test top 40
5 min

Next steps

form

types of questions in test

- Math
- Vocab
- logic questions

No write anything

test 26 to 9 oct

API

language models

Is the 40 spots for virtual training or for the online browser training

overview of processes of SAP

all processes → HR

→ seller

9 - 6 → 26, 27, 28 oct

Next up

follow up email

Next steps

form

types of questions in test

→ Math

Vocab

logic questions

No write anything

test 26 to 9 oct

API

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Is the 40 spots for virtual training or for the online browser training

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9 - 6 → 26, 27, 28 oct

Next up

follow up email

OM 530 16-Sep-2025

Pricing

- Amount to charge customers for goods and services
- IF immediately giving product might be more expensive
- objective to increase firm profit

Pricing / economies of scale
- How to price appropriately to reflect economies of scale

Every day low pricing vs High low pricing

Fixed price vs Menu pricing

Pricing metrics
- Profit margin

Mid term cover (Ch 1, 2, 3, 4, article 1)

7-11 → 11,000 stores
global 83000 stores

OM 514 16-Sep-2025

Qualitative when to use
↳ apple products
↳ give ~~for~~ to people around the world get feedback and modify product
↳ doing benchmark
↳ sampling
↳ panda new product Sampling

Forecasting error
↳ can use for any forecasting method
↳ keep track of forecasting error

Forecasting is dynamic

Trend — FIT — Double exponential smoothing
↳ gradual change / steady change
↳ upward or downward

if there is trend (Gradual change)
↳ all previous not take trend into consideration
if there is trend → go to FIT
the steeper the line the more trend

~~FIT~~

Alpha (AI) + (1 - Alpha) * (FI + TI)

Trend projection

y = intercept + slope(x)

↳ rate of Change

+ → upward

− → downward

high + → upward steeper

less → not steeper

OM 511

Linear Programming

Integer programming

Shortest Route Programming

LP formulation

60x3

80x3

Maximize $\sum a x_i$ obj function

Constraints $\sum a x_i \leq b$

Some problem can be Maximize or Minimize

	Capacity	Crew	Truck
Standard	300	7	40
Basic	500	2	60

excel developed in University of Austin

$$\text{Max} = 300x_1 + 500x_2$$

$$7x_1 + 2x_2 \leq 180$$

$$x_1 \leq 40$$

$$x_2 \leq 60$$

Excel can't do non linear

Studies  Investigation Analysis Report

Cases 

180 → 180 wolves can be lost

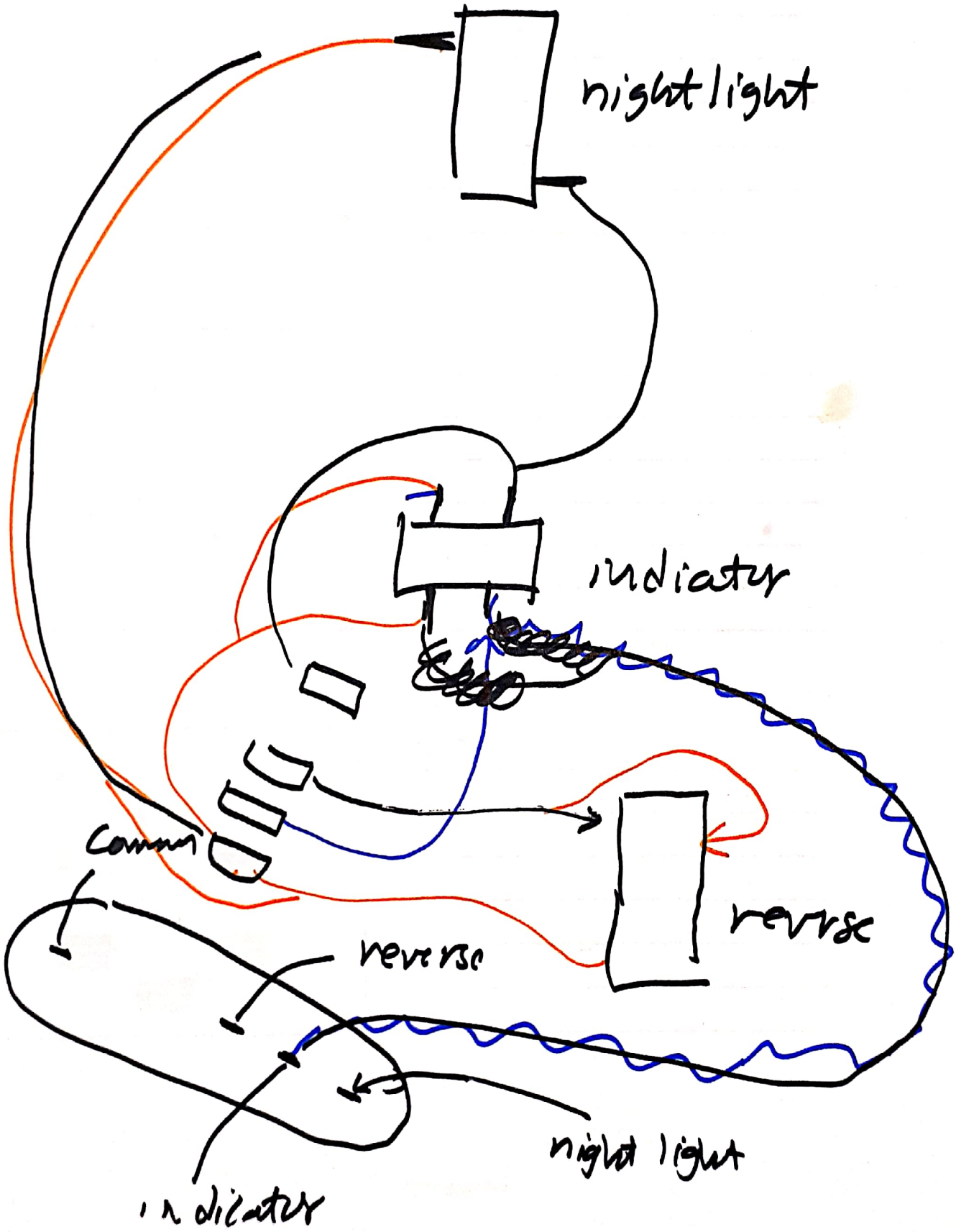
↑ 5% chance survival in litter

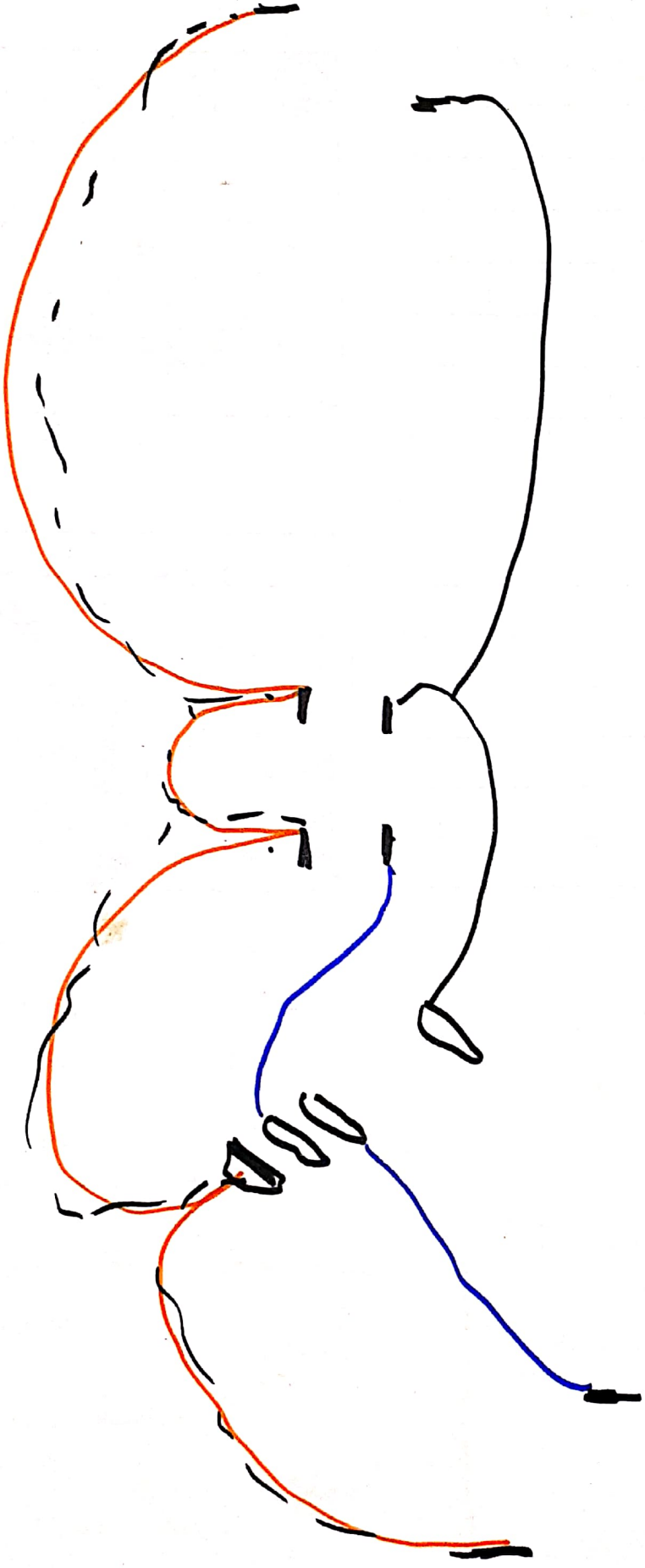
150 % → too weak

Population loss after 3 more months

Month 1

grams / day / wolf


night light
indicator
reverse
reverse
night light
indicator



9/2015

OM530 ch 4

7-11

Many stores in Japan, Korea, USA, Taiwan

83 000 stores gollobally

Sell → beverages
fresh food
hot food

facilitate one distribution point
~~[illegible]~~ serving 100 stores in local area

50+ years

have grown massively

7-11 do
↳ accounting
↳ merchendise dvelopt
↳ 80% utilities ordering system
↳ charge 4% of Profit to business

Students work in stores

New area strategy
↳ open 50-60 stores near distribution center

each store carry 5000 units
3000 tailored to local area

4 categories of food
↳ processed
↳ fast food
↳ lunch boxes
↳ bakery
↳ pasta

also provide services
↳ ATM
↳ recharge Subway card
↳ photocopy
↳ parcel pickup

7 11
↓ ↘
7am to 11 pm
but some shops run 24-7

first to initiate POS terminal system

~~Point of sale Retail Delivery System~~

High Responsiveness
↳ in 1974 → 70 trucks per day
↳ in 2006 → 9 trucks per day

Real time pos update the inventory automatically so store owner doesnt need to worry about inventory

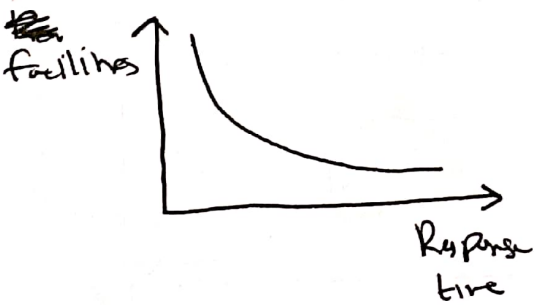
Ch 4

Designing Distribution Networks

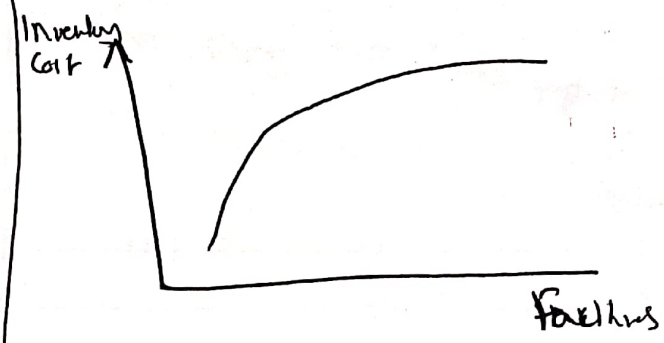
Distribution
↳ last mile delivery

How much customer can wait for product
↳ response time
↳ product variety
↳ product availability
↳ customer experience
↳ Time to market
↳ order visibility
↳ Reliability

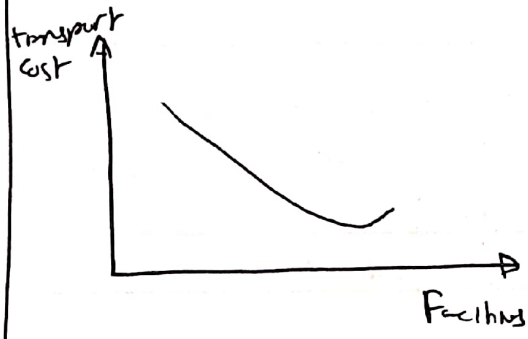
Supply chain effects
- Inventories
- transportation



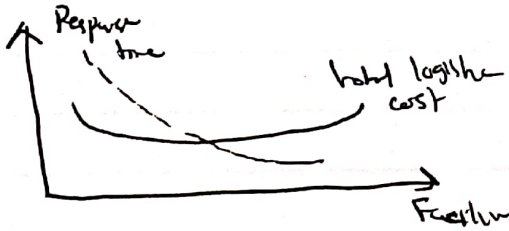
more facilities → response time less
less facilities → response time more



less facilities less inventory cost
more facilities more inventy cost



at certain point transport and facilities will be optimal
↳ need to optimize



OM 514

Can bring one question from JIT case of toyota

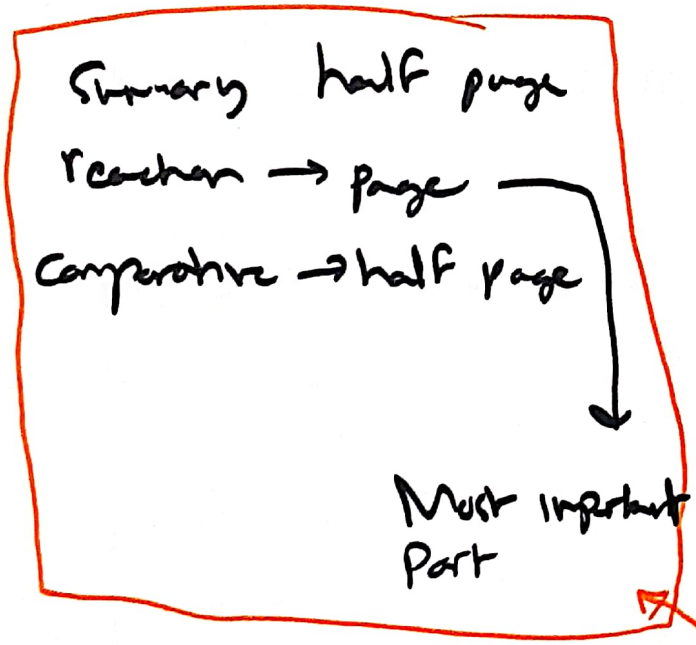
Bring case

had to change it due to change Strategy

↙

tomf
India
China
Vietnam

Submission sep 30 12 AM



No one size fits all
Simple
complex

Fast slow
weekly

forecasting error → important

↳ More error less accurate

Not only straight forecast

↓

need also industry expert

Forwarder & estimator give very expensive rate

Risk Managent in gobal supply chain

Inventory managent risk

- Stock out
- over stock
- holding cost
- Demand fluctuation
- laws / regulation change
  - ↳ fast changes
  - ↳ need to understand laws of manufacture country

Overstocking

High holding cost
wastage
obsolence

Stock out
↳ lost sales _ unhappy customer
↳ reaction paper ~~Strategy~~

Demand uncertainty
↳ How much customer buy

Supply chain disruption
↳ Natural disasters
↳ geopolitical issues

Main Risk Response Strategies

Risk avoidance

↳ practically impossible
↳ evaluate risk
↳ change strategy
↳ Zara produce in small quantity to avoid excess inventory

Risk Mitigation

↳ reduce impact
↳ multiple suppliers

Risk transfer

↳ insurance
↳ shift inventory to other facility
↳ carrefour renting shelfs in stores

Risk Acceptance

↳ accept % of lost/damaged product
↳ lost apple, bananas that got damaged

Rather to gain
dual sourcing
source A, B, C

Cheap electronics / clothes
Not don't work

Ex
↳ KODAK film
KODAK future failed
to innovate for digital film

Digital → developed by Kodak in 1975

Can accept stock out for some products → Small products

Stockout Avoid → use ML/AI tools to improve demand forecasting

Dior bags → limited sales due to scarcity

After Natural day
↳ do Procurement

1, 9, 7
↳ new edition

Inventory turnover

↳ how many time inventory turn

more turn → more efficient

less turn → less efficient

usually 1 year period

$$\text{Inventory turnover} = \frac{\text{Cogs}}{\text{Avg inventory}}$$

tell you how efficient company is

Important due to

efficiency → are we turning stock too slowly

Benchmark

↳ compared to other companies

Cash flow

↳ fast turn = quicker cash flow

Decision making

↳ Quicker
- Purchasing
- pricing
- pricing

Cogs = 1000 000

Avg Inv = 200 000

$$\text{Inventory turnover} = \frac{1000\,000}{200\,000} = 5$$

↙

healthy or not

depend on industry

if average industry is 8 → you are too much stock

if industry average is 3 → you are more efficient than competitor

Non moving → can loose it from avg inventory leading to higher inventory turnover

gives a more clearer picture of inventory

/29/2015

A1 Bank restaurant adv budget = 160000

$T + R + g =$

$65T + 50R + 80g = MAX$

T R G

246153.85T + 32000R + 200000g = MAX

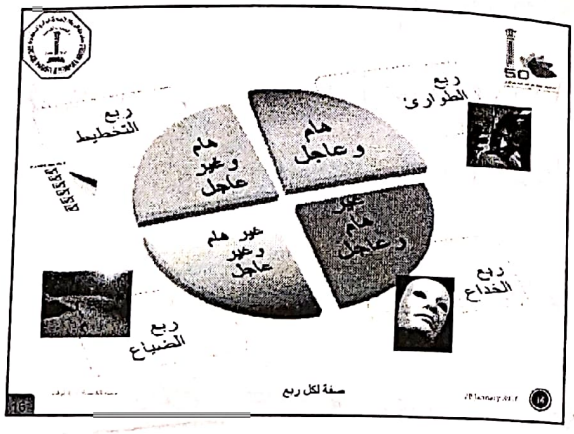
T R g

1 [T ₹ ≤ 64000

R ≤ 64000

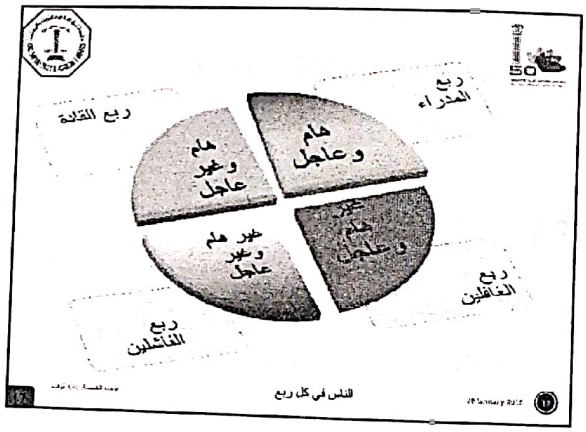
g ≤ 64000

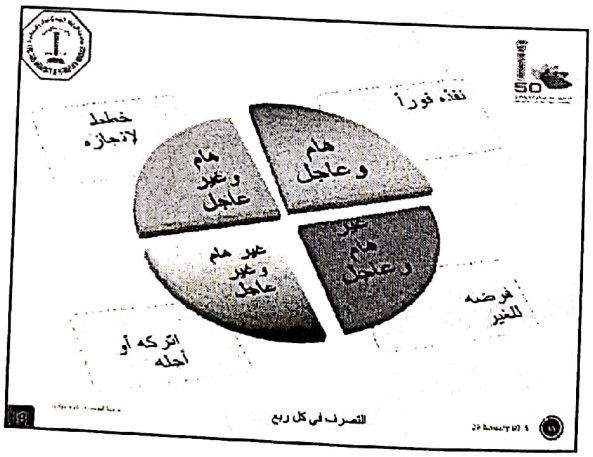
-T R ≥ 0



ad budget = 160 000

64000





~~R ≥ T~~

R − T ≥ 0

/29/2015

$$0.65t + 0.5R + 0.8g = \text{MAX}$$

$$t + R + g \leq 0.25$$

$$-t + R \leq 0$$

$$-R + g \leq 0.3$$

$$246153.85t + 320000R + 20000 = \text{MAX}$$

640000

533333.3

15

$$65t + 50R + 80g = MAX$$

$$1t \leq 640000 \quad 40\,000$$

$$1R \leq 640\,000 \quad 40\,000$$

$$1g \leq 640\,000 \quad 40\,000$$

$$-t + R \geq 0$$

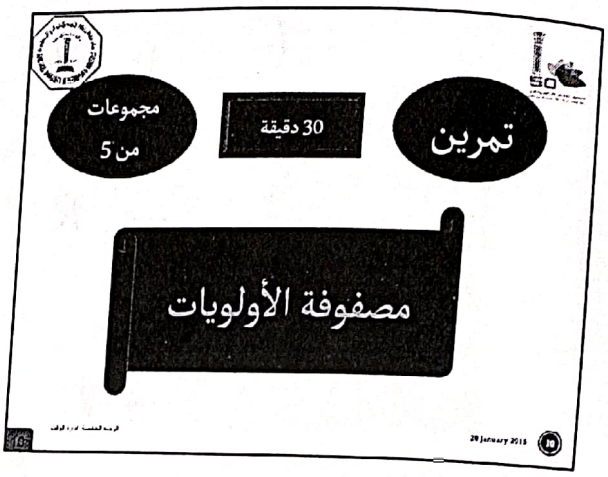
$$-0.3R + g \geq 0$$

6.4
6.4
6.4
6.4

0.3

53,333.3

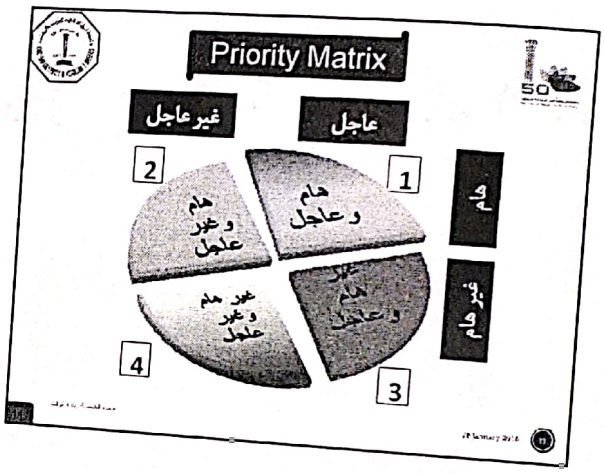
1100 00 00

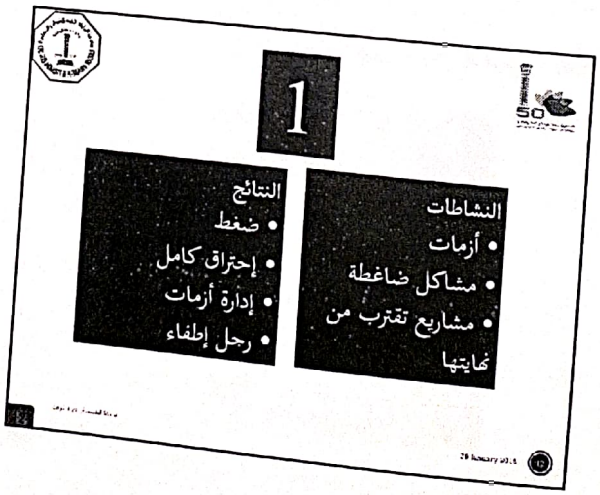


$$g \geq 0.3R$$

$$-0.3R + g \geq 0$$

$$\therefore -0.3R + g \geq 0$$





$$\frac{160000}{0.25} = 640000$$

$$160000 - 640000$$

$$96000$$

29/2015

OM530

Mid on blackboard

6 types of distribution network

Why distribution network
↳ move product from manufacture to retailer

Walmart
↳ online 2015
↳ retail + online

Distribution
↳ steps to move product from supplier to customer

Time to market
↳ time taken to get into store

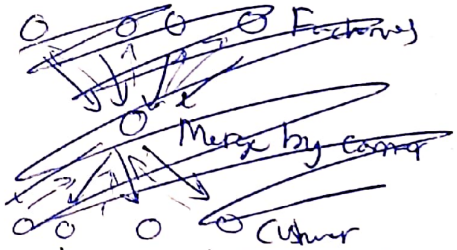
2-1 1
↳ negative → product variety will be less
↳ positive → product availability
→ high response time

Sourcing pricing
on strategic level
Distribution network

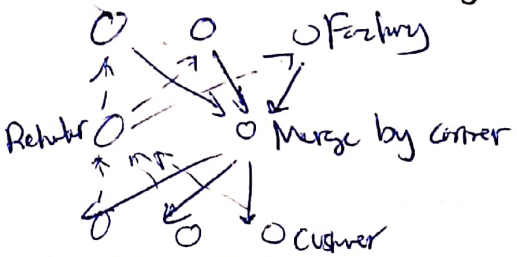
Design options for DN
direct shipping
or have intermediatary

Manufacture Storage with direct Shipping Network
demand low product rate high
- Inventory → lower cost due to combination of item
- long response time → customer and manufacture are far away
- Product variety → high can also be custom made
- Product availability → is always available
- Time to market → always available due to online, if available put online
- Returnability → expensive

Intransit Merge



demand low product rate high

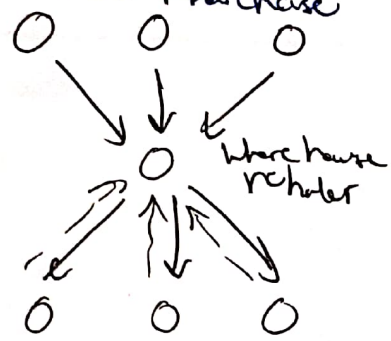


Inventory → Similar to direct shipping
Transportation → lower cost
Response time → higher (due to delays) long time

3

Distributor Storage with carrier delivery

Medium warehouse



response and effiunt

Current factory

Need more inventory

Transport is lower

Facilities and Handling → higher

Info → low (just keep product in storage)

response time → faster than manufacture

Distributor Storage with last mile delivery

↳ sent to customer who will use product

Tefal online → doesn't have physical store but contract with extra to send product to customer house

Inventory → Higher

Mid → 7 out

53 Students

role of supply chain pricing

3 written

16 - mcqs

Midterm until today

until Slide 14

Hier case

TCL Case → given in exam paragraph

No calculation mathematics

OMS14 28-Sep-2025

Purchasing & procurement

↳ transactional, RFQ, day to day activities

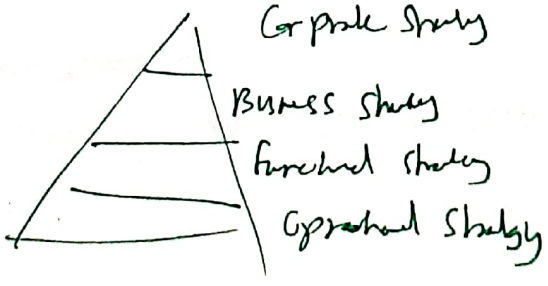
Procurement → negotiation

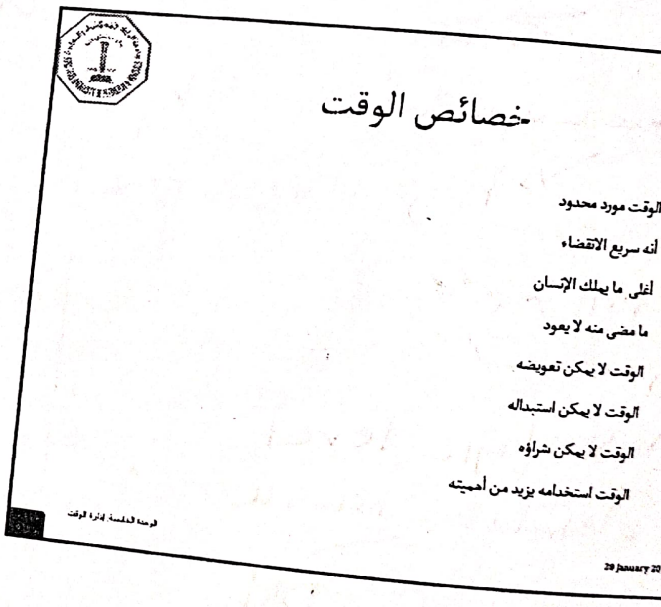
↳ beyond day to day activities

↳ more strategic

Purchasing ⇒ foundation of supply chain performance

Strategy is important for procurement





Incoterms
↳ JIT ↳ DPP

Corporate → finance
→ maintenance

Walmart

Vision → save people money so they can live better → customer centric

lowest price vs passive

Business Strategy
↳ cost leadership, operational excellence, customer experience
↳ long term agreement

Invest in their suppliers to make better products

Supply chain Strategy
↳ Efficient supply chain, JIT, global sourcing

Procurement Strategy
↳ category management
↳ lead multi source

Category Strategy

Supplier ecosystem

Business
Supply chain
Procurement
Category
Supplier

Apple case

2011-2012 → apple prepaid 3.9 billion to Samsung and Toshiba for flash memory chips

Procurement strategy = Market Dominance

Sabic
↳ 12 companies

Previous 12 procurement now shared services

- Leverage bulk buying
- Standard supplier contracts

Effective purchasing

Purchasing
↳ one item

Procurement
↳ analyze needs
↳ negotiation

Purchasing → process of acquiring goods, services, and works from external sources to meet org needs

decreases purchase is more efficient than increase sales price

Purchasing objective

- Continuous supply
- right quality
- cost efficiency

OM511

Max 5 members

willing to provide data

confidentiality is issue

go to public authorities

world bank

kaggel

~~OECD~~ OECD

↳ get data through it

Saudi general authority of statistics

Shortest Route problem

3 - Sensitivity Analysis

~~Set~~

general/specific obj

↳ Maximize

Minimize

last submission Nov 20

Analysis

Model

Nov 2

Dec 8

Implementation

results

Conclusions

phase 1

↳ methodology

↳ and approach

↳ data

1 - 5 } 5 final exam

Sensitivity Analysis

How change in one variable effect other variable

Dubai

1000 — 20%

800 — 30%

500 — 60%

300 — 80%

Change objective funct

↳ Reduce price

Change constraints

↳ Shadow price

Sensitivity analysis important

- prices of raw material changes
- Dynamic environment

Range of optimality

↳ range on which objective func is optimal

More responsive to market trends
deliver faster products
Provide less expensive products

~~Project~~

Exam OM530
Previous exams
advantage & disadvantage
drop shipping model

- role of proc. in supply chain driver
- Strategic fit

Things for homework
Usually don't keep
Backtracking ophers

- Supply chain strategy
align with company
- SC drivers impact
- how SC can relate to more profit
  - ↳ individual dept
  - ↳ how SC impact overall organization

Cases
- their case
  - distribution cost
  - ↳ apply to Saudi company

Aramco, Sabic

MCQs on blackboard

Bring laptop

3 Sentences answers
↳ 2 or one lines
to the point

Distribution Network

OM530 ch 4

Distribution networks

Manufac/distributor Storage with customer Pickup
↳ curbside pickup with online ordering network

- keep extra staff for grocery sorting
- advantage for retail → more efficient as 50 orders can be divided into 3 hours instead of 50 people come to store at one time

High facility holding cost

Retail Storage with Customer pickup
↳ high inventory cost
↳ 7-11, grocery store, panda

customer go to store and buy product

~~Scandinavia~~

OM514

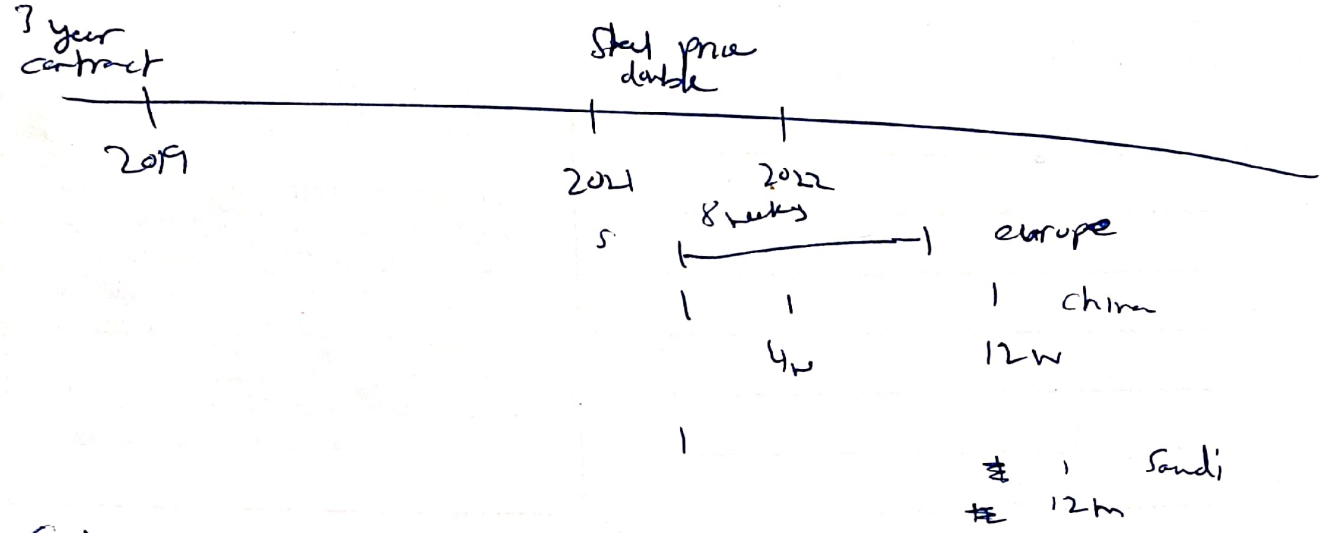
xye

group 2

local not exact

europe

china



Contract with EU is finishing

Better to

do contract 2 months down to normal

do additional 1 year contract and invest in Saudi

Centralized Procurement

ASML → source combine all different business operations

Decentralized Procurement

↳ don't have control

Strategic Sourcing and category manager

↳ recent 20 years

↳ for centralized Procurement

Strategic sourcing

↳ not long term agreement

↳ don't limit yourself

↳ see latest data availability

Category management

↳ group purchase category

IT

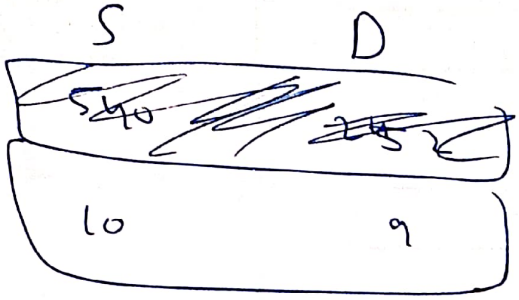
raw metal

logistics

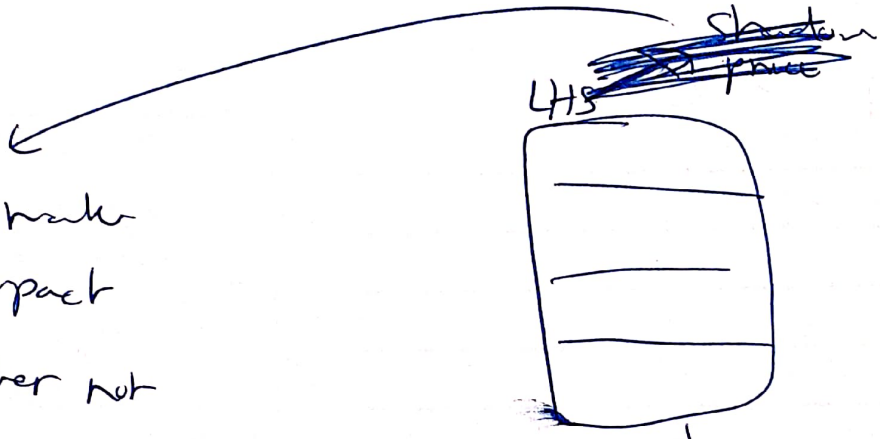
OMS 11

Reduced cost

↳ change in coffients



← reduced cost



high value
more impact
cost → higher not good

Binded

If not varying
affected Shadow
price is zero

Which is binded
constrained

the shadow price is zero

Increase
Limit in
RH will
increase obj
by Shadow price

r h

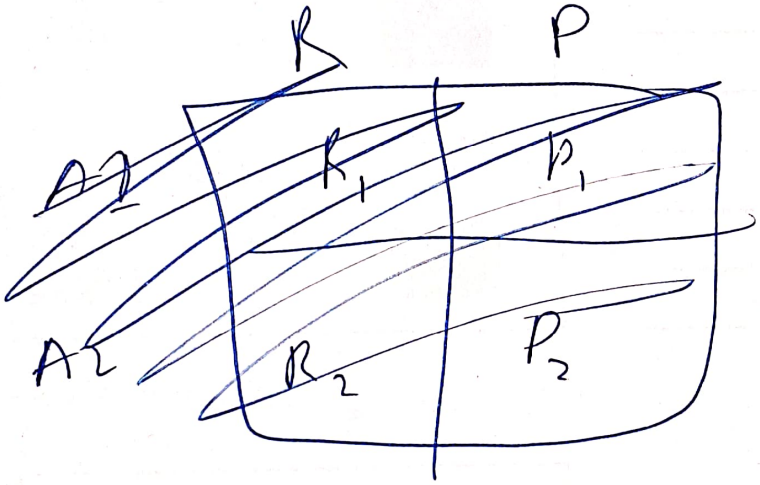
$800000r + 500000h$

R1: gallons C1 used for R

P1: Gallons C1 used for P

R2 gallons C2 used for R

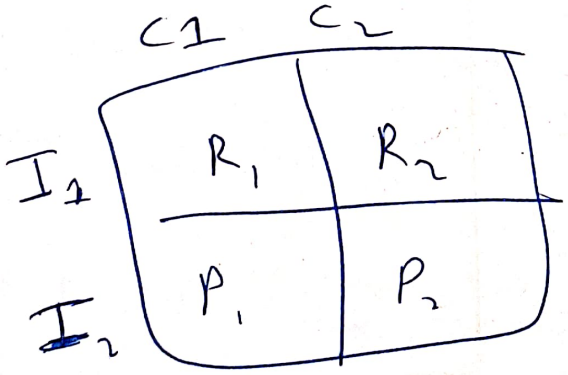
P2: gallons C2 used for P



Mid blackboard

Mcq

excel 1 file



1/29/2015

for Dr. Jesus Igor

. Date of Submission

Saturday October 2 2025

تمرين 1

سمية عثمان فتاة في الرابعة عشرة من عمرها وهي وحيدة والديها – وهبهما الله إيّاها بعد خمسة عشر عاماً من زواجهما– تعاني من فشل كلوي وبحاجة إلى عملية زراعة كلية. وهي حالياً تجري عملية غسيل للكلية مرة كل أسبوع وذلك حتى تتم زراعة الكلية لها.

وحالتها في تدهور مستمر، وهي تناشد أصحاب القلوب الرحيمة من أهل الخير والعمل الصالح لمساعدتها في محنتها هذه بالتبرع مما تجود به النفوس انطلاقاً من قول الرسول الكريم عليه السلام (من فرج عن مسلم كربة من كرب الدنيا، فرج الله عنه كربة من كرب يوم القيامه).

C

$r > 0.4$

$r < 0.5$

تمرين 1

مرض ارتفاع ضغط الدم من أوسع الأمراض العصرية انتشاراً بين عموم الناس وفي جميع طبقات المجتمع وما زال تعامل كثير من المرضى يفتقر إلى الوعي الصحي وأسلوب العلاجي المبني على الأسس العلمية. وهناك خطوات بالغة الأهمية أثبت العلماء جدواها في الحيلولة دون استفحال المرض وكذلك في التخفيف من وطأته، ويوصي الأطباء بضرورة أن يتبعها مرضى ارتفاع ضغط الدم قبل مباشرتهم العلاجات بالأدوية والعقاقير وهي:

1. الابتعاد عن الانفعالات والتوترات العصبية
2. الانتظام في ممارسة الرياضة المعتدلة مثل الهرولة.
3. التخفيف من وزن الجسم
4. التوقف عن التدخين والاقلال من تناول القهوة.
5. تناول طعام صحي متوازن

B

تمرين 1

أحس أحياناً أنني أريد أن أطير.. أن أذهب إلى أماكن لم يذهب إليها أحد من قبل..

جميل أن أتوهم .. جميل أن أحلم . جميل أن أتخيل فلا أستطيع أن أعيش دون الخيال والوهم والحزن، فكلها ذات فائدة..

أنها الأشياء الوحيدة التي تجعلني أشعر أكون محتاجاً للراحة.

وعندما أكون منفعلاً، فإن أفضل ما أفكر به هو الجلوس أولاً، ثم أفكر بطبيعتي كمفكر في أشياء لم تخطر على بال .....أكثر الحالمين

D

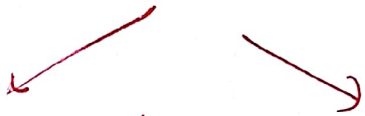
Review

Distribution → steps taken to move and store product from supplier stage to customer in supply chain

Drives profitability by directly affecting SC cost and customer value

Choice of distribution network can achieve SC objective from low cost to high responsiveness

Factors of Distribution Network design



Value provided to customer

cost of meeting customer needs

Profitability = revenue from customer needs + network costs

factors affect distribution network design

Response time → how quick customer receives order after placing it
→ Amazon next day shipping → Speed

Product variety → Alibaba many products available
→ range of products available to customers

Product availability → Pepsi available all around the world
→ Constantly meet customer demand without stockout

Customer experience → Apple online, UI UX
→ Satisfaction by order accuracy
ease of ~~delivery~~ accuracy
ease of purchase
delivery reliability
Service support

→ Zara fashion supply chains → few weeks to market

Time to Market → How fast new products are made available to customers

→ Fedex allow to track orders

Order visibility → ability of customers to track and get updates on their orders in real time

→ Nike simple product returns

Returnability → How easy and efficient it is for customers to return products if needed

Inventories → more Warehouse increase inventory costs

Transportation → cost depend on number of facilities

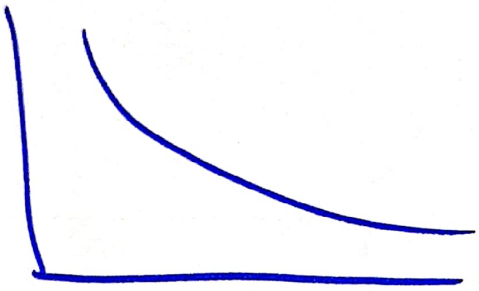
→ few warehouse
less facility cost
high transportation cost

→ large warehouse (inverse)
high facility cost
low transportation cost

→ Amazon fulfillment centers close to cities to reduce transport cost

Information → more IT invest / Data sharing
lead to more coordination and efficiency
but more tech cost

Num facilities

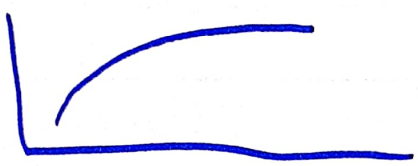


Response time

Fast response time → more facilities

low response → less facilities

Inventory costs

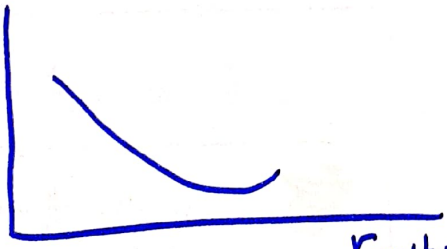


Facilities

less inventory costs → less facilities → low response

more inventory cost → more facilities → fast response

transport cost



Facilities

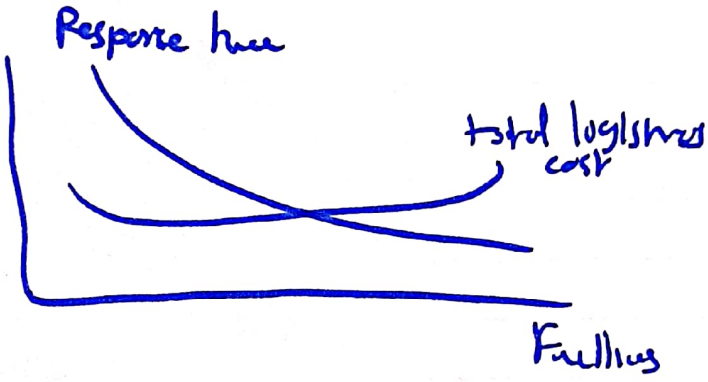
Few facilities → more transport cost → Low response time few inventory costs

large facilities → less transport cost → High response time more inventory costs

more large facilities → transport cost begin to rize → High response time but may be less efficient more inventory costs

less facilities → less facility costs

More facilities → more facility costs



logistics cost = Inventory + transportation costs + facilities cost

More facilities → Faster response time

Less Facilities → Slow response time

Moderate facility → Balance costs
→ lowest logistics cost

Too many Facilities → transport cost increase again
→ High facility & inventory cost
→ Very fast response but expensive

Manager needs to consider customer needs & cost before designing distribution network

Key aspects → response time
→ Product variety / Availability
→ convenience
→ order visibility
→ returnability

Important costs → inventory
→ facility
→ transport
→ handling
→ information

More facility → less response time, less transport cost
Increase inventory more cost
facility

Distribution network changes from manufacturer to end customer

2 designs → will product flow through intermediate / or intermediary location

→ will product be delivered to customer
Or picked up from pre arranged site → Ikea, restaurant pickup

Direct (no intermediary)

↳ manufacture to customer

↳ dell build laptop and deliver to kitchen

↳ fast, custom, less inventory

↳ high transport cost for less orders

Through Intermediary

↳ flow through Distributor / Retailer / Warehouse then customer

P&G → Walmart Distribution center → walmart store → Customer

↳ economies of scale in shipping

more options available

↳ more inventory Holding / long wait time for customer

Ch 3 Supply chain drivers and Metrics

ROE → Return on Equity

↳ $\frac{\text{net income}}{\text{avg shareholder equity}}$

↳ measure firms performance

Direct (no Intermediary)

↳ manufacture to custmer

↳ dell build laptop and deliver to kfhphn

↳ fast, Custom, less Inventry

↳ high transport cost for less orders

Through Intermediary

↳ flow through Distributor / Retailer / Wholesale then custmr

P&G → Walmart Dstrbtn center → walmart store → Customer

↳ economies of scale in Shipping

more options available

↳ more inventry Handling / long wait time for customer

Ch 3 Supply chain drivers and Metrics

ROE → Return on Equity

↳ Net income / avg Shareholder equity

↳ measure firms performance

ROA → return on every dollar invested in firm assets

APT → accounts payable turnover

↳ ⇒ $\frac{\text{Cost of goods sold}}{\text{Accounts payable}}$

Firm's Measures of Performance

↳ Markdowns → discounts for customers to buy excess inventory

↳ lost sales → sales not realized as product not available

↳ stockout

Logistical drivers

Facilities → physical locations
→ assembly, fabrication, storage

Transportation

Inventory

→ more product

→ raw materials
WIP
finished goods

Cross functional drivers

Information → Data analysis

Sourcing → who performs activities

Pricing → how much to charge for particular activity

More responsive → more facilities → more flexible, more capacity

↳ more inventory cost
less transport cost
less response time

more flexibility

↳ more facility cost
less inventory cost
less response time

27

users

user Id
user name
user email
user password
user role
manager id
user [illegible]

OM514

Ch 1 & 2

Ch 7 → purchasing
Ch 9 → Inventory fundamental
Ch 8 → Forecasting and demand Planning

~~Professional~~

Ch 7 → SC Fundamental
↳ 9 edition

Procurement Top Risk
↳ very important now days

can lead to high ~~risk~~ mis conduct

Hamburgluni → Mayonaize
↳ Shut down due to it
↳ loses more than 100 Million $ revenue Company

need ethics of company for procurment

Ask yourself is this right in procurment

① Supply chain disruption
② Supplier dependency & concentration
③ price volitality
④ quality Risk
⑤ compliance & regulatory
⑥ cybersecurity & data
↳ important
↳ need documentation (E-procurment)

Digital Procurment and Technology
↳ need business continity prative
↳ what happen if system is down
↳ need procedures to be printed
↳ need to do what if scenarios
Drill is very important for when system not working
Fax machine → plan B
Paper based → plan C

corona example

Cloud based → SAP

Robotic Process automation RPA
↳ handle Repetitive tasks

AI and Predictive Analytics
↳ more responsive supply chain
↳ Building Central warehouse

AI Predictive Analytics

Supplier Portals & Marketplaces

Risk

↳ cyber security

↳ garbage in garbage out

Outsource Vs off shore

~~Offshoring~~

take facilities outside

Apple → China, Vietnam, India

~~give to other company~~

~~Grant rights to~~

third party make item

Scope of Procurement

① Direct procurement
② indirect procurement
③ Strategic sourcing
④ Market Intelligence
⑤ SRM
⑥ Expediting

⇒ one of these activities can be outsourced

Tata → expediting for multiple oil and gas companies

~~Strategic~~ Factors to consider before outsourcing Procurement

① Strategic importance of category

② Cost- benefit analysis

③ Vendor capability

④

⑤

Next excel works

OM511

2 types of gas → Regular
→ Premium

2 types of crude → C1
→ C2

R_1 : Gallons of C1 for producing regular

P_1 : Gallons of C1 for producing Premium

R_2 : Gallons of C2 for producing regular

P_2 : Gallons of C_2 for producing Premium

Objective function

$$R_1(0.1) + P_1(0.1) + R_2(0.15) + P_2(0.15)$$

$$0.2R_1 + 0.5R_2 >= 0.4(R_1 + R_2)$$

$$0.2R_1 \text{ ---} >= 0.4R_1 + 0.4R_2$$

$$0.2R_2 - 0.4R_1 + 0.5R_2 - 0.4R_2$$

$$-0.2R_1 + 0.1R_2 >= 0$$

$$0.6P_1 + 0.3P_2 \leq 0.5(P_1 + P_2)$$

$$\leq 0.5P_1 + 0.5P_2$$

$$0.6P_1 - 0.5P_1 + 0.3P_2 - 0.5P_2 \leq 0$$

$$0.1P_1 - 0.2P_2 \leq 0$$

if price of oil 1 increase 0.01 cent how much

oil price change

$R_1(0.20)$

$R2(0.11)$ ⟩ to

Biggest impact ⟹ check Shadow price biggest value

OM 530

Challenges of supplychain
↳ globalization
more product variety
decrease product life cycle
fragmented supply chains
changing technology
more focus on sustainability

narrow scope ⇒ optimize performance on goals
wide scope ⇒ impact overall supply chain
↳ increase supply chain surpluss

ch3 SC drivers & metrics

Key financial metrics: ROE, ROA, accounts payable turnover
profit margin, asset turnover
accounts receivable turnover

Major drivers of SC
↳ inventory, Facility, Transport
information, sourcing, pricing

Achiving strategic Fit ⇒ Effeciency
Vs
Responsiveness

more Facilities
↳ more responsive
less Facilities
↳ more efficient

Supply chain surpluss

↳ product value to customer − total cost of supply chain

Design → Planning → Operation

Drivers of SCI

Facilities, Inventory, Transportation

Information, Sourcing, Pricing

More facilities ↑

More facilities and Inventory costs

reduces transport cost

reduce response time

More flexibility or capacity of facility

Increase facility cost but decrease inventory cost and response time

Supply chain Surpluss = Customer Value − Supply chain Cost

① Design SC strategy

↳ configuration of SC

Allocation of resources

what process each stage perform

Supply chain decisions

= Information systems

= Outsource

- locations and capabilities of facilities
- Products to be made and stored in locations
- modes of transportation

Supply chain surpluss

↳ product value to customer − total cost of supply chain

Design → Planning → Operation

Drivers of SCI

Facilities, Inventory, Transportation

Information, Sourcing, Pricing

More facilities ↑

More facilities and Inventory costs

reduces transport cost

reduce response time

More flexibility or capacity of facility

Increase facility cost but decrease inventory cost and response time

Supply chain Surpluss = Customer Value − Supply chain Cost

① Design SC strategy

↳ configuration of SC

Allocation of resources

what process each stage perform

Supply chain designing

= Information systems

= Outsource

- locations and capabilities of facilities
- Products to be made and stored in locations
- modes of transportation

SC design should support strategic objectives

SC design decisions are long term & expensive to reverse
↳ take into account market uncertainty

② Planning SC

↳ operations govern short term operations
↳ fixed by supply config from strategic phase
↳ goal = maximize SC surplus given constraints
↳ start with forecast of demand in coming year

Decisions
- which markets supplied from which locations
- Planned build up of inventories
- Subcontracting
- Inventory policies
- Timing & size of Market promotions

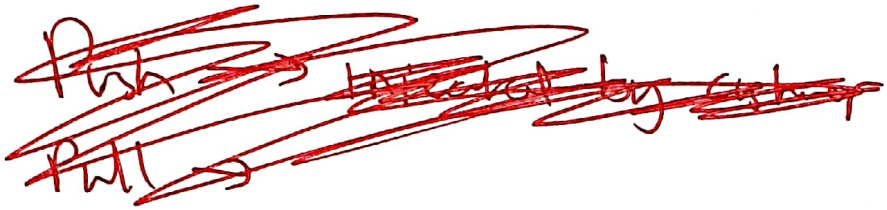
Consider → demand uncertainty, exchange rate, competition

③ Operations SC

- Weekly or daily
- Decisions individual customer orders
- SC config is fixed, planning policies defined
- goal → handle incoming customer orders as effectively as possible

Allocate orders to products or inventory
Set order due dates
generate pick list from warehouse
allocate stock
Set delivery
replenishment order

Short time horizon



Pull → initiated by customer

Push → in anticipation of customer

Cycle view

↳ supplier → manufacturer → distributor
→ retailer → customer

Trend projection OM514 7-Oct-2025

Slope

$y = mx + b$

$\frac{\text{rise}}{\text{run}}$ → for every 1 increase in x, y will increase/decrease with m units

Seasonal Index → lunch break in restaurant
→ coffee shop → in morning peak → hourly or daily season

Randomness

Cycles → repetitive change

→ every time interval, behaviour

seasons, weekly, [redacted], quarterly, monthly

[redacted] mostly to next → quarterly

don't go to yearly

→ doesn't have to be positive

→ [redacted]

Seasonal Index

→ if below 1 then under the line of average monthly demand

if above 1 then above the line of average monthly demand

Avg Monthly demand

→ to Seasonality

Seasonality + Trend

No need to memorize formulas

bring own calculator

Mav
Mse
Mad

why
how } the forecast

how each method work

need more understanding

email
↳ for group working
↳ group for simulation

name
Sid
Job title
company name
sector

Mid til begging of procurement

Next sunday
bring questions
Q & A

written
T/F
MCQ

20% written
MCQ / T/F → 80%

Seasonality → MRO
↓
Maintenance
Turnaround
↓
every 4 years shutdown machine

Postponement of product assembly
↳ Donut food toppings done in front of you
↳ dell assembly at end → ram, ssd put in at end

OM521

Jamir Bookshop

Max

$$Z = \sum_{13x} p_i x_i$$

$x_i = 10\,000$

$C_i x_i \leq 200\,000$

$$\left(\frac{24}{100}\right) 100 + \left(\frac{12}{100}\right) 50 + \left(\frac{5}{100}\right) 30$$

$L_i \leq x_i \leq U_i$

Walkout

Walmart

Analysis
- Pos Systems
- focus on e commerce
- focus on omnichannel

Supply chain competitive advantage
- fleet of trucks

Walmart Performance

Competitors

Challenges

Improvements

OM S14 Review

Inventory
- Management vs control

Classification
- Value, treatment / risk / criticality

Demand / Forecasting

MRP
- System/Roles

Toyota → JIT no buffer stock
- 1 billion lost output
- Lean save cost but risky for supply shocks

Amazon → Ship products to warehouses even before you place order
- Anticipatory shipping

Zara → 2 week manufacturing
- only in EU where manufacturing sites are located

- Supply chain structures vary based on type of business, org size, operating environment

- location play big role → transport
  → lead time
  → supplier access

- Customization is essential → business goals
  → customer expectations
  → market conditions

- Inventory = Buffer → Business continuity
  → most valuable assets

raw materials
Work in progress
finished goods

effective if use it as much as needed without excess inventory

Inventory types

Raw materials
WIP
Finished goods
MRO Packaging Marking
Pre packaged

Steel, Aluminum
Coca, Milk

WIP → not painted car
→ not finished micro chip

Finished → ready for sale phone
laptop

MRO → Barcode Scanner
→ Tape
→ cleaning supplies
→ lubricant
→ tools

Packing Materials → boxes
→ pallets

Inventory management → Strategic
→ oversee
→ control
→ order
→ Storage
→ use

broad

Forecasting
replinishment
Lead time
Stock planning
Demand analysis

Availibility

ERP System

Inventory Control operational
day to day actions

narrow

tracking
Storage
managed
right product
right place

Accuracy

Barcode Scanner

Main players 3PL 4PL

Manufacturers → Nike factories
Distributors
Wholesalers → produce shoes
→ move bulk product
→ buys in bulk
Retailers
Consumer → Sell to customer

Distributor → transit logistics

Wholesaler → Broadcast group

Inventory costs → ordering costs → Admin work, inspection, receiving, order processing, preprocessing, shipping fees
→ Small order increase ordering cost

→ Holding, carry cost → wasted items, rent, insurance, security, depreciation, obsolence → high → increasing holding cost

→ Stockout cost

→ Purchase costs → regulations, bulk discounts

Shrinkage cost → losses due to theft, damage or inaccuracies in inventory records

Earn / Peter-only

2 5 8 11

42000 5% annual rise

4 | 7
| 7
| —
| 7

132300

650 5

80 = 100%

650 5 40 50%

2/3

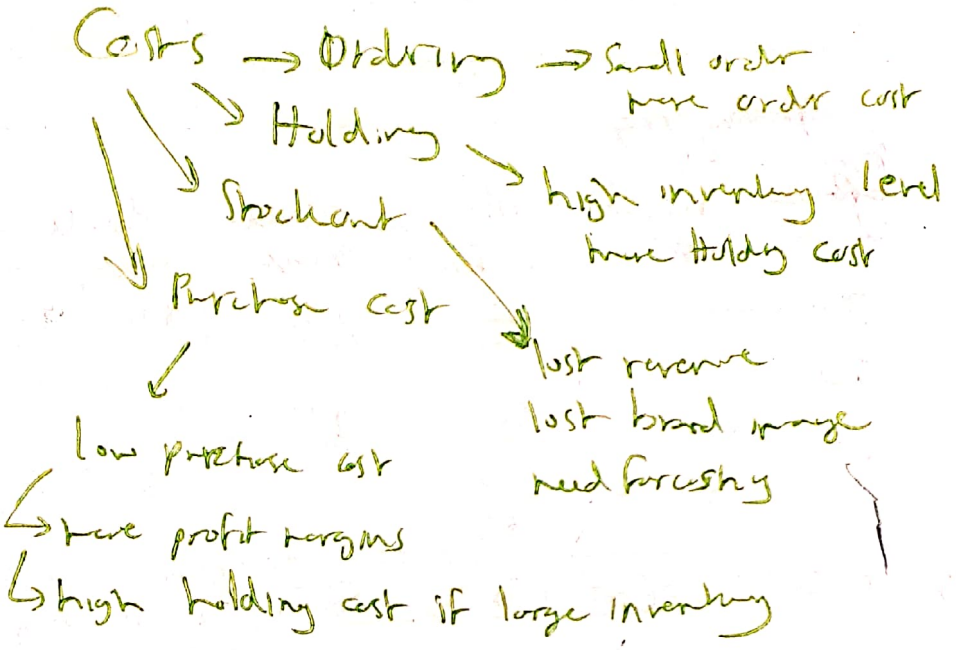
Nova → manufacture

Tommi logistics → distribute

Wholesaler → Birchwood → Buy large quantity

Retailer → sell direct to customer

21



ETO → Engineer to order

↳ longest lead time

↳ Boeing → power plant, Bridge

ATO

↳ assemble to order

↳ premade parts

↳ Bicycles

MTO → Make to order

↳ Standard design, Custom production

↳ Caterpillar

MTS → Make to stock

→ groceries

→ no lead time

→ P&G

Unilever

CTO → configure to order

↳ Cars, Laptops

↳ certain items modified

↳ wood trim or plastic

↳

ETO → Engineer to order

MTO → Make to order

CTO → configure to order

ATO → assemble to order

MTS → Make to Stock

Marketing → need more inventories
- → high customer service
- → many disruptions to production

Production → low customer service (not case)
- → low disruptions to production
- → Need high inventory

Finance → low customer service
- → low disruptions to production
- → need low inventories (minimize cost)

OM 514

7 parts

Reaction Paper

ch 1 & 2 → intro activity supply chain & manufacturing

ch 7 pricing ch 7 ed 9
↳ sc fundamentals

ch 9 → inventory fundamentals

ch 8 → forecasting & demand plng

Reaction Paper review

ABC-XYZ

Zaml AC → ~~category~~ example

Avoid
- ↳ Sore statements (word by word)
- ↳ Incomplete thoughts
- ↳ related thoughts

7 - 11

dell

ASML

gm

Nissan

Hasbro

Apple

Abbot Industries

Midterm

group discussion

2 questions essay

no ambiguity in questions

→ calculation and reasoning

One question related about Forecast

Case

Global tech

- size percent cost
- long lead time
- limited visibility

} across two suppliers

Procure X

- ↳ sourcing
- ↳ supplier management
- ↳ spend analytics

} 2% cost saving through tech and global leverage

question 1

lose control

- ↳ supplier relationship
- ↳ Confidentiality risk
- ↳ increase job loss

Which activity kept in house Vs outsource

How Stoke tech ensure savings if outsourcing proceeds

Sourcing outsource

Don't outsource Supplier management

don't spend analytics outsource → in house

Sourcing outsource

If spend analytics outsource confidentiality risk because deal with numbers

Boring case

Outsource → lead to lost expertise on that field

BPA

Problem identification

	Annual rate of return %	Risk
Stocks	10	0.8
Bonds	3	0.2
Mutual funds	4	0.3
Cash	1	0.0

$$10S + 3B + 4M + 1C \geq \text{Max}$$

$$S + b + m + c = 1$$

$$0.8s + 0.2b + 0.3m + 0c \leq 44$$

$$S \leq 0.75$$

$$m - b \geq 0$$

$$0.1 \leq c \leq 0.3$$

Assume I have ~~40000 SAR~~ 5000 SAR

Where to invest

Which are best to invest

US

UK

Japan

Saudi

Problem which sharia compliant etf is best return

Moving average

Week	Sales	3MA	Error	|Error|	Error²	%Error
1	39					
2	44					
3	40					
4	45	$\frac{39+44+40}{3} = 41$	$45-41=4$	4	$4^2=16$	
5	38	$\frac{44+40+45}{3} = 43$	$38-43=-5$	5	$5^2=25$	
6	43	$\frac{40+45+38}{3} = 41$	$43-41=2$	2	$2^2=4$	
7	39	$\frac{45+38+43}{3} = 42$	$39-42=-3$	3	$3^2=9$	
8		$\frac{38+43+39}{3} = 40$				

$16+25+4+9 = 54$

$4+5+2+3 = 14$

$\frac{14}{4} = 3.5$

$\frac{54}{4} = 13.5$

$$MAPE = \frac{|Error|}{actual} \times 100\%$$

Sales	|Error|	|%Error|
45	4	$\frac{4}{45}(100) = 8.89\%$
38	5	$\frac{5}{38}(100) = 13.16\%$
43	2	$\frac{2}{43} \times 100 = 4.65\%$
39	3	$\frac{3}{39} \times 100 = 7.69\%$
		34.66

8.665%

		Error	|Error|
$A_1 = 100$	$F_1 = 110$	$100 - 110 = -10$	10
$A_2 = 120$	$F_2 = 115$	$120 - 115 = 5$	5
$A_3 = 130$	$F_3 = 125$	$130 - 125 = 5$	5
$A_4 = 140$	$F_4 = 130$	$140 - 130 = 10$	10

Actual	|Error|	Mape
100	10	$\frac{10}{100} \times 100 = 10\%$
120	5	$\frac{5}{120} \times 100 = 4.167\%$
130	5	$\frac{5}{130} \times 100 = 3.846\%$
140	10	$\frac{10}{140} \times 100 = 7.14\%$
		25.153%

$$\frac{25.153\%}{4} = 6.288\%$$

Forecast Accuracy analysis

$$MSE = \sum \frac{(\text{Forecast error}^2)}{n}$$

week	Actual	Player 1	|Error|	$\|Error\|^2$	Player 2	|Error|	$\|Error\|^2$
1	12	14	$12 - 14 = +2$	4	12	0	0
2	15	17	2	4	16	1	1
3	16	19	3	9	17	1	1
4	16	14	2	4	20	4	16
5	18	16	2	4	16	2	4
				$\frac{25}{5} = 5$			$\frac{22}{5} = 4.4$

Which is more accurate

↳ player 2 is more accurate due to lower MSE lower error of 4.4 in player 2 compared to 5 of player 1

		Error	|Error|
$A_1 = 100$	$F_1 = 110$	$100 - 110 = -10$	10
$A_2 = 120$	$F_2 = 115$	$120 - 115 = 5$	5
$A_3 = 130$	$F_3 = 125$	$130 - 125 = 5$	5
$A_4 = 140$	$F_4 = 130$	$140 - 130 = 10$	10

Actual	|Error|	Mape
100	10	$\frac{10}{100} \times 100 = 10\%$
120	5	$\frac{5}{120} \times 100 = 4.167\%$
130	5	$\frac{5}{130} \times 100 = 3.846\%$
140	10	$\frac{10}{140} \times 100 = 7.14\%$
		25.153%

$\frac{25.153\%}{4} = 6.288\%$

Forecast Accuracy analysis

$MSE = \sum \frac{(\text{Forecast error}^2)}{n}$

Week	Actual	Planner 1	|Error|	$\|Error\|^2$	Planner 2	|Error|	|Error|
1	12	14	$12 - 14 = +2$	4	12	0	0
2	15	17	2	4	16	1	1
3	16	19	3	9	17	1	1
4	16	14	2	4	20	4	16
5	18	16	2	4	16	2	4
				$\frac{25}{5} = 5$			$\frac{22}{5} = 4.4$

Which is more accurate

→ planner 2 is more accurate due to lower MSE lower error of 4.4 in planner 2 compared to 5 of planner 1

MAD ⇒ $\frac{\sum |A-f|}{n}$ ← $\frac{|Error|}{n}$

MSE ⇒ $\frac{|Error|^2}{n}$

Actual	$\lvert Error \rvert$	$\lvert Error \rvert^2$
10	1	1
8	2	4
10	2	4
6	0	0
9	1	1
		10

$\frac{6}{5} = 1.2$ ← absolute

↓

MAD = 1.2

↙ not sensitive to outliers

MSE = $\frac{10}{5} = 2$

↳ penalize large error more

↳ sensitive to outliers

800 units per months

$S_1 = \frac{\text{Read avg demand}}{\text{overall avg demand}}$

Seasonly adjusted F_1 800

Seasonal Index for Jan = 1.25

for Jan = 800 × 1.25

for feb = 800 × (x)

$1.25 = \frac{x}{800}$

Deseasonalized value = $\frac{\text{Actual (Forcast)}}{\text{Seasonal Index}}$ or

Not given

$1.25 \times 800 = x$

$1000 = x$

Seasonly adjusted Forcast = Base Forcast × Seasonal Index

average monthly demand = 800

Jan Seasonal index = 1.25

deseasonalized base demand for Jan = ?

$\text{desalted} = \frac{800}{1.25} = 640$

desalted $640 = \frac{F}{0.9}$

$640 \times 0.9 = 576$

$1.1 \times 640 = 704$

Aggregate planner → Overall production
→ Inventory
→ workforce levels
→ medium term
→ capacity, inventory, backlogs, subcontracting
→ deal in macro level

Cost of placing order → Inventory Management

March 3000

April	2400 +15%	March	3000
May	2560 −25%	April	2760
June	3800 −25%	May	~~1800~~ 1920
		June	2850

Seasonal index = $\frac{\text{Period avg demand}}{\text{overall avg demand}}$

$$y_t = \alpha y_{t-1} + (1-\alpha) y_{t-1}$$

ABC →

Risks of digital
- cyber security
- high implementation cost
- data quality issues

Procurement risk
- Supply chain disruption
- Supplier dependency
- Price volatility
- Cybersecurity
- Compliance & regulatory
- Cybersecurity & Data

محتوى المقرر

الاسبوع	المهارة
الأول	القيادة وفرق العمل
الثاني	انماط التفكير
الثالث	مهارات الاتصال
الرابع	إدارة الوقت
الخامس	حل المشكلات واتخاذ القرار
السادس	تحديد الاهداف
السابع + الثامن	أخلاقيات المهنة من منظور إسلامي
التاسع	فن الانصات
العاشر والحادي عشر	مهارات الإلقاء
الثاني عشر	كتابة السيرة الذاتية وكيفية اجراء المقابلة الشخصية

Supply chain risk → avoid → no single supplier
→ Mitigate → dual sourcing
→ transfer → use contract
→ Accept → low cost, low impact

FOB → Free on board → apple get products
→ risk transfer at china ship
headed for USA

CIF → cost insurance freight → risk transfer at destination port in USA

EXW → Ex works → Buyer picking product from supplier

FCA → Free Carrier → exporter export to agreed location
→ deliver to a location

DDP → Delivery duty paid → DHL → at home delivery
↳ opposite of ddp

value ABC → High, Medium, Low value

Demand XYZ → Predictable, Variable, Unpredictable

ABC - XYZ

AX → High value, Stable demand
↳ tight control
↳ accurate forecasting
↳ frequent review
↳ Jet engine, semiconductor

AY → High value
↳ Medium demand
↳ Seasonal advanced
Forecasting

AZ → High value
↳ erratic Demand
↳ low stock
↳ sepellized turbines
↳ close supplier collaboration

BX → Lubricants
↳ middle value
↳ high demand

BY → construction materials
↳ need buffer stock
↳ regular monitoring

BZ → order when required
↳ custom mold
↳ emergency pumps

CX → low value
↳ Stable demand
↳ Nuts bolts
↳ Bulk orders

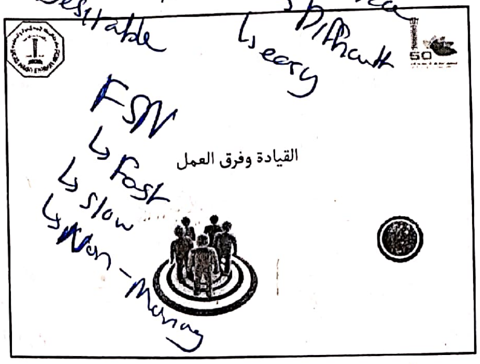
CY → Small safety stock
↳ work uniform
↳ order on demand

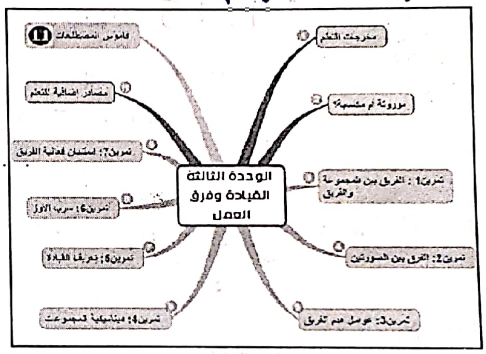
CZ → low priority
↳ order on demand
↳ special paints colors

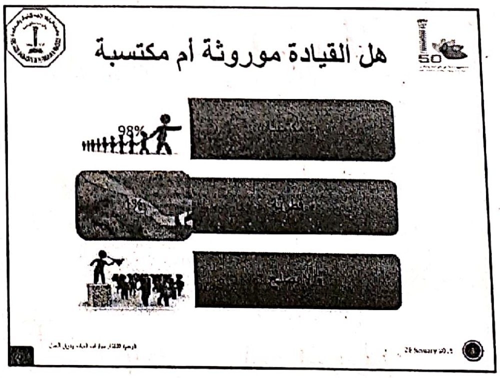
VED
↳ Vital
↳ Essential
↳ Desirable

SDE
↳ Scarce
↳ Difficult
↳ easy

FSN
↳ Fast
↳ slow
↳ Non-Moving







ABC Rchal

A → Smartphone / laptop
B → Tablet
C → Headphone

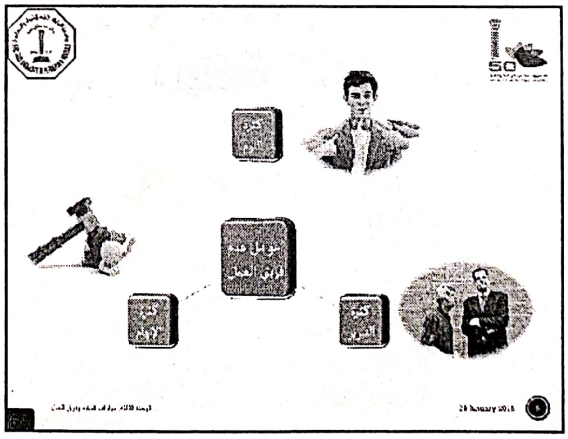
Inventory valuation Methods
↳ Moving average price MAP
↳ Weighted Average cost WAC
↳ FIFO First in First Out
↳ LIFO → last in first out

Moving average price MAP
↳ SAP usage
↳ Manufacturing Companies

Weighted Average cost
↳ Distributors
↳ small business
↳ product usage

Fifo
↳ food, Pharma
↳ shelf life

Engineer to order
Make to order
Configure to order
Assemble to order
Make to Stock



$$F_t = f_{t-1} + \alpha (A_{t-1} - F_{t-1})$$

Previous forcast = 200

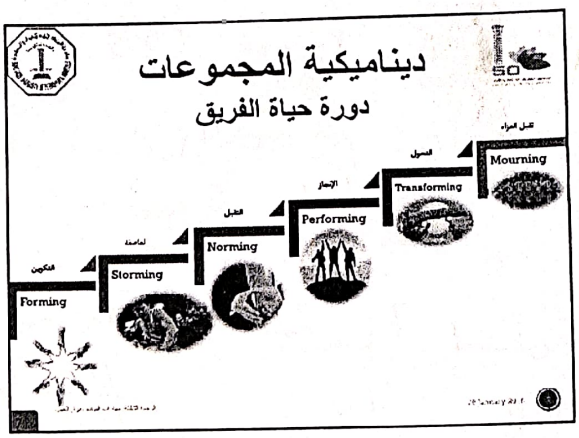
Actual last period = 220

$\alpha = 0.3$

$= 200 + 1(220 - 200)$

$200 + 20$

220



Seasonal index = $\frac{\text{Avg monthly demand}}{\text{overall avg demand}}$

Jan 90

~~Feb 80~~

~~Mar~~ 110

overall demand = $\frac{90 + 80 + 110}{3}$

$= 93.3$

avg monthly demand

↳ 90 for jan

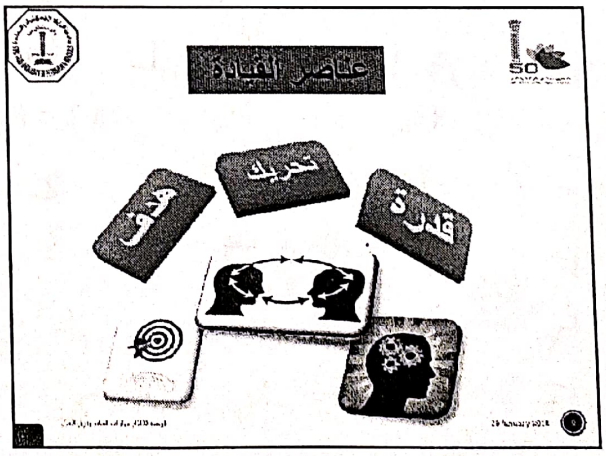
80 for Feb

110 for Mar

Seasonal index jan = $\frac{90}{93.3}$

SI for Feb $\frac{80}{93.3}$

SI for Mar $\frac{110}{93.3}$



Sunday = $\frac{40+35+39+44}{4} = 39.5$

Monday = 55

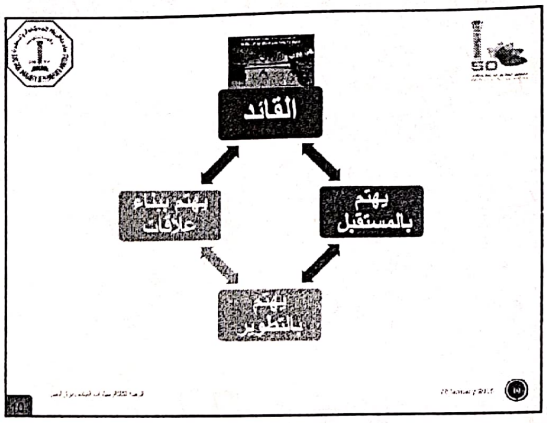
Tue 63.5

Wed = 74.25

Thu = 82.5

Fri = 93.75

Sat = 81.5



Overall = $\frac{39.5+55+63.5+74.25+82.5+93.75+81.5}{7}$

Overall = 70

Si Sunday = $\frac{39.5}{70} = 0.564$

Si Mon = 0.786

Si tue = 0.907

Si wed = 1.062

Si thu = 1.179

Si Fri = 1.339

Si Sat = 1.164

Book CH, 1, 2, 3, 4 OM511 on Blackboard

MCQ

No written

Slides 01.01 ~~02.02~~ Intro

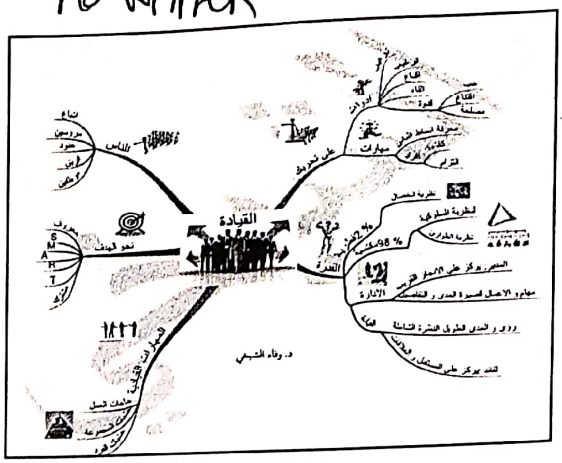
02.02 Lever Program

03.3 Excel solver

04 4 Sensitivity analysis

05 Steps in Mathematical Modelly

20 questions



PPt

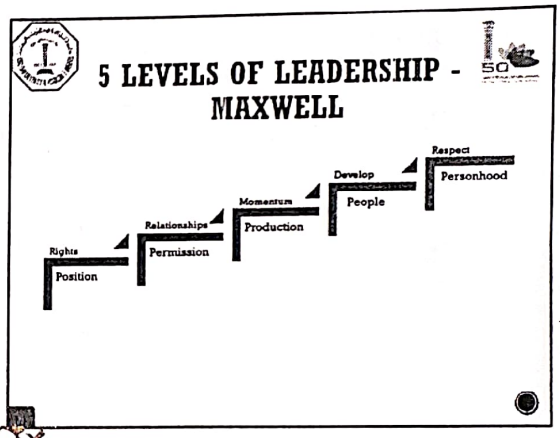
~~Slide~~ 1 → what is my career Slide 9

Slide 17

Slide 18 → author of Simplex

What is Simplex method

Slide 20



PPt 2 Slide 4 convex non convex

↳ What is property of convexity → can do excel solver

2 types of LP → convex → also can do excel solver

↳ non convex → several min or several max

↳ cannot do excel solver

What are steps in Problem formulation

" is graphical method

PPt 3 → no exercise → what is method behind Simplex method

~~Sensitivity analysis~~

PPt 4 → 50 % of exam

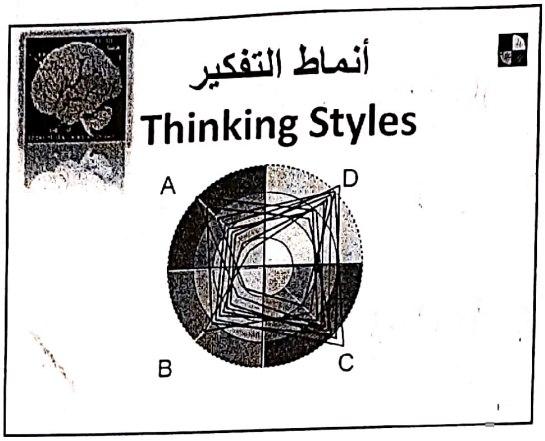
binded not binded

Shadow price

What is Sensitivity analysis

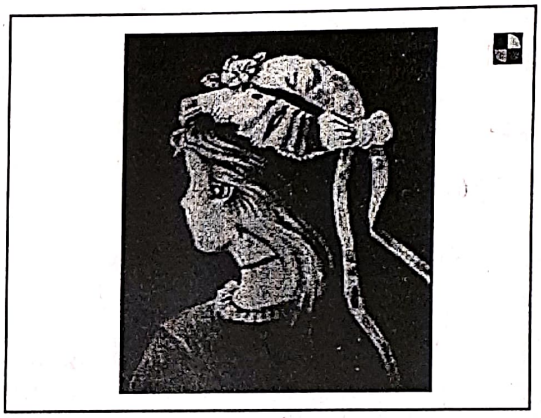
1/29/2015

Int Range of optimality
↳ set of values model is valid → beond not valid
↳ within these values → beond objective function not value
↳ for constants
What is reduced cost
Shadow price
↳ negative
↳ increase ~~positive~~ optval → ~~[illegible]~~
↳ positive
↳



Reduced cost

PPT 5
understand process
↳ steps in process modelling
↳ problem identification
↳ Formulation
↳ Problem Solving
↳ What is Validating
↳ Implementing the solutions

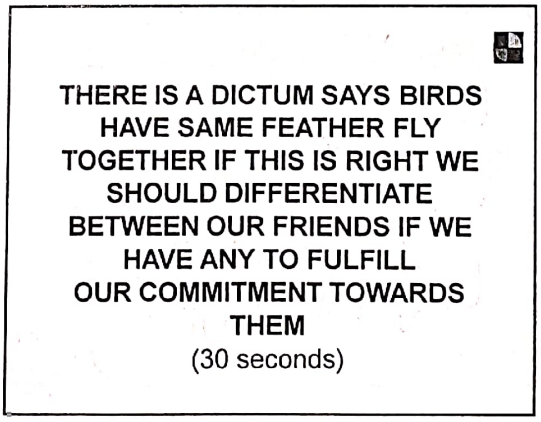


Sample

12000 − 6500 =
12.5 − 7.5

local global Minimum

2 questions about convexity



Shadow price = 0
Reduced price = 0
⟹ What happen

questions

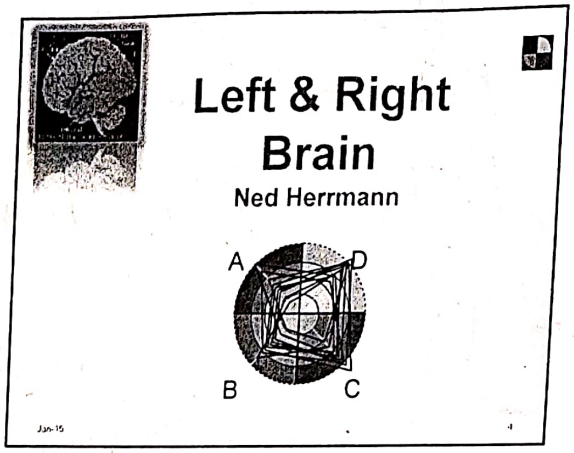
§ LP sensitivity analysis

$$\sigma = \sqrt{\frac{1}{N-1}\sum r_i - \bar{r})^2} \times \sqrt{k}$$

14.69 %

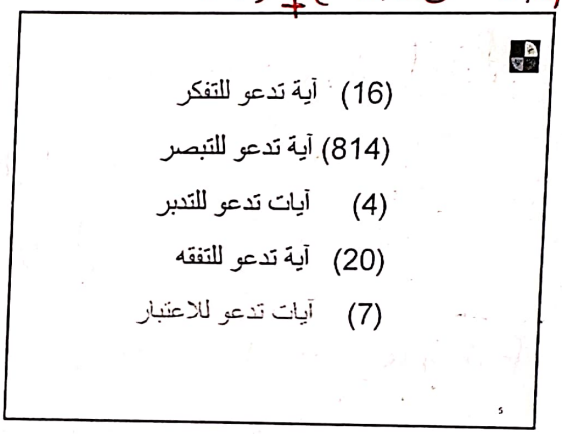
$$\bar{r} = \frac{-11.79 + 22.94 + 5.26}{3}$$

$$\bar{r} = 5.47$$



$$\sqrt{\frac{1}{3-1}\sum^{3}(-11.79 - 5.47)^2 + (22.94 - 5.47)^2 + (5.26 - 5.47)^2} \times \sqrt{12}$$

$$\Rightarrow 17.36$$



Main steps in LP Modeling

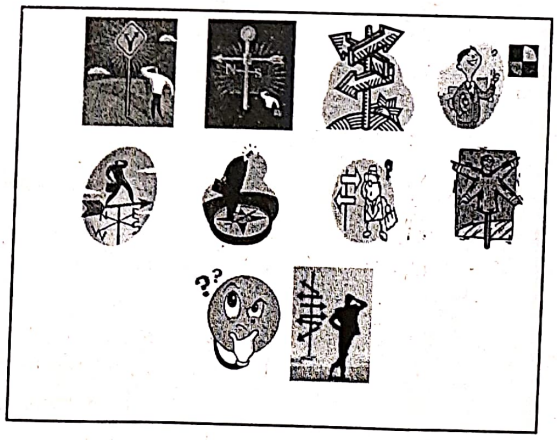
1. Problem identification
2. formulation as mathematical Model
3. Solving the model
4. Validate model and results
5. Model Implement

Sensitivity analysis

↳ how variation in input affect output variables

Question 1 In optimum problem, why are convex distributions preferred

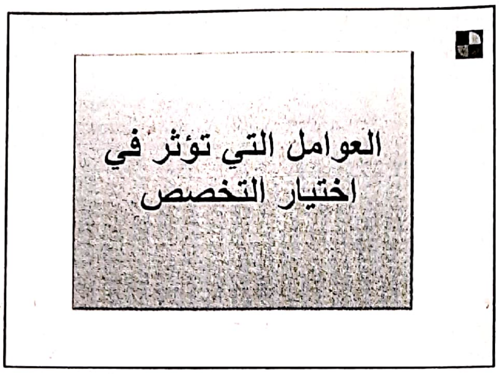
↳ every local minimum is a global minimum



$$\frac{\text{after} - \text{initial}}{\text{after} - \text{initial}} = \frac{7.5 - 12.5}{12000 - 6500}$$

Change in price = $\Delta P = P_2 - P_1$

change in demand = $\Delta D = D_2 - D_1$

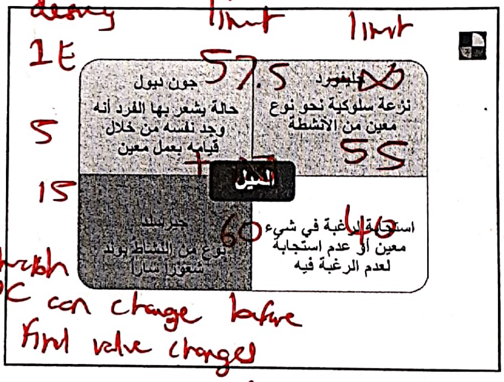


Max = 50A + 60B + 55C

~~Sensitivity ranges~~

Final value	reduced cost	Objective coefficient	allowable increase	allowable decrease	upper limit	lower limit
0		50	7.5	1E	57.5	∞
70		60	1E	5		55
30		55	5	15	60	40

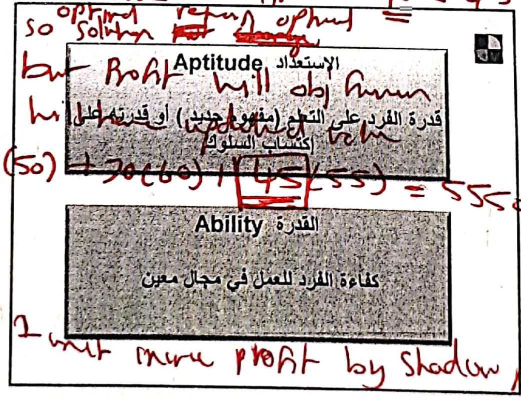
how much OC can change before final value changes



Profit = 0(50) + 70(60) + 30(55) ⇒ 5850

Constant RH side
100
300
250
60

If unit profit on C drops to 45
→ allowable low limit ⇒ 40 < 45
so optimal solution ~~not change~~ remain optimal
but profit will obj function ...



profit = 0(50) + 70(60) + 45(55) = 5550

Shadow price → increase finishing by 1 unit increase profit by shadow price

$$\frac{6.5000 - 12000}{12.5 - 7.5} = -1100$$

$$\frac{\text{Initial} - \text{Final}}{\text{Initial} - \text{Final}}$$

$$\frac{\text{Percent}}{\text{cost}}$$

OM514 Lean Production

1/29/2015

lean → low weight
↓ ↳ manufacturing
cut companies
study

Lean can be applied everywhere

Waste elimination

more value for customer

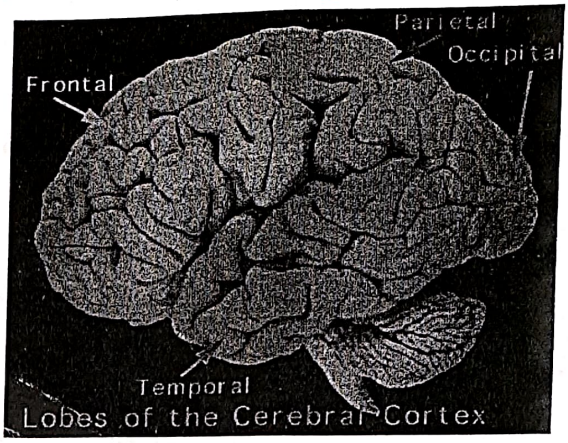
using less resources

eliminate waste

Maximize value for customer

max customer satisfaction

Chicken factory



1. customer first
2. Minimize waste

Main principles

↳ Identifying Value

Which features customer willing to pay for

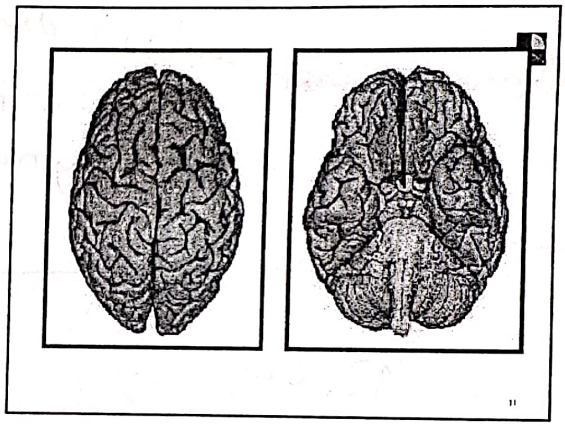
the feature

everything else is waste

Map value stream → from A-Z process

↳ sticky notes

↳ Visualize from A-Z



التفكير هو
أي عملية أو نشاط
يحدث في عقل الإنسان
قبل القول أو الفعل

Create flow

↳ flow without interruptions

establish Pull

↳ look at demand

↳ only when demand is there

Seek Perfection

↳ there is no finish line

lean → from all stakeholders

1/29/2015

① Identify Value → determine what customer needs

↳ iPhone release phone chargers/earphones

Maintenance and turnaround (TSI)

test and inspection

Customer value

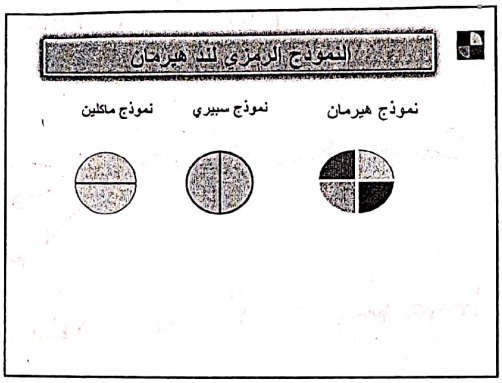
- minimal downtime
- reliable equipt
- compliance

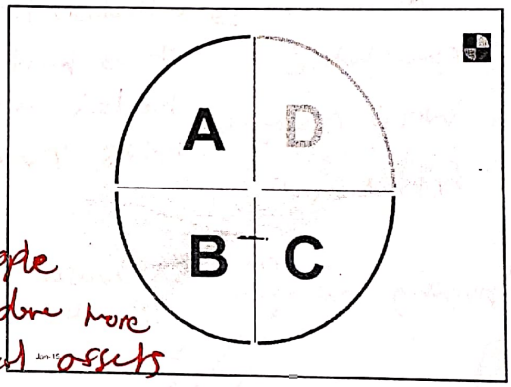
Value added

- Preventive maintenance
- rapid response critical failure

Non-added value

- waiting for spare parts
- ⇒ reduce waste and improve
  - ↳ Separate approval people
  - ↳ look at approval cycle people
  - ↳ approval optimization can be done more
- Over inspection of non critical assets
- Poor scheduling for idle work
  - ↳ standby rate





② Map value stream

↳ analyze all steps from start to finish

↳ material flow

~~↳ Inventory~~

↳ information flow

↳ Achieving

يبلغ وزن دماغ المولود الجديد
حوالي 400غرام
يتراوح وزن دماغ الانسان البالغ
من 1300 – 1400غرام وهذا يعادل
2% من وزن الجسم

OM511

$$\frac{\Delta x}{\Delta y} = \frac{\Delta d}{\Delta t}$$

$$\text{Reduced cost} = \frac{\Delta \text{Coefficient}}{\Delta \text{Constraints}}$$

$$\text{Reduced cost} = \frac{\Delta \text{Saudi}}{\Delta \text{Usd}}$$

$$\text{Reduced cost} = \frac{\text{decision variable}}{\text{optimal value}}$$

تقدر عدد الخلايا العصبية الدماغية

بمائة بليون خلية

$$\frac{20 - 50}{500 - 600} =$$

$$\frac{500 - 600}{20 - 50} = 3$$

Demand on top

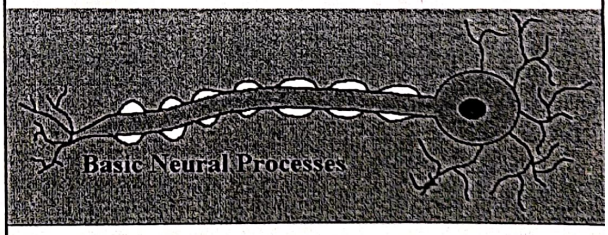
يستهلك الدماغ 20%
من الاكسجين الذي
يحتاجه جسم الإنسان

$$\frac{\text{new} - \text{old}}{\text{new} - \text{old}}$$

$$= \frac{600 - 500}{50 - 70} = -5$$

Demand on top

new demand 600 − old demand 500



شحنه كهرو كيميائية

$$\frac{12000 - 6500}{7.5 - 12.5} = -1100$$