CRIB for MET2A Paper 3: 3P4 and 3P5

2021-2022

1.

(a)

(i) Pros: focus on core competences, harness lower labour cost at supplier, access technology at provider, stable predictable financial planning as fee for transaction service, less investment risk.
Cons: loss of control over process, limited ability to improve processes, risk of opportunistic behaviour of supplier, loss of human capital and tacit knowledge

(ii) Students will give examples of different HR functions, highlighting that the functions most suitable to outsource would be transaction based tasks, such as payroll and benefits. IT based HR systems can be outsourced easily, however call centres would only be possible to some degree. Recruitment may be possible but not at senior level. Career planning, strategic HR development, training unlikely to work. Students should discuss that the key is to consider what process requires tacit knowledge as opposed to pure transaction.

(b)

(i) Benefits of positive SRM include improved trust, efficiency, and the discovery of value adding synergies. Students may also explain alliance formation for handling competitive forces in SC, such as the threat of new entrants, product substitutes, rivalry . Some students may discuss how these could balance against SC monopolies or disproportionate power in the marketplace.

(ii) These factors will include, nature and importance of item being purchased, Geographical closeness, Supply market conditions, and priorities of purchasing function. Students may elaborate on how these factors individually impact appropriate types of relationship, mentioning A,B,C categorisation, and relate these concepts to Supply Chain Strategy such as Pareto approaches and discuss how these influence relationship formation.

(e) Supplier improvement encompasses activities that the buyer undertakes to improve supplier performance and capabilities to meet buyer's short and long term needs. These may target raising supplier competence to a specified level such as reduced cost for a certain group of items, improved quality, delivery performance, and are thus results oriented and rather specific (directive approach). Buyers may also support suppliers in self sustaining the required performance with continuous process improvement (facilitative approach). An example would be the implementation of Kaizen, where there is no direct intervention from buyer, but rather the buyer supports the supplier with problem solving and advises on change management techniques. Implementation may involve secondment of buyer to supplier or vice versa for training, or offer buyer or third party training to supplier staff in relevant areas. Students may elaborate examples we have been through in class, such as Toyota's approaches to SCM, and supplier associations. They may also discuss any potential "negatives' of improvement such as tie-in, IP leakage, and the boundary between pressure and genuine development.

2.

(a)

Both lines have the same average, but Line A processes are less variable, and for that reason, Line A (and its processes) will have on average the higher total throughput.

(b)

$$\text{EOQ} = \sqrt{\frac{2 \times \text{D} \times \text{S}}{\text{H}}} = \sqrt{\frac{2 \times 9125 \times 9}{0.75}} \approx 468 \text{ cans}$$

σ=2.5 cans per day

95%⇒z=1.645

$$\text{ROP} = \text{D} \times \text{L} + \text{z} \times \sigma \times \sqrt{\text{L}} = 25 \times 10.5 + 1.645 \times 2.5 \times \sqrt{10.5} = 275.82 \approx 276 \text{ cans}$$

(c)

(i) Company A because it orders smaller quantities more frequently. The reason to do that is to avoid carrying inventory due to high h.

(ii) Company B because it orders larger quantities less frequently. The reason to do that is to avoid ordering frequently due to high K.

(iii) Company A because it order smaller quantities.

(iv)

What are limitations of using the over-simplistic EOQ model

Brief discussion on some of the following:

- Assumptions
- Theoretical vs Practical differences
- Dealing with demand fluctuations
- The EOQ model fails to consider current stock levels in warehouse network
- All items in the warehouse are not of equal value
- Will EOQ orders meet the minimum order quantity (MOQ) requirements of the suppliers?
- EOQ assumes immediate availability of stock

How to overcome such limitations?

Brief discussion on some of the following:

- Using tools like Enterprise Resource Planning (ERP)
- Using statistical demand forecasting
- Recommending when to order and by how much by setting dynamic inventory levels
- Bridging the gap between theoretical assumptions and the real world.

3.

(a)

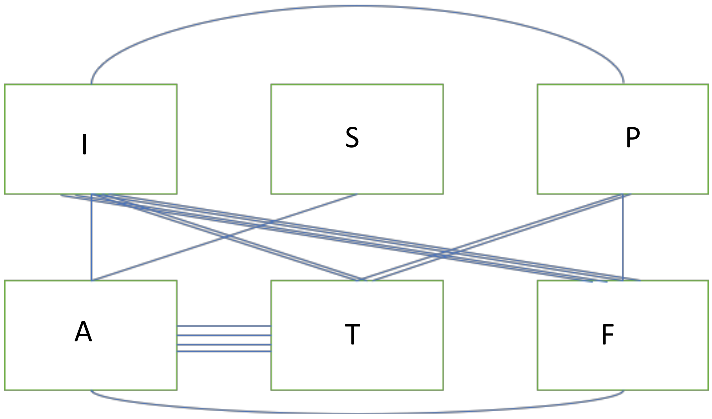
(i)

The From-To chart and the corresponding activity relationship chart based on the data given is shown below:

From/To	**I**	**F**	**P**	**T**	**A**	**S**
I	-	110	10	70	30	
F	70	-	20		60	
P	30		-	60		
T				-	180	
A					-	130
S						-

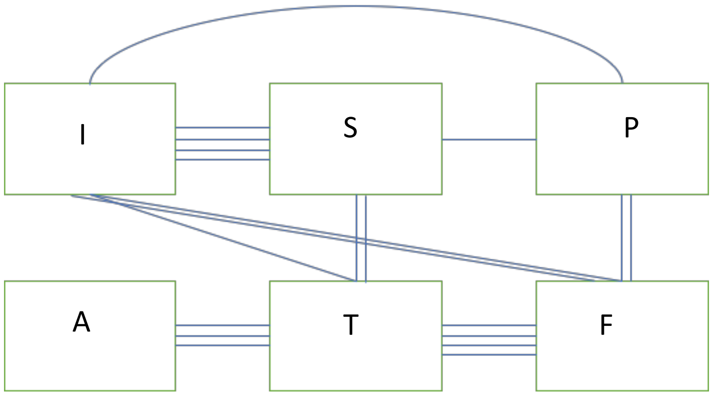
	I	**F**	**P**	**T**	**A**	**S**
I	-	A	O	I	O	U
F		-	O	U	I	U
P			-	I	U	U
T				-	A	U
A					-	E
S						-

The activity relationship diagram for the proposed layout is shown below:



Using the following points for the closeness ratings – A=4; E=3; I=2; O=1; U=0, based on the activity relationship chart, the adjacency score is given by:
CRFG+CRMF+CRTD = 4+1+1 = 6
Maximum adjacency score = 20
Hence, Layout Efficiency Rating = 0.3

(ii)
Based on the activity relationship chart, an improved activity relationship diagram is shown below:



And the corresponding layout is shown below:

I	F	P
S	A	T

The Layout Efficiency Rating of this Layout = 16/20 = 0.8.

(iii)
There are a number of missing elements to this analysis that the candidates are expected to discuss:

• Need to consider the space required in each department considering the number of machines required, which in turn is based on the predicted demand.

• Various adjustments and allowances will need to be added to the space calculation, which includes: o Personnel requirements - rest rooms, locker rooms, food services, plant entrances and exits

- Material handling methods - may affect floor space and building height
- Storage facilities - treat as separate department or add allowance
- Aisle space - add a percentage allowance
- Offices - for individual departments
- Building features - walls, column locations

• Further, additional considerations include: o Budget - construction costs may impose limitation on building size

- o Building codes - may affect location of building on property as well as structural and utility details
- o Safety requirements - some included in building codes
- o Since this is an existing building, its shape and size of building is a limitation on plant layout design

(b)

(i) **For the engineer's study** since it is a small sample the student t distribution should be used. The formula for the 95% confidence limits is:

$$\bar{x} \pm \frac{t_{n-1}^{1-\alpha/2} s}{\sqrt{n}}$$

Mean = 50.72 Std Dev 2.99

For 4 degrees of freedom and $\alpha = 0.05$ from the tables of student t distribution t = 2.776

95% confidence interval is $50.72 \pm 2.776\,(2.99)/\sqrt{5} = 50.72 \pm 3.71$

The 95% confidence interval is 47.01 to 54.43

(i) For the supervisor's sample

For the supervisor's study, the sample size is large enough to use the normal distribution. From the Cumulative normal distribution function table the u value for $1-\alpha/2 = .975$ is 1.96 therefore the 95% confidence interval is $\sqrt{(((1.96^2 * .745 * (1- .745))/400} = 0.042$

95% confidence limits for the proportion of productive vs. non productive are .703 to .787.

The TAKT time for the worker is (70 x 60 x 60)/3400 = 74.12 secs. If the worker is productive for 298/400 of the time the mean assembly time for the product is .745 x 74.12 = 55.2 secs.

Applying the confidence limits to the proportion of productive time to predict the assembly times suggests the 95% confidence interval times are :

74.12 x 0.703 = 52.11 secs

74.12 x 0.787 = 58.33 secs

4.

(a) A method study should be carried out to systematically record and examine the current methods of production

so that they can be improved and recreated in an alternative location. This should include selecting the key production methods to be examined. record the facts about the current methods of production including for example Material/Flow process charts mapping: operation, inspection, movement, delay and storage. other tools might include multiple activity charts, value stream mapping; and two handed process charts.

Where available Standard Operating Procedures should be captured including layout of workplace, tools and

equipment, procedures and inspections.

Current methods should be reviewed to identify any contextual factors which might not be present in the new

location.

The type of machine layout should also be observed and recorded, eg Is there a process or product layout or is a

cell layout (using group technology) in place? Material handling methods should also be examined.

The factory layout can also be analysed using activity relationship charts and diagrams, space relationship

diagrams and consideration of proximity requirements (e.g. using the Adjacency Score).

Work measurement on key production activities should also be carried out to provide a basis for redesign in the new environment including potentially:

Time studies using direct observation and measurement Predetermined Motion Time Studies (PMTS) using standard times Activity sampling using statistical sampling of activity over a period

(b) Now that the current production methods have been systematically recorded and critically examined, they should be developed to come up with a more efficient and cost effective method of doing the work, before they are re-implemented into the new factory.

The analysis undertaken above provides the foundations for the manufacturing system design in the new location. Three aspects might be considered

Uses of human body: including hand movements, positioning of work, safety, comfort etc Design of workplace: including seating position, environment, glare etc Design of tools and equipment: including for example use of robot/lifts etc.

Once the method has been developed and optimised it should be implemented as standard operating procedure (SOP) to reduce variations in time and quality and provide a basis for training and continuous improvement.

Designing of the new manufacturing system will also involve systematic layout planning (SLP) for factory level design. The first stage of SLP involves looking at material flows. Then the activity relationships might be considered using a closeness rating. An activity relationship chart could be used to *analyse* the closeness ratings of all the separate operations. Then a space relationship diagram can be developed to analyse how the production layout could fit into the new factory.

Finally, adjustments and allowances should be made to take account limiting factors such as the shape/site of the building, locations of drop off points, fire exits, regulations etc.

(c) When moving to a new location the following might be considered:

Labour force: what are the available levels of skill and how much available labour is there? local culture: what is the local culture like? This will have effects on the attitude of the labour and the attitudes of locals towards the installation of a new factory. Supply: availability of raw materials and sub-assemblies Regulations: environmental regulations may influence things like waste and pollution; minimum wage rates will affect labour costs. Proximity to markets, transportation costs and lead times will be affected by distances from suppliers to buyers. Infrastructure: existing roads, railways, etc. will affect transportation of goods and people. Financial: what are the financial implications of moving to this new location.

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