UNIVERSITY OF JOHANNESBURG

FACULTY OF ENGINEERING AND BUILT ENVIRONMENT
DEPARTMENT OF QUALITY AND OPERATIONS MANAGEMENT
JUNE 2015 MAIN EXAMINATION

PROGRAMME	:	DIPLOMA OPERATIONS MANAGEMENT MANAGEMENT SERVICES NATIONAL DIPLOMA MANAGEMENT TRANSPORTATION
SUBJECT	:	OPERATIONS MANAGEMENT I A
CODE	:	OPM11A1/BPJ11A1
DATE	:	05 JUNE 2015
DURATION	:	3 HOURS
TIME	:	(08:30 – 11:30)
TOTAL MARKS	:	100
WEIGHTS	:	50

EXAMINER(S)	:	MR S. MUKWAKUNGU
(EXTERNAL) MODERATOR	:	MRS A. AMADI-ECHENDU
NUMBER OF PAGES	:	10 PAGES

INSTRUCTIONS TO CANDIDATES:

- You will only submit your answer sheet together with the scanner sheet and Annexure B
- Answer ALL questions
- This is a closed book assessment.
- Leave margins and spaces between the questions.
- Number your answers clearly.
- Write neatly and legibly
- The general University of Johannesburg policies, procedures and rules pertaining to written assessments apply to this assessment.

Case Study 1 - Productivity at the Cape Town Salmon Processing Facility — 30 Marks

Mr Frank Langa operates a salmon processing facility where fish are purchased from local sources along the Mossel Bay coastline, processed at the facility, and sold to customers for distribution. The plant manager, Christopher Nkosi, is contemplating a plant modernization to upgrade the technology in the plant. While the plant performs well enough now, modernizing equipment would allow the plant to increase capacity per hour, which is particularly advantageous because the factory has enough demand to cover additional capacity. Currently, the plant operates five days a week, in two 8 hour shifts of 30 workers per shift. The workers are paid R60 per hour. Adding a third shift is not possible because the plant is cleaned during the third shift.

The firm is contemplating a plant modernization project to upgrade existing equipment, which should increase the plant's output while lowering energy costs. Using the current equipment, around 1500 kg of salmon can be processed each hour, while the new plant would be able to process 2000 kg per hour. The updated equipment is made by the same manufacturer as the existing equipment, and the production personnel feel that they will be able to learn to use the new equipment quickly. For this reason, costs to train personnel are assumed to be negligible. The production manager, Maria Pietersen, is sceptical about undergoing the plant modernisation. The older equipment, she argues, is already paid for, and the new equipment would cost R60000 per week. This cost comprises of both principal and interest, and includes manufacturer installation of the equipment. The controller, Maret Karlsen, cautions that all decisions related to costs should be included in the analysis and that because energy consumption would be different, this must also be accounted for in the decision. Energy costs are presently R60 per unit, and the existing plant uses 1000 units of energy per week. With the modernised plant, the consumption of energy would fall by 50%.

Case related questions

1. What is the productivity of the processing facility, with the equipment currently in use? (6)
2. What would the productivity of the plant become if the new system were purchased and implemented? (6)
3. What is the percentage change in productivity after the modernisation of the plant has taken place? (4)
4. In order to motivate the production manager, can you indicate the 10 decisions of the Operations Managers?
5. Mr Langa would like to know about the history of operations management. He has a keen interest in Fredrick W. Taylor. Can you identify the items that Fredrick W. Taylor believed management should be more responsible for? (4)

Case Study 2: Forecasting at M&L Manufacturing — 30 Marks

M&L Manufacturing makes various components for printers and copiers. In addition to supplying these items to a major manufacturer, the company distributes these and similar items to office supply stores and computer stores as replacement parts for printers and desktop copiers. In all, the company makes about 20 different items. The two markets (the major manufacturer and the replacement market) require somewhat different handling. For example, replacement products must be packaged individually whereas products are shipped in bulk to the major manufacturer.

The company does not use forecasts for production planning. Instead, the operations manager decides which items to produce and the batch size, based on orders and the amounts in inventory. The products that have the fewest amounts in inventory get the highest priority. Demand is uneven, and the company has experienced being overstocked on some items and out of others. Being under stocked has occasionally created tensions with the managers of retail outlets. Another problem is that prices of raw materials have been creeping up, although the operations manager thinks that this might be a temporary condition.

Because of competitive pressures and falling profits, the manager has decided to undertake a number of changes. One change is to introduce more formal forecasting procedures in order to improve production planning and inventory management.

With that in mind, the manager wants to begin forecasting for the most critical product in inventory. This product is important for several reasons. First, it accounts for a disproportionately large share of the company's profits. Second, the manager believes that this product will become increasingly important to future growth plans; and third, the product has experienced periodic out of stock instances.

The manager has compiled data on product demand from order records for the previous 10 weeks. These are shown in the following table.

Months	1	2	3	4	5	6	7	8	9	10
Demand	120	115	125	119	127	114	120	124	116	137

Case Related Questions

The manager has requested the following:

1. Calculate three forecasts using the following data. PLEASE NOTE THAT YOU WILL USE THE SCANNER SHEET PROVIDED IN ORDER TO ANSWER THE QUESTIONS BELOW.
    a. First, for periods 4 through 10, develop the exponentially smoothed forecasts using a forecast for period 3 (F_3) of 120.0 and an alpha of 0.3, and calculate the absolute deviation for each period **(Note that you will have to answer this question by choosing the options provided in questions 1 to 7 – See Annexure A)** (7)
    b. Second, calculate the three-period moving-average forecast for periods 4 through 10, and calculate the absolute deviation for each period **(Note that you will have to answer this question by choosing the options provided in questions 8 to 14 – See Annexure A)** (7)
    c. Third, calculate the weighted moving average for periods 4 through 10, using weights of 0.60, 0.30, and 0.10, and calculate the absolute deviation for each period **(Note that you will have to answer this question by choosing the options provided in questions 15 to 21 – See Annexure A)** (7)
    d. Which forecasting procedure would you select? Why? **(Note that you will have to answer this question by choosing the right option provided in question 22 – See Annexure A)** (1)
2. Please answer the following questions:
    a. What are the two approaches to forecast? (2)
    b. For each approach, provide a detailed explanation with examples. (6)

Case Study 3: Dell Uses the House of Quality for New Product Development Strategy. 40 Marks

Dell Computers is developing a new software program that will be run in their new generation of Laptops. Dell has a strict policy of always providing the customers with what they want; this is why Dell has been the leader in the market for a while. The research and development department at Dell has been implementing Quality Function Deployment for the development of all of Dell Computer products.

You have been assigned to work in their design team. As part of the design team task, you must develop a house of quality for this new software. The first task was to obtain the ***whats*** from the customers. The market research team has provided your team with the following information about what the customers want in the product: (1) reliable/resilient, (2) accurate, (3) fast, (4) responsive, (5) secure, (6) remote links, (7) connectivity and (8) scalability together with their respective importance ratings 9, 10, 7, 4, 8, 6, 5 and 2. After considering the customers' requirements, your design team has identified ***how*** the product will be able to satisfy the customers' wants and came up with following: (1) availability, (2) R-3 conformity, (3) Password x2, (4) intranet compatibility, (5) memory requirement, (6) database, (7) interface, and (8) firewalls. As part of the process of building the house of quality, your team has assessed each hows against one another and provided the following relationship levels:

- Availability and intranet compatibility have a negative relationship,
- R-3 conformity and memory requirement have a strong negative relationship,
- Intranet compatibility and memory requirement have a negative relationship,
- Intranet compatibility and interface have a strong positive relationship, and lastly
- Password x2 has a positive relationship with firewalls

After assessing the way your product will satisfy customers' requirements, your team moved on and worked on the relationship between your ***hows*** and the ***whats***. The outcome of the assessment is as follows:

- Reliable/resilient has a medium relationship with availability as well as password x2 but a weak relationship with interface.
- Accurate has a medium relationship with R-3 conformity and a strong one with database.
- Fast has a strong relationship with availability but a weak relationship with memory requirement.
- Responsive has a weak relationship with availability, but a medium one with R-3 conformity.
- Secure has a strong relationship with password x2 as well as firewalls.
- Remote links has a strong relationship with intranet compatibility, but it has a weak relationship with firewalls.
- Connectivity has a strong relationship with interface.
- Scalability has a medium relationship with R-3 conformity, but a weak relationship with memory requirement.

As part of building the house of quality, your team has conducted a benchmark assessment of your company's competitors' product against your customer's requirements. This task was not as simple as it seemed, as your team was seriously biased toward your product performance compared to the competitors' ones. Therefore, you suggested making use of a panel of external experts to assess the competitors' products. The panel's assessment, using satisfaction values of Good, Fair and Poor, provided the following information: company A and B fairly satisfied reliable/resilient requirement. The accuracy requirement of the product was poorly satisfied by both company A and B. While

company B's product was poorly fast, company A's product was good. Company B's product was poorly responsive; while company A's product response was good. Both company A's and B's products were fairly secure. Company A's product provided poor remote links, while B's had good remote links. In terms of connectivity, A's product poorly provided it, while B's was fair. Finally, A's product had a poor scalability, while B's had a good one.

Your team was convinced that all this information was sufficient to go ahead and construct a house of quality. The expected results from building the house of quality was that it will ensure that the team's eventual software as well as hardware design actually meets the needs of its customers.

Case Related Questions

1. In the new product development process, companies must ensure that they meet the order qualifiers (OQ) & order winners (OW) of the product. Please differentiate between the two. (4)
2. What are the steps involved in conducting quality function deployment covered in your prescribed text material? (7)
3. Based on the information provided in the text (Case study 3), complete the house of quality provided in Annexure B. (21)
4. After completing the table, compute the value of "***Our Importance Ratings***" row. (8)

ANNEXURE A – ANSWERS TO MULTIPLE CHOICES QUESTIONS 1.a, 1.b, 1.c & 1.d FROM CASE STUDY 2

1. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 4 are respectively:
   A) 121.50 & 3.50
   B) 122.21 & 2.50
   C) 120.50 & 1.25
   D) 121.50 & 2.50
   E) None of the above
2. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 5 are respectively:
   A) 121.50 & 3.50
   B) 120.75 & 6.25
   C) 120.50 & 1.25
   D) 121.50 & 2.50
   E) None of the above
3. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 6 are respectively:
   A) 121.50 & 3.50
   B) 120.75 & 6.25
   C) 120.50 & 1.25
   D) 121.50 & 2.50
   E) None of the above
4. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 7 are respectively:
   A) 120.50 & 3.50
   B) 120.75 & 0.00
   C) 120.04 & 0.04
   D) 121.50 & 2.50
   E) None of the above
5. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 8 are respectively:
   A) 120.50 & 3.50
   B) 120.75 & 0.00
   C) 120.03 & 3.96
   D) 124.50 & 2.50
   E) None of the above
6. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 9 are respectively:
   A) 120.50 & 3.50
   B) 121.22 & 5.22
   C) 120.03 & 3.96
   D) 124.50 & 2.50
   E) None of the above
7. From your calculation the values of the exponential smoothing forecast and absolute deviation for month 10 are respectively:
   A) 120.50 & 3.50
   B) 121.22 & 5.22

C) 119.03 & 13.96
D) 119.65 & 17.35
E) None of the above

8. From your calculation the values of the simple moving average forecast and absolute deviation for month 4 are respectively:
   A) 121.50 & 3.50
   B) 120.00 & 1.00
   C) 120.50 & 1.25
   D) 120.00 & 0.50
   E) None of the above
9. From your calculation the values of the simple moving average forecast and absolute deviation for month 5 are respectively:
   A) 119.67 & 7.33
   B) 120.00 & 1.00
   C) 120.50 & 1.25
   D) 120.00 & 0.50
   E) None of the above
10. From your calculation the values of the simple moving average forecast and absolute deviation for month 6 are respectively:
   A) 119.67 & 7.33
   B) 120.00 & 1.00
   C) 120.50 & 1.25
   D) 120.00 & 0.50
   E) None of the above
11. From your calculation the values of the simple moving average forecast and absolute deviation for month 7 are respectively:
   A) 119.67 & 7.33
   B) 120.00 & 0.00
   C) 120.50 & 1.25
   D) 120.00 & 0.50
   E) None of the above
12. From your calculation the values of the simple moving average forecast and absolute deviation for month 8 are respectively:
   A) 119.67 & 7.33
   B) 120.00 & 0.00
   C) 120.33 & 3.65
   D) 120.00 & 0.50
   E) None of the above
13. From your calculation the values of the simple moving average forecast and absolute deviation for month 9 are respectively:
   A) 119.67 & 7.33
   B) 120.00 & 0.00
   C) 119.33 & 3.33
   D) 120.00 & 0.50
   E) None of the above
14. From your calculation the values of the simple moving average forecast and absolute deviation for month 10 are respectively:
   A) 119.67 & 7.33

B) 120.00 & 17.00
C) 119.33 & 17.00
D) 120.00 & 0.50
E) None of the above

15. From your calculation the values of the weighted moving average forecast and absolute deviation for month 4 are respectively:
A) 121.67 & 7.33
B) 120.00 & 17.00
C) 121.5 & 2.50
D) 120.5 & 0.50
E) None of the above

16. From your calculation the values of the weighted moving average forecast and absolute deviation for month 5 are respectively:
A) 121.67 & 7.33
B) 120.00 & 17.00
C) 121.5 & 2.50
D) 120.5 & 0.50
E) None of the above

17. From your calculation the values of the weighted moving average forecast and absolute deviation for month 6 are respectively:
A) 121.67 & 7.33
B) 120.00 & 17.00
C) 124.5 & 10.40
D) 120.5 & 0.50
E) None of the above

18. From your calculation the values of the weighted moving average forecast and absolute deviation for month 7 are respectively:
A) 121.67 & 7.33
B) 118.4 & 1.60
C) 124.5 & 10.40
D) 120.5 & 0.50
E) None of the above

19. From your calculation the values of the weighted moving average forecast and absolute deviation for month 8 are respectively:
A) 121.67 & 7.33
B) 118.4 & 1.60
C) 119.8 & 5.10
D) 118.9 & 5.10
E) None of the above

20. From your calculation the values of the weighted moving average forecast and absolute deviation for month 9 are respectively:
A) 121.8 & 5.80
B) 118.4 & 1.60
C) 119.8 & 5.10
D) 118.9 & 5.10
E) None of the above

21. From your calculation the values of the weighted moving average forecast and absolute deviation for month 10 are respectively:
    A) 121.8 & 5.80
    B) 118.4 & 1.60
    C) 118.8 & 18.20
    D) 118.9 & 18.22
    E) None of the above

22. Which forecasting procedure would you select based on the MAD value? Why?
A) Using MAD, the simple moving average is best because it has the highest MAD value
B) Using MAD, the exponential smoothing forecast in the best because it has the lowest value of 6.00
C) Using MAD, weighted moving average is best because it has the highest MAD value
D) Using MAD, the simple moving average is best because it has the lowest MAD value.
E) None of the above

ANNEXURE B: CASE STUDY 3 HOUSE OF QUALITY FOR DELL COMPUTER'S NEW SOFTWARE

INITIAL(S) AND SURNAME:..... STUDENT NUMBER: