Tutorial Letter 101/3/2018

Production and Operations Management

MNO3701

Semesters 1 and 2

Department of Operations Management

This tutorial letter contains important information about your module.

BARCODE

CONTENTS

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Dear Student

1 INTRODUCTION

We are pleased to welcome you to the module **Production and Operations Management** (POM). We trust that you will have a pleasant, stimulating and most successful year of study. If you grasp the potential economic impact of “adding value”, you will agree that a country's economic growth depends directly on this. The importance of this subject discipline can, therefore, only be fully appreciated if the contribution of productive transformation processes in the economy is understood.

The study material for this module is an **integrated package**. Therefore, do not merely study the prescribed book. The assignments (Addendum A) are also based on additional material (the **case studies** in Addendum B). Your study guide can be regarded as your “lecturer” – please follow the guide (with additional activities/examples) as it has **16 learning units** with very specific learning outcomes. The module is divided into the following three parts:

- Part 1: Developing POM strategies for competitive advantage (with two topics)
- Part 2: Designing, planning and controlling the POM system for world-class performance (with five topics)
- Part 3: Improving POM for the emerging challenges of the 21st century (with three topics)

This tutorial letter contains information on the assignments, feedback on the assignments, the availability of lecturers, etc.

It is imperative that you study Tutorial Letter MNALLEQ/301/4/2018 thoroughly as it contains important general information about all the undergraduate modules.

2 PURPOSE AND OUTCOMES

2.1 Purpose

Please refer to the study guide for 2018 for a detailed description of the purpose and outcomes of this module.

2.2 Outcomes

Please refer to the study guide for 2018 for a detailed description of the purpose and outcomes of this module.

3 LECTURER(S) AND CONTACT DETAILS

3.1 Lecturer(s)

The lecturer prefers to communicate with students by **e-mail**. The lecturer for this module in 2018 is as follows:

Lecturer	E-mail address
Dr Alet Tolmay	etolmaas@unisa.ac.za

The lecturer's offices are situated on the 4rd level of the AJH van der Walt Building on Unisa's Muckleneuk Campus in Pretoria. Personal visits must please be pre-arranged by appointment. Usually at least one lecturer is available. If lecturers are in consultation and not available, please leave a message by e-mail or with another lecturer in the department. We will then contact you.

A final request: Please do not wait until the last moment before you contact us. Usually it is only a day or two before the scheduled examination date that we receive literally thousands of desperate calls!

Please note: Do not contact lecturers with administration matters – only contact them about academic matters. Any other enquiries must rather be taken up with the relevant department or section concerned. Use the guidelines in Tutorial Letter MNALLEQ/301/4/2018.

LECTURER AVAILABILITY

The lecturer for this module will be available to take phone calls on academic matters and/or to attend to students who may prefer to visit personally for academic engagement. However, the days and times of lecturer's availability will be communicated in the module page on myUnisa. These days and times are subject to change from time to time in order to accommodate the lecturer's work schedule and other commitments. The changes on the days and times will be

communicated by the lecturer in advance through the announcement option on myUnisa as and when this happen. Students are advised to check the module page on myUnisa before making phone calls or visiting the lecturer's office for academic enquiries/engagements.

4 RESOURCES

4.1 Prescribed books

You should receive the following study material for this module from Unisa:

- one study guide
- tutorial letters

Please Note:
We are experiencing difficulties regarding the availability of the prescribed book for MNO3701. We are in discussion with the publishers. Please note that we are still working with the previous edition (Pycraft et al 2010) for 2018. You have studied from this handbook for MNO2601 – please do not buy the Slack et al, 2017 (3rd edition) book if you have a copy of Pycraft et al (2010).

The new edition of the prescribed book; Slack et al, 2017 (3rd edition) will be introduced for MNO3701 only from 2019. I am aware of slight differences between the two prescribed books. However, you will be able to study from the 3rd edition should you not have a copy of Pycraft et al (2010). The only chapter that differs completely is chapter 21. This is a very important chapter and you will be examined on chapter 21 of Pycraft et al (2010). A summary of chapter 21 (Pycraft et al., 2010) will be posted on MyUnisa.

Please work according to the study guide's module framework regarding the study units and topics. Also, make sure that you work out previous examination papers posted on MyUnisa under "official study material".

Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S & Johnston, R. 2010. Operations management. 2nd edition. Cape Town: Pearson Education

Slack, N; Brandon-Jones, A; Johnston, R; Singh, H; Phihlela, K. 2017. Operations management; Global and Southern African Perspectives. 3nd edition. Cape Town: Pearson ISBN: 9781775956600

The study guide serves both as a manual for studying the prescribed textbook and as a source of additional information about certain aspects of the syllabus.

4.3 Electronic reserves (e-reserves)

Please refer to “additional resources” on MyUnisa for videos and more examples on material.

4.4 Library services and resources information

For brief information, go to www.unisa.ac.za/brochures/studies

For detailed information, go to http://www.unisa.ac.za/library. For research support and services of personal librarians, click on "Research support".

The library has compiled a number of library guides:

- finding recommended reading in the print collection and e-reserves – http://libguides.unisa.ac.za/request/undergrad
- requesting material – http://libguides.unisa.ac.za/request/request
- postgraduate information services – http://libguides.unisa.ac.za/request/postgrad
- finding, obtaining and using library resources and tools to assist in doing research – http://libguides.unisa.ac.za/Research_Skills

- how to contact the library/finding us on social media/frequently asked questions – http://libguides.unisa.ac.za/ask

5 STUDENT SUPPORT SERVICES

Predatory providers of classes and examination support

Please be aware of the existence of multiple fraudulent and predatory providers of classes and examination guidance to Unisa students. Please note that Unisa do not have agreements with any of these agencies/schools/colleges to provide tuition or support to our students. Unisa also do not provide these predators with studymaterial, guidelines or your contact information. These providers may not have the necessary expertise to assist you and often charge exorbitant fees. If you receive an invitation from any agency or College, it is best to confirm with your lecturer if the provider is a legitimate Unisa partner.

TVET Agreements

Unisa have agreements with a number of TVET Colleges to provide contact tuition and support for students in the following Higher Certificates. More information on this is available on the Unisa website.

- Higher Certificate in Economic & Management Sciences
- Higher Certificate in Banking
- Higher Certificate in Tourism
- Higher Certificate in Accounting Sciences

6 STUDY PLAN

MNO3701 comprises three parts, 10 topics and 12 learning as depicted in the Module Framework (below). The module framework also serves as the examination scope. The applicable chapters in both prescribed books (Pycraft et al., 2010) and (Slack et al., 2017) are depicted in the Module Framework. The study guide refers to Pycraft et al., 2010 (therefore the cross reference to Slack., 2017 in the (module framework). However, the complete syllabus in the study guide is applicable.

Module Framework Part I

Topics (Study Guide)	Learning units (Study Guide)	Pycraft et al,.2010 2nd Edition*	Slack et al,. 2017 3rd Edition**
PART I: DEVELOPING PRODUCTION AND OPERATIONS MANAGEMENT STRATEGIES FOR COMPETITIVE ADVANTAGE			
Topic 1 (Study Guide p2) The strategic role and objectives of production and operations management.	**Learning Unit 1** (Study Guide p4) Effective production/operations management: a review	Chapter 1	Chapter 2
	Learning Unit 2 (Study Guide p13) Strategic role and performance objectives of the production and operations function	Chapter 1	Chapter 2
Topic 2 (Study Guide p19) Production and operations management strategies	**Learning Unit 3** (Study Guide p20) Developing production and operations management straties	Chapter 3	Chapter 3

* Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S & Johnston, R. 2010. Operations management. 2nd edition. Cape Town: Pearson Education

** Slack, N; Brandon-Jones, A; Johnston, R; Singh, H; Phihlela, K. 2017. Operations management; Global and Southern African Perspectives. 3nd edition. Cape Town: Pearson ISBN: 9781775956600

Module Framework Part III

Topics (Study Guide)	Learning units (Study Guide)	Pycraft et al,.2010 2nd Edition*	Slack et al,. 2017 3rd Edition**
PART II: DESIGNING, PLANNING AND CONTROLLING THE PRODUCTION/OPERATIONS MANAGEMENT SYSTEM FOR WORLD-CLASS PERFORMANCE			
Topic 3 (Study Guide p32) Process technology	**Learning Unit 4** (Study Guide p34) The general nature of design in operations: a review	Chapter 4	Chapter 4
	Learning Unit 5 (Study Guide p42)	Chapter 8	Chapter 8
Topic 4 (Study Guide p50) Material requirements planning	**Learning Unit 6** (Study Guide p52) General nature of planning and control in operations: a review	Chapter 10	Chapter 10
	Learning Unit 7 (Study Guide p60) Enterprise resource planning	Chapter 14	Chapter 14
Topic 5 (Study Guide p89)	**Learning Unit 8** (Study Guide p90) Lean operations and JIT	Chapter 15	Chapter 15
Topic 6 (Study Guide p99) Quality planning and control	**Learning Unit 9** (Study Guide 101) Assuring quality in production and operations management systems	Chapter 17	Chapter 17
	Learning Unit 10 (Study Guide p106) Statistical process control (SPC), Six Sigma and acceptance sampling	Chapter 17 Chapter 18	Chapter 17
Topic 7 (Study Guide p116) Material requirements planning	**Learning Unit 11** (Study Guide p118) Project planning and control	Chapter 16	Chapter 16
	Learning Unit 12 (Study Guide p127) Network analysis	Chapter 16	Chapter 16

* Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S & Johnston, R. 2010. Operations management. 2nd edition. Cape Town: Pearson Education

** Slack, N; Brandon-Jones, A; Johnston, R; Singh, H; Phihlela, K. 2017. Operations management; Global and Southern African Perspectives. 3nd edition. Cape Town: Pearson ISBN: 9781775956600

Module Framework Part III

Topics (Study Guide)	Learning units (Study Guide)	Pycraft et al,.2010 2nd Edition*	Slack et al,. 2017 3rd Edition**
PART III: IMPROVING THE PRODUCTION AND OPERATIONS MANAGEMENT SYSTEM FOR THE EMERGING CHALLENGES OF THE 21ST CENTURY			
Topic 8 (Study Guide p147)	**Learning Unit 13** (Study Guide p150) Production and operations management improvement	Chapter 18	Chapter 18
	Learning Unit 14 (Study Guide p158) Total quality management	Chapter 17 Chapter 20	Chapter 20
Topic 9 (Study Guide p167) Maintaining the production and operations management system	**Learning Unit 15** (Study Guide p168) Failure prevention and recovery	Chapter 19	Chapter 19
Topic 10 **(Study Guide p176)** New challenges to and contemporary issues in production and operations management Responsible production and operations management	**Learning Unit 16** (Study Guide p178) The production and operations management challenge Corporate Social Responsibility	Chapter 21	Chapter 21

* Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S & Johnston, R. 2010. Operations management. 2nd edition. Cape Town: Pearson Education

** Slack, N; Brandon-Jones, A; Johnston, R; Singh, H; Phihlela, K. 2017. Operations management; Global and Southern African Perspectives. 3nd edition. Cape Town: Pearson ISBN: 9781775956600

7 PRACTICAL WORK AND WORK-INTEGRATED LEARNING

Students are advises to study consistently for the best results. Please visit the MyUnisa website regularly to review material and announcements posted online.

8 ASSESSMENT

8.1 Assessment criteria

Unisa has adopted a policy of **compulsory assignments** for all modules for 2018. Both multiple-choice question (MCQ) assignments (Assignments 01 and 02) for MNO3701 are

compulsory assignments. The third assignment includes essay-type questions and this assignment is **voluntary** (for self-assessment purposes).

Assignment 01 has a dual purpose: you must submit this assignment to be admitted to the examination and the marks that you obtain for it will contribute towards your year mark. You will get examination admission by submitting Assignment 01 **on time** and it will not be based on the mark that you get for the assignment. Failure to submit this assignment on/before the due date will mean that you will not be admitted to the examination, regardless of whether or not you have submitted Assignment 02 and obtained a year mark.

You will receive feedback on **both** the assignments in **Tutorial Letter MNO3701/201/3/2018.**

8.2 Assessment plan

The compulsory and self-assessment assignments for 2018 are set out in **Appendix A** of this tutorial letter.

Assignment number	First semester	
	Due date	Unique number
01	19/03/2018	**899909**
02	23/04/2018	**809645**

Assignment number	Second semester	
	Due date	Unique number
01	27/08/2018	**719398**
02	24/09/2018	**823633**

Consult Tutorial Letter MNALLEQ/301/4/2018 about the following:

- administrative matters concerning the assignments
- guidelines on answering essay questions
- key concepts for the examination

IMPORTANT NOTICE

For students to benefit fully from our formative tuition and assessment, the management of the University decided to introduce TWO **compulsory assignments** for all modules. The marks that you obtain for these assignments will contribute towards your year mark.

You have to submit the **first compulsory assignment** to obtain admission to the examination, but both assignments will contribute towards your year mark.

Please ensure that your assignments reach the University **before their due dates. Late submission** of Assignment 01 will result in you **not being admitted to the examination!**

PLEASE DO NOT CONTACT LECTURERS ABOUT THE SUBMISSION/LATE SUBMISSION OF ASSIGNMENTS.

8.3 Assignment numbers

8.3.1 General assignment numbers

Please refer to 8.2 “Assessment Plan” for assignment numbers.

8.3.2 Unique assignment numbers

Please refer to 8.2 “Assessment Plan” for assignment numbers.

8.4 Assignment due dates

Please refer to 8.2 “Assessment Plan” for assignment numbers.

8.5 Submission of assignments

VERY IMPORTANT

Please ensure that your assignments reach us on or before their due dates. You will not be admitted to the examination if you submit **Assignment 01** late. Please **do not phone** us with a request to be admitted to the examination if you did not submit **Assignment 01** or if you submitted it late.

Different **unique numbers** are allocated to the two assignments. **Please make sure that you provide the correct unique number on the mark-reading sheet.**

8.6 The assignments

Please note: Completing the assignments is to the benefit of students. It will benefit you by helping you to be better prepared for the examination and it will benefit students with a relatively low examination mark (between 46 and 50%). Please note that **no assignment mark will be added to an examination mark below 40%.** Irrespective of the year mark obtained, a subminimum of 40% must be obtained in the examination. You can, therefore, not pass the module if your examination mark is less than 40%.

These two assignment marks (percentages) will be combined as an **average percentage mark** (referred to as your year mark). Your year mark and examination mark (will, therefore, be combined to calculate your final mark, in other words **your final mark for this module will consist of a combination of your year mark (average assignment mark/percentage) and your examination mark**. Your year mark will contribute 20% and your examination mark will contribute 80% towards your final mark for this module.

Please study the following examples of how the year mark (assignment marks) may contribute to the final mark.

Example 1

The student submits both compulsory Assignments 01 and 02 and earns an average year mark of 50%. This year mark of 50% is then multiplied by 0,2, (which equals 10% of the final mark). If the student obtains 35 out of 70 marks in the examination (that is, 50%), this percentage is

multiplied by 0,8 (which equals 40% of the final mark). The year mark and the examination mark are combined (10% + 40%) to give a final mark of 50% for the module.

Example 2

The student submits both compulsory Assignments 01 and 02 and obtains an average year mark of 60%. This year mark multiplied by 0,2 gives 12% of the final mark. The student then obtains 44 out of 70 marks (or 63%) in the examination. This figure is multiplied by 0,80 to give 50,4%. The two results are combined to give a final mark of 62% (12% + 50,4%) for the module.

Example 3

The student submits both compulsory Assignments 01 and 02 and earns an average year mark of 30%. This year mark of 30% is multiplied by 0,2 (which equals 6% of the final mark). If the student obtains 35 out of 70 marks in the examination (that is, 50%), this percentage is multiplied by 0,8 (which equals 40% of the final mark). The year mark and the examination mark are combined (6% + 40%) to give a final mark of 46% for the module. This student, therefore, **does not pass the module, even though he/she passed the examination**. Your year mark can thus be critical in determining whether you pass or fail the module!

Example 4

The student submits both compulsory Assignments 01 and 02 and earns an average year mark of 100%. This year mark of 100% is multiplied by 0,2 (which equals 20% of the final mark). If the student obtains 31 out of 70 marks in the examination (that is, 44%), this percentage is multiplied by 0,8 (which equals 35% of the final mark). The year and the examination mark are combined (20% + 35%) to give a final mark of 55% for the module. This student passes the module – although he/she failed the examination, he/she did obtain a mark above the subminimum of 40% for the examination. Again, your year mark can be critical in determining whether you pass or fail the module!

Example 5

The student does not submit Assignment 01, although he/she obtains a mark of 100% for Assignment 02. Because the student did not submit Assignment 01, he/she **will not be admitted to the examination** and thus receives an examination mark of 0%. The student will be awarded a final mark of 10% (0% for Assignment 01 + 100% for Assignment 02 = 100 ÷ 2 = 50% x 0,2 = 10% [year mark] + 0% [examination mark] = 10% [final mark]).

Completing the assignments is, therefore, an excellent opportunity for you to ensure that the work that you do during the year contributes towards your final mark. If you decide not to use this opportunity to the full, you will be at a definite disadvantage compared to learners who grab hold of the opportunity with both hands. You are, therefore, advised and encouraged to do ALL the assignments and to obtain a good year mark in order to get the full benefit of this system of assessment.

8.7 Other assessment methods

Alternative assessment to assist students who qualify for final-year concessions

The brochure *my Studies @ Unisa* contains important information on the final-year concession procedure for students who have one or two modules outstanding to complete their degrees.

The Department of Examination Administration will inform all students who qualify for a final-year concession per SMS/e-mail.

For this module, these final-year students have the option to make use of the next formal examination opportunity, or to engage in an alternative method of assessment (which will be a portfolio).

More information on the alternative method of assessment will be communicated directly to qualifying students.

Alternative methods of assessment are subject to stringent academic rules and processes, and should not be considered an easier option. Failure to meet the learning outcomes of the module, through the alternative method of assessment, will result in students failing and they will have to re-register for the outstanding module(s).

8.8 The examination

Please note that the examination will cover the whole syllabus (all parts, topics and learning units) for this module. It will be a "closed-book" examination and you must, therefore, know, understand and be able to apply **ALL** the work (including formulas). We, therefore, urge you not to leave out or ignore any part of the study material in your final preparation for the examination.

The format of the examination paper will be very similar to the format for the last two assignments (that is, a combination of multiple-choice and essay-type questions).

The examination paper will count 70 marks and will have two sections. Section A will contain multiple-choice questions (10 questions of 1 mark each that will count 10 marks of the examination total of 70 marks, or 14%). Section B will contain essay questions. There will be three questions of 30 marks each; the questions will have subsections (as in the assignments) and you will have to select two (that will count 60 marks of the examination total of 70 marks, or 86%). The duration of the examination will be two hours.

9 IN CLOSING

We wish you a successful year of study and we hope that you will find this module interesting and stimulating. We are convinced that this module can make a significant contribution to both your personal and professional development.

Myself, and your e-tutors are always willing to help. Feel free to consult us at any time if you have any problems with your studies.

Kind regards

Dr Alet Tolmay
DEPARTMENT OF OPERATIONS MANAGEMENT
UNISA

Addendum A: Assignments for 2018

SEMESTER 1
ASSIGNMENT 01: COMPULSORY ASSIGNMENT
DUE DATE: 19/03/2018
UNIQUE NUMBER: 899909

This assignment for module MNO3701 consists of **twenty** multiple-choice questions (MCQs) for topic 1 (learning units 1 and 2), topic 2 (learning unit 3) and topic 3 (learning units 4 and 5).

MULTIPLE-CHOICE QUESTIONS

Answer the following twenty (20) multiple-choice questions. Each question is of equal value and is allocated one (1) mark. No negative marking will be applied.

1 Operations processes have four dimensions. Which of the following is **one** of them?

1 Appearance
2 Variety
3 Quality
4 Material
5 Globalisation

2 Which **two** of the following statements are **correct**?

a If you want to "do things nicely", then you should satisfy your customers/clients by providing error-free goods and services that are "fit for purpose". This gives your customers/clients a dependability advantage.
b If you want to "do things right the first time", then you should satisfy your customers/clients by providing error-free goods and services which are "fit for purpose". This gives your customers/clients a quality advantage.
c If you want to "do things on time", then you should satisfy your customers/clients by keeping to delivery promises. This gives your customers/clients a dependability advantage.

d If you want to “do things fast”, then you should satisfy your customers/clients by providing slow-free goods and services, which are “fast for purpose”. This gives your customers/clients a JIT advantage.

e If you want to “do things cheaply”, then you should satisfy your customers/clients by providing “good-looking products”. This gives your customers/clients an image advantage.

1 a, b
2 b, c
3 a, e
4 b, d
5 d, e

3 Strategies are not mere objectives or goals. In this regard, which **one** of the following statements is **correct**? Business strategies....

1 represent the end points at which all production/operations control activities are aimed.
2 represent the starting points at which all production/operations improvements are aimed.
3 reflect the large-scale, future oriented production and operations plans.
4 reflect the large-scale, future-oriented business plans to optimise the achievement of business objectives or goals.
5 represent and reflect the large-scale, future-oriented starting and ending points to optimise the achievement of production/operations goals.

4 You are the production and operations manager of a large organisation. Which questions will you ask when analysing the procurement of new computer numerically controlled machine tools (CNC)?

a What does the technology do?
b How does it do it?
c What advantages does it give?
d What constraints does it impose?
e Will it contribute to the marketing value of the company (image of the organisation)?

1 a
2 a, b
3 a, b, c
4 a, b, c, d
5 a, b, c, d, e

5 Which **two** of the following statements regarding the general nature of production/operations strategies in the "modern era" are **incorrect**?

a Strategies must be ethical (morally justifiable).
b Strategies must be populous (evoke support from majority stakeholders).
c Strategies must only be documented (management might delay the implementation indefinitely).
d Strategies must be creative (imaginative, unorthodox and unconventional).
e Strategies must only apply to international business (beyond national boundaries).

1 a, b
2 a, c
3 c, e
4 c, d
5 d, e

6 Which **two** of the following statements are **correct**?

a The operation's competitive role and position, together with the articulation of the specific performance or strategic objectives it hopes to achieve, largely influence the content of the production/operations strategy of the business.
b The hierarchical position of the production/operations strategy in relation to the corporate or business strategy depends on how management view the potential of the production/operations function in contributing to the long-term success of the business.
c The process aspects of the production/operations strategy largely determine the relative priority of the performance objectives of the business and further relate to each of the specific decision areas in the design, planning and control, and improvement of the production/operations management system.

d The relative importance that a business attaches to specific performance objectives is determined by the influence that customers/clients may have on the business, its competitors and the stage of the business's products or services in their life cycles.

e The operation's infrastructural strategy areas are primarily influenced by the design activities (i.e.similar to the "hardware" of a computer system), whereas the structural strategy areas are influenced by the planning and control and improvement activities (i.e.similar to the "software" of a computer system).

1 a, b
2 b, c
3 c, d
4 a, d
5 a, e

7 Which **three** of the following statements are **incorrect**?

a Performance objectives of the design activity include producing: error-free designs, designs that are moved from concept to specification in as short a time as possible, designs that do not consume excessive amounts of resources during the creation process, etc.

b The primary purpose of the design activity is the requirement for a high degree of compatibility between the design of the product/service and the design of the processes for their manufacture or provision.

c The overlap between the design of the product and the design of the process for its manufacturing is generally greater than for the design and provision of services because in the case of manufacturing, the high degree of automation makes greater coordination necessary.

d The design activity for high-volume, low-variety operations should emphasise the product/service design if the degree of standardisation is high, the process flow is continuous and the staff skills are task specific.

e The aspects of the production/operations management system that need to be designed are: the design of the products/services themselves, the design of the production/-operations network, the design of the layout and the work flow of the manufacturing or service provisioning facility, the choice and selection of process technology, and job design and work organisation.

1 a, b, c
2 c, d, e
3 a, b, e
4 a, c, d
5 b, c, d

8 Identify the performance objectives variable(s) of production and operations management.

a Speed
b Dependability
c Cost
d Flexibility
e Quantity

1 a
2 a, b
3 a, b, c
4 a, b, c, d
5 a, b, c, d, e

9 Which of the following statements is/(are) incorrect?

a In case study 2 entitled “AGVs at new international, Wapping” in Addendum B of this tutorial letter, the process of delivering the paper reel to the printing press and loading the paper into position are fully automated by the use of AGVs.

b In case study 3 entitled “FMS at Yamazaki Mazak” in Addendum B of this tutorial letter, the factory at Worcester in the UK won the Management Today “Best Factory Award” by installing the greatest possible number of robotic assembly tools and by utilising them fully unmanned for overnight production.

c In contrast to material and information-processing technologies where production/operations managers are mainly concerned with the interaction between their staff and the technology itself, customer/client-processing technology involves a three-

way set of interactions in addition to the two above with the customers/clients themselves.

d Developments in material-processing technologies include more sophisticated numerically controlled machine tools, robotics, AGVs, FMS and CIM; in the case of information-processing technologies, there is a strong movement to merge with telecommunications technologies, such as EDI.

e In case study 4 entitled "Technology at the Robeco Group" in Addendum B of this tutorial letter, the primary interaction between technology is direct and active through telephonic financial advice.

1 b
2 b, c
3 a, d, c
4 a, d, e
5 b, e

10 The product/service life cycle is a generalised model of the behaviour of both customers and competitors during the life of a product or service; it is generally held to have stages. Identify the **incorrect** statement(s).

a Introduction stage – introduction into the market
b Growth stage – growth in market is extremely slow
c Maturity stage – maturity of market, sales level off
d Decline stage – decline as market becomes saturated
e Marketing stage – introduce the product to the market

1 e
2 b, e
3 a, b, c
4 a, b, c, d
5 b

11 Flexibility means being able to change in some way. Which of the following are included in flexibility in production and operations management:

a Product/Service flexibility – the operation's ability to introduce new or modified products and services.

b Interest rate flexibility – the operation's ability to adjust to interest rate fluctuations when manufacturing products.

c Mix flexibility – the operation's ability to produce a wide range or mix of products and services.

d Volume flexibility – the operation's ability to change its level of output or activity to produce different quantities or volumes of products and services over time.

e Delivery flexibility – the operation's ability to change the timing of delivery of its services or products.

1 a, b, c
2 a, b, c, d
3 a, b, c, d, e
4 a, c, d, e
5 a, b, d, e

12 Which of the following is a competitive factor for operations strategy (*Tip: Chapter 3, Slack et al., 2017?*

1 Radio advertisements
2 New premises
3 Low product prices
4 Young employees
5 Restructuring

13 Study case study 1 entitled “Improvement strategies at Rover” in Addendum B of this tutorial letter and then indicate which **two** of the following statements are **incorrect**:

a A significant element of Rover’s improvement strategy was the attention given to its human resources by recognising that the workforce was the most important resource in the company and the driver of all continuous improvement efforts.

b Rover’s improvement strategy primarily focused on the re-organisation of the company structure and the introduction of re-engineering principles for the adoption of Japanese best-working practices.

c Rover's improvement strategy further emphasised the performance objectives of low cost, dependability and good service.

d Competitor benchmarking at Rover meant the company was to get to “know its enemy”.

e “Roverization” meant that the company dedicated itself to an improvement strategy that would move its products to the top of each product class. The elements of the programme included training the entire workforce in the philosophies and tools of total quality management (TQM) and the company’s endeavours to achieve “extraordinary customer satisfaction”, etc.

1 b, c
2 a, b
3 c, d
4 d, e
5 a, e

14 Which **three** of the following statements are **correct**?

a A general guideline for effective design is that the number of components of the product or operations of the service is minimised to reduce costs, improve on the quality of the product/service and generally facilitate production or service.

b General guidelines for effective design in production/operations management may be classified under the three main headings of: general guidelines, quality guidelines, and producibility/operability guidelines.

c Avoidance of special complicated fasteners and/or connectors for products or off-line elements of the service that may interrupt it, is a producibility/operability guideline well worth pursuing.

d A quality guideline holds that designs should concentrate on the robustness of the product (i.e."should not break easily") and avoid designs that require a great deal of attention during manufacture or delivery (i.e."one could make the product or provide the service with one's eyes closed").

e Key questions in assessing the feasibility of a design for a product/service are as follows: Are the necessary skills or quality of resources available? Are the financial resources and financial return acceptable? Does the business have the organisational capacity or quantity of resources to cope with the specific design option?

1 b, c, d
2 c, d, e
3 b, d, e
4 a, b, c
5 a, b, e

15 Which **three** of the following statements are **correct**?

a All operations of all types of businesses produce goods or render services, or a mixture of the two, by a process of transformation.

b Transformed input resources comprise the following: materials, information and customer/clients.

c The difference between transforming and transformed input resources lies in their position in relation to the output resources.

d A dominant transformed material resource, such as a factory plant, would be found in all types of manufacturing operations.

e After having gone through either materials, information or customer processing, outputs emerge in the form of goods or services, which are generally different because of tangibility, storability, transportability and customer/client contact.

1 a, b, c
2 b, c, d
3 c, d, e
4 a, b, e
5 a, d, e

16 Which **one** of the following statements is **correct**?

1 The operations department is not required to get involved with ethical actions; this is a task for the CEO and marketing department.

2 Operations managers are responsible for taking into account the King III report regarding operational decisions.

3 The operations principles to keep costs down include: decreasing volume, increasing variety, increasing variation and increasing visibility.

4 The management of cost is the responsibility of the finance department and not the responsibility of production and operations management.

5 The operations can affect economic performance in five ways: increase cost, work force, increase technology, increase risk and increase investment.

17 Match the description in column I with the appropriate example in column II (learning unit 2).

Column I	Column II
(a) "Bottom-up" view of operations strategy	(i) Formulation, implementation, monitoring, control
(b) "Top-down" view of operations strategy	(ii) Sees the overall strategy as emerging from day-to day operational experience.
(c) Operations life cycle	(iii) Perspective of operations strategy that sees the main role of operations as satisfying customers' requirements.
(d) Formulating an operations strategy	(iv) Views strategic decisions at a number of levels.
(e) "Market requirements"	(v) Introduction, growth, maturity, decline

1

(a)-(ii)	(b)-(iv)	(c)-(v)	(d)-(i)	(e)-(iii)

2

(a)-(ii)	(b)-(iv)	(c)-(v)	(d)-(iii)	(e)-(i)

3

(a)-(v)	(b)-(i)	(c)-(ii)	(d)-(iv)	(e)-(iii)

4

(a)- (ii)	(b)-(i)	(c)-(v)	(d)-(iv)	(e)-(iii)

5

(a)-(i)	(b)-(iv)	(c)-(v)	(d)-(ii)	(e)-(iii)

18 Match the description of the operation in column I with the appropriate example in column II.

Column I	Column II
(a) Quality	(i) Degree to which an operations process can change what it does and how it does it.
(b) Speed	(ii) In a bus transport company, an example would be constant availability of seats.
(c) Flexibility	(iii) Reduces inventories and risks.
(d) Dependability	(iv) Four different types
(e) Cost	(v) All assemblies are according to specifications.
	(vi) Immediate availability of goods
	(vii) A universally attractive objective

1

(a)-(v)	(b)-(iv) (vi)	(c)-(i) (iii)	(d)-(ii)	(e)-(vii)

2

(a)-(v)	(b)-(iii) (vi)	(c)-(i) (iv)	(d)-(ii)	(e)-(vii)

3

(a)-(v)(vii)	(b)-(vi)	(c)-(iv)	(d)-(i) (ii)	(e)-(iii)

4

(a)-(v)	(b)-(vi)	(c)-(i) (iv)	(d)-(ii) (iii)	(e)-(vii)

5

(a)-(ii)	(b)-(iii) (vi)	(c)-(i) (iv)	(d)-(v)	(e)-(vii)

19 Which **two** of the following statements are **correct**?

a The process of operations strategy involves the specific decisions to determine the operations role, objectives and activities. The content of operations strategy is the method used to make the specific process decisions.

b There is no universal agreement on how to describe an operation. Various pressures result in four perspectives from which the operations strategy can be seen.

c When the operations strategy involves translating market requirements into operations decisions, a strategy may develop gradually over time. This is referred to as an emergent strategy.

d An order-winning factor may not be the major competitive determinant of success, but unsatisfactory performance in this area may result in a customer deciding to purchase a product elsewhere.

e The impact on an organisation's operations resource capabilities will be at least as great, if not greater, than what it would gain from its market position.

1 b, e
2 b, c
3 c, e
4 b, d
5 a, e

20 Which of the following statements is/are correct?

a Although technologies are categorised as either material-processing technology, information-processing technology or customer-processing technology, combinations do occur. These technologies are referred to as integrating technologies.

b Operations managers are continually involved in the management of process technology. They need to be able to articulate what the technology should be able to do, design the technology and manage its implementation into the operation.

c Different process technologies are associated with different volume-variety combinations. A low automation operation with high scalability is typically classified as having low volume and high variety.

d Some of the factors operations managers should consider when selecting automated technology are the overall cost-saving, safety, maintenance and new product possibilities.

e Scalability is the ability to shift to a different level of useful capacity quickly and cost-effectively, whereas coupling is the means of linking together separate activities in a single process of process technology to form an interconnected processing system.

1 a, d
2 a, e
3 a, d, e
4 c, d, e
5 a, c, d

TOTAL: ASSIGNMENT 01 20 x 1 mark = 20 marks

SEMESTER 1

ASSIGNMENT 02: COMPULSORY ASSIGNMENT

DUE DATE: 23/04/2018

UNIQUE NUMBER: 809645

This assignment for module MNO3701 consists of **twenty** multiple-choice questions (MCQs) for topic 4 (learning units 6 and 7), topic 5 (learning unit 8), topic 6 (learning units 9 and 10), topic 7 (learning units 11 and 12), topic 8 (learning units 13 and 14), topic 9 (learning unit 15), and topic 10 (learning unit 16).

MULTIPLE-CHOICE QUESTIONS

Answer the following twenty (20) multiple-choice questions. Each question is of equal value and is allocated one (1) mark. No negative marking will be applied.

1 According to AoN diagram as per the table below, identify the LF for activity E and the EF for activity F respectively:

Activity	Duration	Immediate follower
A	1	B, C, D, E
B	3	F
C	4	F
D	2	F
E	4	F
F	4	G
G	1	-

1 LF for activity E is 5; EF for activity F is 4

2 LF for activity E is 4; EF for activity F is 9

3 LF for activity E is 4; EF for activity F is 4

4 LF for activity E is 1; EF for activity F is 1

5 LF for activity E is 5; EF for activity F is 9

2 From the AoN in question 1 (above), identify the activity(ies) with slack:

a Activity A
b Activity B
c Activity C
d Activity D
e Activity E

1 a
2 b, d
3 b, c, d
4 a, b, c, d
5 None of the above.

3 From the AoN in question 1 (above) identify the critical path(s).

1 A, B, F, G
2 A, C, F, G
3 A, D, F, G
4 A, E, F, G
5 A, C, F G and A, E, F, G

4 Material requirements planning (MRP) is used to plan and control material requirements. The master production schedule (MPS) for three sizes of screwdriver is given in the table below. All three screwdrivers (2 mm, 7 mm and Star 5) use the same handle. The available stock is 70, orders are placed in batches of 20 and the safety stock is set at 2.

Item	Week				
	1	2	3	4	5
2mm	10			10	
7mm	18		18		18
Star 5	8	8	8	8	8
MPS	36	8	26	18	26

The **second** planned order is in:

1 week 1
2 week 2
3 week 3
4 week 4
5 week 5

5 Which **one** of the following statements is **incorrect**?

1 MRP I is a dependent demand system. Here, demand is derived from some other decision taken within the operation.

2 The MPS is a time-phased record of each end product, which contains a statement of demand and stock available of each end item and component that goes into each item.

3 Variation of sales orders makes the MRP I process very complex. Different types of operations have different profiles in terms of the mix between known orders and forecast orders.

4 The mix between known orders and forecast orders determines the MPS (master production schedule), which activates the MRP I-run.

5 The MRP I-run needs the bill of materials and the different inventory records before material plans can be finalised.

6 What techniques can be used for improvement in production and operations management?

a Scatter diagrams
b Flow charts
c Cause-effect diagrams
d Pareto diagrams
e Why-why analysis

1 a
2 a, b
3 a, b, c
4 a, b, c, d
5 a, b, c, d, e

7 Which **one** of the following statements is **correct**?

1 The operation's view of quality is primarily manufacturing-based and focuses on "error-free" products.

2 The most significant quality gap and the one that the production/operations management function is primarily responsible for preventing, is the customer's/client's specification-operation's specification gap where there is a mismatch between what the customer/client thinks he/she is getting and what the operation thinks the customer/client wants.

3 The organisational responsibility for closing the actual quality-communicated image gap lies with the production/operations function because it is not providing the quality of product/service that customers/clients expect.

4 Currently quality is everybody's business. Most businesses now realise that high-quality products and services can give the organisation a considerable competitive edge.

5 Quality is like beauty – it is in the eye of the beholder.

8 Which **three** of the following statements are **incorrect**?

a Quality gap number 3 is the primary responsibility of production/operations management because it concerns the mismatch between the actual quality of the product or service manufactured or provided by the operation, and the quality it supposedly sets out to provide or deliver – this gap is also known as the "conformance to specification" gap.

b Quality planning and control comprise a number of sequential steps, one of which is to set quality standards for each quality characteristic and thereafter decide how to measure the quality characteristic itself.

c In case study 11 entitled “Entrepreneurial quality” in Addendum B of this tutorial letter, quality is defined as “making customers happy” for which the following quality standards are set: size of each pie (large), sufficient filling (minimum of 100 mg per pie), appearance (appetising), smell (“one whiff and all resistance crumbles”) and durability (pies must stay fresh for at least 3 days after baking).

d In step 4 of quality planning and control, actual quality is controlled against the quality standards set for each quality characteristic. Of some concern during this process is the possible occurrence of type I errors (i.e.where action is not taken to prevent quality problems when it should be taken) and type II errors (i.e.where action is taken to prevent quality problems, when it should not in fact have been taken).

e In SPC control charts for variables monitor the sample average or mean and range while for attributes the number or proportion of defective or wrong products is monitored.

1 a, b, c
2 a, c, d
3 a, d, e
4 c, d, e
5 b, c, d

9 ABC (Pty) Ltd manufactures medical needles that are subjected to a quality test. They use statistical process control (SPC) and the results (measured in grams) are plotted on a chart. If the process average is 26,3 and the average range is 5, what will the control limits be if the sample size n=6? The factor for calculation of control limits is 0,483 for sample size n=6. The sample average is 27,05.

Which of the following statement(s) is/are true?

a UCL = 28.715
b The process is out of control.
c The process is in control.
d LCL = 23.885
e UCL = 63.031

1 a, b
2 a, c, d
3 b, e
4 c only
5 b, c, d, e

10 Which **three** of the following statements are **correct**?

a The improvement of the production/operations management system follows after the system has been designed and its activities planned and controlled.

b Improvement activities of production/operations management may be treated as a process involving three stages, namely to understand the approaches and techniques used for improvement, to prevent failure but knowing how to recover when failures occur, and to support the whole improvement process through the TQM approach.

c The performance objectives of quality, speed, dependability, flexibility and cost are the main performance standards for the improvement of the production/operations management system.

d A disaggregated, partial measure for the performance objective of high quality is the level of customer/client complaints.

e A performance standard is much the same as a performance measure, that is, it describes how to measure the performance of the production/operations management system against which criteria.

1 a, c, e
2 b, c, e
3 b, c, d
4 a, b, d
5 a, b, e

11 Which of the following is **NOT** a cost associated with quality?

a Opportunity cost
b Prevention cost
c Appraisal cost
d Internal failure cost
e External failure cost

1 a
2 a, b
3 a, b, c
4 a, b, c, d
5 a, b, c, d, e

12 Failure prevention and recovery are important in production and operations management. Which of the following measure failure?

1 Failure rates – how often a failure is likely to occur.

2 Reliability – measures the chances of a failure occurring.

3 Availability – is the amount of available and useful operating time left after taking account of failure.

4 None of the above.

5 Options 1, 2 and 3 are correct.

13 Production/Operations managers should always comply with their corporate social responsibility (CSR). Which **one** of the following statements regarding production/operations CSR is **correct**?

1 CSR refers to profit maximisation
2 CSR stakeholders comprise the shareholders of an organisation
3 CSR implies environmental, social, economic, stakeholder and voluntariness dimensions
4 CSR implies “Client Service Reach”
5 CSR is important only in developed countries such as the USA, the UK and Japan

14 Which of the following forms part of successful project management?

a Responsiveness to clients
b Troubleshooting mechanisms
c Sufficient resource allocation
d Project staff continuity
e Top-management support

1 a, b, c
2 a, c, d, e
3 a, b, c, d, e
4 b, c, d, e
5 c, d, e

15 Which **one** of the following options is **incorrect** regarding TQM?

1 TQM discourages the balance between different types of quality cost.
2 TQM takes an organisation-wide perspective.
3 TQM puts customers at the forefront of quality decision-making.
4 TQM holds that all parts of the organisation have the potential to contribute to quality.
5 TQM is a very important concept in production and operations management.

16 Which **one** of the following regarding operational TQM is **correct**?

1 TQM means the involvement of the chairperson of the organisation
2 TQM stands for “Team Quota Measurement”
3 TQM is only applicable to the operations department of an organisation
4 TQM entails compliance with CSR (corporate social responsibility)
5 TQM means meeting the requirements of the customer

17 Johnson & Johnson manufactures needles that are subjected to a bend test. They use statistical process control (SPC) and the results (measured in grams) are plotted on a chart. If the process average is 26,1 and the average range is 5; what will the control limits be if the sample size n = 8? The factor for calculation of control limits is 0,373 for sample size n=8. Which statement(s) are true:

a The process is “out of control”.
b The process is “in control”.
c The upper control limit is equal to 27,965
d The upper control limit is equal to 24,235
e The lower control limit is equal to 27,965

1 a
2 b, c
3 a, c
4 b, c, d
5 a, d, e

18 Which of the following is associated with (a) quality characteristic(s)?

a Recovery
b Durability
c Appearance
d Functionality
e Reliability

1 b
2 d
3 b, d
4 e
5 a, b, c, d, e

19 Project management demands very specific competencies. Which one of the following alternatives is **not** associated with the **basic** project management processes as defined in the project management body of knowledge?

1 Project integration and scope management
2 Risk management and procurement management
3 Work breakdown management and network management
4 Time management and quality management
5 Cost management and human resource management

20 Production/operations improvement is important no matter how well the operation is managed. Which **one** of the following in this regard is **incorrect**?

1 Incremental continuous improvement places a high value on creative solutions and radical rethinking of systems.

2 The whole improvement process should be supported through the TQM approach.

3 The PDCA cycle, benchmarking, BPR and performance standards are terms associated with operations improvement.

4 Four kinds of standards are used, namely competitor performance standards; absolute performance standards; historical standards and target performance standards.

5 Quality, speed, dependability, flexibility and cost are composites of many smaller measures.

TOTAL: ASSIGNMENT 02 20 x 1 mark = 20 marks

SEMESTER 2

ASSIGNMENT 01: COMPULSORY ASSIGNMENT

DUE DATE: 27/08/2018

UNIQUE NUMBER: 719398

This assignment for module MNO3701 consists of **twenty** multiple-choice questions (MCQs) for topic 1 (learning units 1 and 2), topic 2 (learning unit 3) and topic 3 (learning units 4 and 5).

MULTIPLE-CHOICE QUESTIONS

Answer the following twenty (20) multiple-choice questions. Each question is of equal value and is allocated one (1) mark. No negative marking will be applied.

1 Which three of the following statements are correct?

a All operations of all types of businesses produce goods or render services, or a mixture of the two, by a process of transformation.
b Transformed input resources comprise the following: materials, information and customer/clients.
c The difference between transforming and transformed input resources, respectively, lies in their position in relation to the output resources.
d A dominant transformed material resource, such as a factory plant, would be found in all types of manufacturing operations.
e After having gone through either materials, information or customer processing, outputs emerge in the form of goods or services, which are generally different because of tangibility, storability, transportability and customer/client contact.

1 a, b, e
2 a, b, c
3 b, c, d
4 c, d, e
5 a, d, e

2 Which **one** of the following is **not** an operational strategy?

1 Top-down operational strategy
2 Bottom-up operational strategy
3 Statistical process control (SPC) operational strategy
4 Market requirements operational strategy
5 Capabilities of operations resources operational strategy

3 Which of the following is correct regarding dependability inside the operation?

a Dependability has the potential to offer more reliable delivery of services and products
b Dependability saves money
c Dependability gives stability
d Dependability saves time
e Dependability is an ISO standard

1 a, e
2 b, e
3 c, e
4 d, e
5 a, b, c, d

4 Which **one** of the following statements (if any) is **incorrect** with regard to the basic performance objectives for production/operations management?

a Speed
b Dependability
c Flexibility
d Profit

1 a
2 b
3 c
4 d
5 None of the above.

5 Which **two** of the following statements are **correct**?

a The operation's competitive role and position, together with the articulation of the specific performance or strategic objectives it hopes to achieve, largely influence the content of the production/operations strategy of the business.

b The hierarchical position of the production/operations strategy in relation to the corporate or business strategy depends on how management views the potential of the production/operations function in contributing to the long-term success of the business.

c The process aspects of the production/operations strategy largely determine the relative priority of the performance objectives of the business and further relate to each of the specific decision areas in the design, planning and control, and improvement of the production/operations management system.

d The relative importance that a business attaches to specific performance objectives is determined by the influence that customers/clients may have on the business, its competitors and the stage of the business's products or services in their life cycles.

e The operation's infrastructural strategy areas are primarily influenced by the design activities (i.e.similar to the "hardware" of a computer system) while the structural strategy areas are influenced by the planning and control and improvement activities (i.e.similar to the "software" of a computer system).

1 a, b
2 b, c
3 a, d
4 c, d
5 a, e

6 Study case study 1 entitled "Improvement strategies at Rover" in Addendum B of this tutorial letter and then indicate which **two** of the following statements are **incorrect**:

a A significant element of Rover's improvement strategy was the attention given to its human resources by recognising that the workforce was the most important resource in the company and the driver of all continuous improvement efforts.

b Rover's improvement strategy primarily focused on the re-organisation of the company structure and the introduction of re-engineering principles for the adoption of Japanese best-working practices.

c Rover improvement strategy further emphasised the performance objectives of low cost, dependability and good service.

d Competitor benchmarking at Rover meant the company was to get to "know its enemy".

e "Roverization" meant that the company dedicated itself to an improvement strategy that would move its products to the top of each product class. The elements of the programme included training the entire workforce in the philosophies and tools of total quality management (TQM) and the company's endeavours to achieve "extraordinary customer satisfaction", etc.

1 a, b
2 b, c
3 c, d
4 d, e
5 a, e

7 Which **three** of the following statements are **correct?**

a A general guideline for effective design is that the number of components of the product or operations of the service be minimised to reduce costs, improve on the quality of product/service and generally facilitate production or service.

b General guidelines for effective design in production/operations management may be classified under the three main headings of: general guidelines; quality guidelines; and producibility/operability guidelines.

c Avoidance of special complicated fasteners and/or connectors for products or off-line elements of the service that may interrupt it, is a producibility/operability guideline well worth pursuing.

d A quality guideline holds that designs should concentrate on the robustness of the product (i.e.“should not break easily”) and avoid designs that require a great deal of attention during manufacture or delivery (i.e.“one could make the product or provide the service with one’s eyes closed”).

e Key questions in assessing the feasibility of a design for a product/service are as follows: Are the necessary skills or quality of resources available? Are the financial resources and financial return acceptable? Does the business have the organisational capacity or quantity of resources to cope with the specific design option?

1 a, b, c
2 b, c, d
3 c, d, e
4 b, d, e
5 a, b, e

8 Process types describe a particular general approach to managing processes. Which **three** of the following are defined as service process types?

a Professional services
b Jobbing services
c Service shops
d Continuous services
e Mass services

1 a, b, c
2 b, c, d
3 c, d, e
4 a, c, e
5 a, b, e

9 Production and operations' flexibility principles are applicable to:

a Product
b Mix
c Service
d Volume
e Delivery

1 a, b, c, d
2 a, b, c, d, e
3 b, c, d, e
4 a, b, d, e
5 a, d, b, e

10 Which of the following statements is/(are) **incorrect**?

a In case study 2 entitled "AGVs at new international, Wapping" in Addendum B of this tutorial letter, the process of delivering the paper reel to the printing press and loading the paper into position are fully automated by the use of AGVs.

b In case study 3 entitled "FMS at Yamazaki Mazak" in Addendum B of this tutorial letter, the factory at Worcester in the UK won the Management Today "Best Factory Award" by installing the greatest possible number of robotic assembly tools and by utilising them fully unmanned for overnight production.

c In contrast to material and information processing technologies where production/operations managers are mainly concerned with the interaction between their staff and the technology itself, customer/client processing technology involves a three-way set of interactions, in addition to the two above also with the customers/clients themselves.

d Developments in material processing technologies include: more sophisticated numerically controlled machine tools, robotics, AGVs, FMS, CIM; in the case of information processing technologies there is a strong movement to merge with telecommunications technologies, such as EDI.

e In case study 4 entitled “Technology at the Robeco Group” in Addendum B of this tutorial letter, the primary interaction between technology is direct and active through telephonic financial advice.

1 b
2 b, e
3 b, c
4 a, d, c
5 a, d, e

11 Which **one** of the following statements is **incorrect**?

a Operations management is one of the three core functions of any organisation.

b Marketing can be categorised as one of the two “support functions” that enable the core functions to operate effectively.

c Operations management’s responsibility towards the support functions can be summarised as “this is what we want/need”. Its relationship with the other two core functions can be classified as “this is what we do – help us reconcile with broader business needs”.

d Designing new furniture by a furniture manufacturer is not part of the operations core function.

e A broad definition of operations would entail the inclusion of all activities necessary for the fulfilment of customer requests.

1 a
2 b
3 c
4 d
5 e

12 Which **three** of the following statements are **incorrect**?

a The function of operations differs from operations as an activity because the operations activity refers specifically to that part of an organisation that produces the products and services.

b Operations can be analysed at two levels, namely operation and the operations internal processes.

c The budgeting process in the finance and accounting function can be classified as a non-operations function.

d Because all managers have some responsibility for managing processes, they are, to some extent, operations managers.

e Internal customers are part of the supply network, whereas external customers are not.

1 a, b, e
2 b, c, d
3 c, d, e
4 a, b, d
5 a, c, e

13 Which of the following is correct regarding operations performance?

a Quality reduces costs
b Quality increases dependability
c Corporate social responsibility is the responsibility of the marketing department
d Speed increases inventories
e Speed increases risks

1 c, d
2 c, e
3 d, e
4 a, b
5 c, d, e

14 Which of the following is correct regarding strategy implementation in the operations?

a Operations strategic decisions must be clear to all

b Leadership is important for operations strategies

c Project management forms part of operations strategies

d Drawing up strategic plans is important, but does not necessarily need to be implemented

e Strategy implementation means the execution of a strategic plan

1 d

2 a, b, c, e

3 d, e

4 a, b

5 a, b, c, d, e

15 Match the description of the operation in column I with the appropriate example in column II.

Column I	Column II
(a) Quality	(i) Degree to which an operation's process can change what it does and how it does it
(b) Speed	(ii) In a bus transport company, an example would be constant availability of seats
(c) Flexibility	(iii) Reduces inventories and risks
(d) Dependability	(iv) Four different types
(e) Cost	(v) All assembly is to specification
	(vi) Immediate availability of goods
	(vii) A universally attractive objective

1

(a)-(v);	(b)-(iv) (vi)	(c)-(i) (iii)	(d)-(ii)	(e)-(vii)

2

(a)-(v)(vii)	(b)-(vi)	(c)-(iv)	(d)-(i) (ii)	(e)-(iii)

3

(a)-(v)	(b)-(vi)	(c)-(i) (iv)	(d)-(ii) (iii)	(e)-(vii)

4

(a)-(v)	(b)-(iii) (vi)	(c)-(i) (iv)	(d)-(ii)	(e)-(vii)

5

(a)-(ii)	(b)-(iii) (vi)	(c)-(i) (iv)	(d)-(v)	(e)-(vii)

16 Which **one** of the following statements is **correct**?

a The process of operations strategy involves the specific decisions to determine the operations role, objectives and activities. The content of operations strategy is the method used to make the specific process decisions.

b There is a definite universal agreement on how to describe an operation. Various pressures result in three perspectives from which operations strategy can be seen.

c When the operations strategy involves translating market requirements into operations decisions, a strategy may develop gradually over time. This is referred to as an emergent strategy.

d An order-winning factor may not be the major competitive determinant of success, but unsatisfactory performance in this area may result in a customer deciding to purchase a product elsewhere.

e The impact on an organisation's operations resource capabilities will be at least as great, if not greater, than what it would gain from its market position.

1 a
2 b
3 c
4 d
5 e

17 Which **two** of the following statements are **incorrect**?

a Without an understanding of what markets require, it is impossible to ensure that an operation is giving the right priority to its performance objectives (quality, speed, dependability, flexibility and cost).

b The introductory stage of a product/service life cycle will generally require flexibility to enable the organisation to cope with any changes, as well as quality to match the customer's need for performance.

c In the growth stage of the product/service life cycle, keeping up with demand is the major challenge. An organisation is required to excel in the areas of speed, dependability and quality in this growth phase.

d In the maturity stage, demand starts to increase drastically.

e In the decline stage, competitors will drop out of the market and sales will decline. During this phase, the organisation will need to prioritise dependability and quality to ensure customers do not switch to one of the remaining competitors in the market.

1 a, b
2 d, e
3 c, d
4 b, e
5 a, e

18 Match the description in column I with the appropriate example in column II. (learning unit 4)

Column I	Column II
(a) Quality	(i) Less disruption, confusion and rescheduling in the process
(b) Speed	(ii) Eliminates process waste in terms of excess capacity, in process delays, in process errors and inappropriate process inputs
(c) Dependability	(iii) Low in-process inventory
(d) Flexibility	(iv) Appropriate resources for correct specification
(e) Cost	(v) Resources with an appropriate range of capabilities

1

(a)-(iv)	(b)-(iii)	(c)-(i)	(d)-(v)	(e)-(ii)

2

(a)-(iv)	(b)(ii)	(c)-(i)	(d)-(v)	(e)-(iii)

3

(a)-(ii)	(b)(i)	(c)-(iv)	(d)-(v)	(e)-(v)

4

(a)-(ii)	(b)(iv)	(c)-(i)	(d)-(v)	(e)-(iii)

5

(a)-(iii)	(b)-(ii)	(c)-(i)	(d)-(v)	(e)-(iv)

19 Which **one** of the following statements is **correct**?

a A continuum exists, from low volume-low variety through to high volume-high variety, on which we can position operations.

b Examples of project processes include most construction companies, a specialist tool-maker and a movie production company.

c Continuous processes are one step beyond mass processes because they operate at even higher volumes.

d In the Hayes and Wheelwright product-process matrix, the “unnatural” diagonal refers to the line on which the minority organisations can be found.

e The three different types of service processes, on a continuum of high-volume to low-volume operations include (in order) mass services, professional services and service shops.

1 a
2 b
3 c
4 d
5 e

20 Which of the following statements are correct?

a Although technologies are categorised as either material-processing technology, information- processing technology or customer-processing technology, combinations do occur. These technologies are referred to as integrating technologies.

b Operations managers are continually involved in the management of process technology. They need to be able to articulate what the technology should be able to do, design the technology and manage its implementation into the operation.

c Different process technologies are associated with different volume-variety combinations. A low automation operation with high scalability is typically classified as having low volume and high variety.

d Some of the factors operations managers should consider when selecting automated technology are the overall cost-saving, safety, maintenance and new product possibilities.

e Scalability is the ability to shift to a different level of useful capacity quickly and cost-effectively, while coupling is the means of linking together separate activities in a single process of process technology to form an interconnected processing system.

1 a, d, e
2 a, d
3 a, e
4 c, d, e
5 a, c, d

TOTAL: ASSIGNMENT 01 20 x 1 mark = 20 marks

SEMESTER 2

ASSIGNMENT 02: COMPULSORY ASSIGNMENT

DUE DATE: 24/09/2018

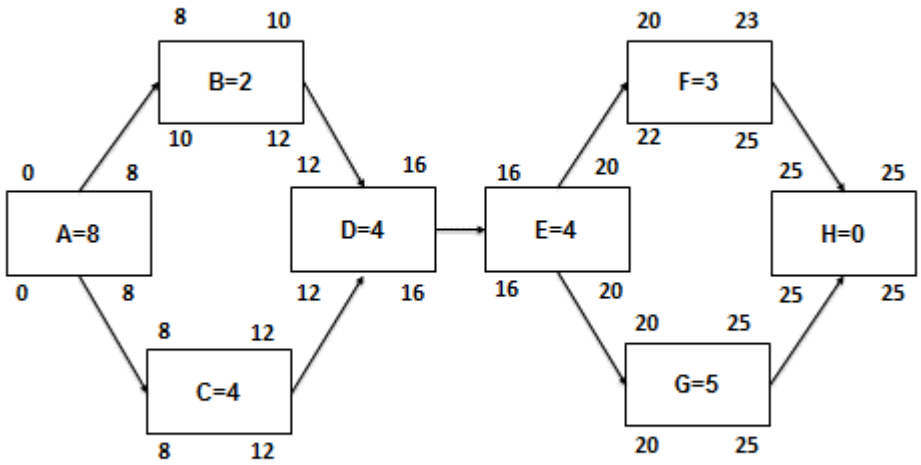
UNIQUE NUMBER: 823633

This assignment for module MNO3701 consists of **twenty** multiple-choice questions (MCQs) for topic 4 (learning units 6 and 7), topic 5 (learning unit 8), topic 6 (learning units 9 and 10), topic 7 (learning units 11 and 12), topic 8 (learning units 13 and 14), topic 9 (learning unit 15) and topic 10 (learning unit 16).

MULTIPLE-CHOICE QUESTIONS

Answer the following twenty (20) multiple-choice questions. Each question is of equal value and is allocated one (1) mark. No negative marking will be applied.

1 Which route on the following diagram represents the critical path?



1 A; B; D; E; F; H = 21

2 A; B; D; E; G; H = 23

3 A; C; D; E; G; H = 25

4 A; C; D; E; F; H = 23

5 A; B; C; D; E; F; G; H = 30

2 Which **one** of the following statements is **correct**?

a The nature of the decisions that are taken to plan and control an operation will largely depend on the extent of uncertainty regarding the strategy of top management.

b Dependent demand planning and control can only be exercised where the demand for the item based on some other known factor is reasonably certain and predictable.

c The demand time D (length of time that customers must wait for the product) will always be greater than the throughput time P (the time it takes the operation to deliver the product to the customer) in “make-to-stock” operations.

d The scheduling activity as part of the planning and control task in operations must determine which tasks must be performed before (or have priority over) others.

e In case study 6 entitled “The hospital triage system” in Addendum B of this tutorial letter, the hospital follows a strict FIFO sequencing and scheduling priority system.

1 a
2 b
3 c
4 d
5 e

3 Which **two** of the following statements are **correct**?

a Materials requirements planning systems reconcile the supply of products and services with the demand for them by calculating the volume and timing of materials flow in independent demand conditions.

b Inputs to the SPC process include the demand management inputs (comprising known customer orders and realistic forecasts of demand in the future), the bills of materials and inventory records.

c In case study 7 entitled “Overcoming forecast problems at Racal recorders” in Addendum B of this tutorial letter, problems of demand forecast followed the independent nature of demand of customer orders.

d Outputs of the MRP process include purchase orders (both the quantity and time required), materials plans and works orders.

e In case study 8 entitled “Staedtler: manufacturing and the use of MRP” in Addendum B of this tutorial letter, the MRP system is initially analysed to ensure that the weekly loadings on each work centre are realistic.

1 a, b
2 a, c
3 a, e
4 c, d
5 c, e

4 Which **one** of the following South African factories/industries is most likely to utilise the JIT (Just-in-time) planning and control system?

1 A factory in Rosslyn manufacturing concrete pots for plants.
2 A Toyota automotive manufacturing plant in the EThekwini Municipality.
3 A recruiting agency providing human resources to Eskom in Woodmead.
4 A crèche looking after pre-schoolers in Sandton.
5 A nursery providing plants for the Ekurhuleni Metropolitan Parks Division.

5 Which **one** of the following statements is **correct**?

a JIT or just-in-time refers to both a philosophy behind production and operations management and a distinct method of production/operations planning and control.

b Just-in-time production/service means that products/services are manufactured/provided only a few days before they are needed by a customer/client – not too many days beforehand because they then become inventory – and not too many days late

because then the customer/client has to wait too long.

c The JIT approach is the same as the traditional approaches to manufacturing where inventory is kept at each successive stage rather than delivery on request.

d Reducing the level of inventory, means that production and operations management must deal with an increased amount of work-in-process, fewer defective deliveries, more scrap and rework but less downtime.

e JIT as a philosophy holds that all forms of waste should be eliminated, all employees should be involved, improvements should continuously be made, and high utilisation of production capacity should be maintained.

1 a
2 b
3 c
4 d
5 e

6 Which **two** of the following statements are **incorrect**?

a JIT requires a high standard in all of the operation's performance objectives, specifically in high quality, fast speed, high dependability and flexibility.

b Basic working practices in line with the JIT principles include: discipline, equality and development of personnel, line stop authority, problem-solving and quality of work life.

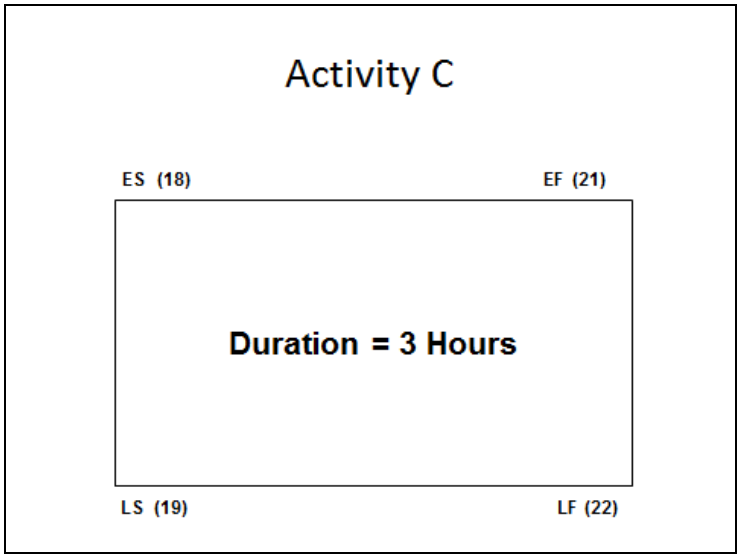
c In case study 9 entitled "Flexibility helps JIT at L'Oréal" in Addendum B of this tutorial letter, the company was able to increase batch sizes to more economical production runs, which improved the overall logistics of purchasing materials, production, storage and distribution of their products all over the world.

d In case study 10 entitled "Toyota's production system" in Addendum B of this tutorial letter, the specific JIT planning and control techniques used were "assembly line broadcasting" for components and smaller subassemblies but conveyance kanban for major subassemblies such as engines, push scheduling and Jidoka.

e Although JIT may be described as a “pull” system of planning and control and MRP as a “push” system, the two may be used in combination (i.e.JIT for “runners” and “repeaters” and MRP for “strangers”).

1 a, b
2 b, c
3 d, e
4 c, d
5 c, e

7 Activity C is one activity of a larger project. What is the Slack on activity C?



1 1 hour
2 2 hours
3 3 hours
4 22 hours
5 23 hours

8 What type of technique is used to structure the brainstorming that can help to reveal the root causes of problems?

1 Scatter diagrams
2 Pareto diagrams
3 Why-why analysis
4 Root diagrams
5 Cause-effect diagrams

9 Which of the following statements is (are) incorrect?

a Project operations involve complex, large-scale activities or endeavours that have defined beginning and end points that are high in volume but low in variety.

b A possible match between the elements of a project and the factors that contribute to successful project management could be (note: the element numbers 1 to 6 below refer to the general characteristics of projects namely, an objective, complexity, uniqueness, uncertainty, temporary nature and life cycle while the factors for project management success, numbers 1 to 11 below, are described on page 466 of your prescribed textbook):

ELEMENTS OF A PROJECT	FACTORS FOR SUCCESSFUL PROJECT MANAGEMENT
(1)	(1)/(3)/(9)
(2)	(7)/(4)
(3)	(2)
(4)	(10)/(6)
(5)	(8)
(6)	(5)(11)

c Projects with a high level of complexity need to be planned particularly well in comparison with projects with high uncertainty where the emphasis should rather be on project control.

d If the “earned-value” method of project control is applied for a project of which the ACWP is R750 000, the BCWP is R600 000 and the BCWS is R700 000, the project is R150 000 over budget but R100 000 ahead of schedule.

e In case study 12 entitled “The channel tunnel” in Addendum B of this tutorial letter, the project would be considered one with high complexity because many different organisations of different countries being involved, and one with medium uncertainty in terms of meeting its objectives with regard to time, cost and technical performance.

1 b
2 a, d
3 b, c, d
4 d, e
5 a, c

10 Which of the following is (are) correct regarding the requirements for successful project management?

a Clearly defined goals
b Adequate communication
c ISO14000
d Responsiveness to clients
e Troubleshooting mechanisms

1 a only
2 b only
3 c only
4 a, b, d, e
5 a, b, c, d, e

11 Which of the following is (are) correct regarding the requirements for a successful project manager?

a Experience and background
b Leadership expertise
c Interpersonal competence
d Tecnical expertise
e A good track record

1 a only
2 e only
3 a and e
4 a, b, c, d, e
5 none of the above

12 Material requirements planning (MRP) is used to plan and control material requirements. The master production schedule (MPS) for three sizes of screwdriver is given in the table below. All three screwdrivers (4 mm, 6 mm and Star 8) use the same handle. The MPS requirements are:

Item	**Week**				
	1	**2**	**3**	**4**	**5**
4 mm	12			10	
6 mm	10	2	18		16
Star 8	8	8	7	10	14
MPS	30	10	25	20	20

The inventory record (item master file) shows the following planning factors: batches are set at quantities of 20; safety stock is set at two handles; the available inventory is 70 and the lead time for orders is two weeks. When will the **first** order be issued (i.e. in which week)?

1 week 1
2 week 2
3 week 3

4 week 4
5 week 5

13 According to question 12 (above), how many units will the first order be?

1 20
2 40
3 60
4 5
5 70

14 As part of organising and improving operations management, which one of the following is a benchmarking technique?

1 ISO9000
2 Non-competitive benchmarking
3 ISO14000
4 CSR
5 Active sampling

15 In terms of operations improvement, which statements are true regarding a balanced scorecard?

a A balanced scorecard is a multi-dimensional performance measurement tool.
b A balanced scorecard attempts to bring together the elements that reflect a business's strategic position.
c A balanced scorecard measures customer performance.
d A balanced scorecard measures learning and growth performance.
e A balanced scorecard measures financial performance.

1 All options are correct
2 Only c, d and e
3 Only a and b
4 Only option a
5 None of the above

16 Within production and operations management, how can quality problems be diagnosed?

a The gap between a customer's specification and the operation's specification.
b The gap between the service or product concept and the way the organisation has specified it.
c The gap between the way quality has been specified and the actual delivered quality.
d The gap between the actual delivered quality and the way the series or product has been described to the customer.
e The gap between marking and sales perceptions.

1 a only
2 a, b, c
3 a, e
4 a, b, c, d
5 e

17 Which **two** of the following statements are **correct**?

a Some businesses or operations can afford to be somewhat indifferent to failure. In other cases, dependability is not only desirable but essential as in the cases of a taxi transport service or hot-water geyser at home.
b Though production/operations managers should always attempt to minimise the likelihood of failure, they should recognise that they will inevitably occur. In such situations they should learn from them and put plans in place to help the operation to recover from them.
c A failure in a particular product or service is usually more serious than a failure in the production/operations process because the customer/client will immediately complain.
d In case study 19 entitled "Failures puncture Hoechst's reputation" in Addendum B of this tutorial letter, the failures were primarily technical in nature and directly attributable to a design failure in the chemical plant.
e In case study 20 entitled "Failed philosopher" and in case study 21 entitled "Two million to one" in Addendum B of this tutorial letter, the type of failure in the first case was primarily a design failure while in the second case, it was attributable to staff failures.

1 a, b
2 b, c
3 c, d
4 c, e
5 b, e

18 Material requirements planning (MRP) is used to plan and control material requirements. The master production schedule (MPS) for three sizes of screwdriver is given in the table below. All three screwdrivers (2 mm, 7 mm and Star 5) use the same handle. Available stock = 70. Orders in batches of 20. Safety stock = 2. The MPS requirements are:

Item	**Week**				
	1	**2**	**3**	**4**	**5**
2 mm	10			10	
7 mm	18		18		18
Star 5	8	8	8	8	8
MPS	36	8	26	18	26

What is the available stock at week 5:

1 20
2 16
3 10
4 12
5 14

19 Which **three** of the following statements are **correct**? (learning unit 15)

a In its design state, an operation may look fine on paper – only when it has to cope with real circumstances may inadequacies become evident. Failures resulting from these inadequacies can be termed “facility failures”.

b Failure as an opportunity stems from the notion that organisations can learn from failure and modify their behaviour accordingly.

c Three means of measuring failure include failure rates, reliability and availability.

d The total reliability of a system containing five parts, each with an individual reliability of 0.99 would be 0.90.

e Failure analysis uncovers the root causes of failure through various techniques, two of which include failure traceability and complaint analysis.

1 b, c, e
2 a, b, c
3 c, d, e
4 a, c, e
5 a, c, d

20 Assume an AON network diagram in which the following is evident:

Activities: A>B>C:
Activity A is a predecessor of activities B and C. Activity B is a predecessor of activity C.
The durations of the activities for A, B and C are two days, two days and one day respectively. By using the above information, what are the latest start time (LS) for activity A and the latest finish time (LF) for activity B?

1 LS = day 2 and LF = day 3
2 LS = day 0 and LF = day 4
3 LS = day 3 and LF = day 5
4 LS = day 2 and LF = day 5
5 LS = day 4 and LF = day 2

TOTAL: ASSIGNMENT 02 20 x 1 mark = 20 marks

SEMESTER 1 & 2

ASSIGNMENT 03 SELF-ASSESSMENT ASSIGNMENT

This assignment for module MNO3701 consists of essay-type questions and covers all topics at random (90 marks).

THREE ESSAY QUESTIONS x 30 MARKS = TOTAL: 90

QUESTION 1 (30 MARKS)

1.1 Over recent years there has been a resurgence of interest in operations management, in universities but especially in business. Why do you think this is?

(5)

1.2 Illustrate the concept of a Stage 4 company by explaining how a Stage 4 operations function within the following organizations could contribute to their long-term competitive success:

a salted snack manufacturer
an airline
a parcel delivery service
an hotel.

(10)

1.3 Illustrate how the strategy hierarchy would operate in a 'not-for-profit' organization such as a charity which provides hostel accommodation and other welfare services to vagrants.

(5)

1.4 Explain the importance of the volume-variety dimension as a way of understanding operations and their approach to design.

(5)

1.5 Discuss the relationship between product/service and process technology for a product or service with which you are familiar.

(5)

[30]

QUESTION 2 (30 MARKS)

2.1 Identify as many applications of automation as you can in the following operations: a hospital and a university.

(5)

2.2 What is meant by a closed-loop MRP system?

(5)

2.3 Discuss the advantages and disadvantages of working just-in-time.

(5)

2.4 A factory uses two machines to slice plastic extrusions. The specification range for the output of machine 1 is 16.7 to 17.3 cm and is 22 to 26 cm for machine 2. The outputs of the machines are normally distributed around 17 and 24 cm respectively with standard deviations of 1.7 and 2.1 cm. The normal variation in the two machines is known to be 0.5 and 1.9 cm respectively. The operations manager has the budget to upgrade one of the two machines this year. Which one would you recommend is replaced on the basis of its ability to do the job?

(5)

2.5 Construct a network diagram which satisfies the following relationships:
A, B, and C are the first activities of the project and can start simultaneously.

A and B precede D.

B precedes E, F and H.

F and C precede G.

E and H precede I and J.

C, D, and J precede K.

K precedes L.

I, G and L are the terminal activities of the project.

(Note: use the CPM method of analysis.)

(10)

[30]

QUESTION 3 (30 MARKS)

3.1 Explain the differences between breakthrough improvement and continuous improvement. Discuss the advantages and disadvantages of each.

(5)

3.2 Find more out about one of the “quality gurus”. Describe his background, his approach to quality and his key contributions to the subject. Refer to pages 609 - 610 in chapter 20 of your prescribed book. (Note: clearly show the probable contribution of the said person to the total quality management (TQM) approach.)

(10)

3.3 A 24-hour ATM machine outside a bank was closed down between the following times during a seven-day period:

11.00 am Monday - 2.00 pm Monday

1.00 am Monday - 10.30 am Tuesday

4.00 am Tuesday - 10.00 am Wednesday

3.00 pm Friday - 10.00 am Saturday

Calculate the ATM’s failure rate (in time), the mean time between failures, and its availability.

(5)

3.4 If a busy operations manager said to you, ‘Why should I spend time and effort on putting an operations strategy together? I already have enough to do as it is, if I devote any time to such luxuries I would fail to satisfy our customer’s immediate needs. This would put us out of business and no operations strategy is going to help us then!’. How would you make a case to the operations manager which will convince him that operations strategies formulation will be worthwhile?

(10)

[30]

TOTAL: 90 marks

Addendum B: MNO3701 CASE STUDIES for 2018

The following cases were selected to enrich the study material and also for purposes of the assignments.

Note: all case studies contained in this Annexure were taken from the **Southern African Edition** of the Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston first edition textbook, titled *Operations management*, which was adapted by Pycraft, M, Singh, H & Phihlela, K and published by Pitman Publishing in 1997. Full acknowledgement for the contributing authors is given.

CASE STUDY 1: IMPROVEMENT STRATEGIES AT ROVER

During the 1960s and '70s large parts of the British motor industry came together in a vast conglomerate. The resulting (nationalized) company's structure was messy, its factories relatively inefficient, and its products were failing to compete against Japanese imports to Europe. By 1994 the company, now known as The Rover Group, had been turned round to become a successful and respected company within BMW, the up-market German automobile manufacturer.

Rover's improvement strategy had responsible for this change. It started with what the company called *Roverization* - meaning that it moved its products to occupy the top of each product class. Between 1989 and 1993 Rover also embarked on what was to become the most intensive new model introduction programme in its history. But, most important, underpinning the development of attractive new products was a revolution in the company's manufacturing operations. This improvement strategy had a number of elements.

These included a *quality strategy* which formed part of the foundations of all the company's activities. It involved training the entire workforce of more than 30 000 people in the philosophies and tools of total quality management. Not only did the strategy emphasize the use of improvement tools, it helped to create an appropriate environment of a 'step change' in quality and working practices within the company. Fundamental to its quality strategy was a concept of how the company wanted its customers to react. It summarized this in the phrase *extraordinary customer satisfaction* - a phrase which Rover's Chief Executive described as the three most important words in the company.

Competitor benchmarking was also an important element in Rover's improvement strategy - what some in the company called 'knowing your enemy'. In looking outside the company it was influenced by the experiences of North American manufacturers in their own home market. For every Japanese-owned factory which had opened, an American manufacturer's plant had closed. By studying the performance and methods of Japanese motor manufacturers, Rover knew just how good it had to be in order to compete. Its long association with Honda, recognized as a world-class company, was a considerable help in understanding how Japanese 'lean' operations practices could be adapted to a Western environment.

Perhaps though, the most significant element of Rover's improvement strategy was the revolution in how it approached its *human resources.* A reorientation towards seeing the workforce (or associates as Rover calls them) as the most important resource in the company and the driver of continuous improvement was supported by a belief that people needed to work not just harder but smarter as well. The *Rover Tomorrow* programme involved briefing all employees about the company's plan for the future. People policies also included:

- total flexibility in working practices and between jobs;
- single status for all associates no matter what their job within the company.

The reason why improvement strategies were so central to Rover was very simple - the company might not have survived without them.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 94-95. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 2: AGVs AT NEWS INTERNATIONAL, WAPPING

The News International plant at Wapping, in London, produces three daily newspapers and two Sunday papers. Together these have a weekly circulation of around 25 million papers. The facilities at the plant include 16 printing presses, which run through the evening and into the night at full speed, to ensure the completion of the run before the early morning delivery deadlines. To the production staff at News International it is vital to achieve high levels of dependability and reliability: Their major objective during the print run each night is to minimize downtime which could have repercussions on their achieving their production volumes and times.

Each of the 16 printing presses uses one roll of paper every 20 minutes during the seven hour production period. These rolls of paper each weigh about one tonne. The paper is delivered from the nearby warehouse daily, and once checked, is stored for collection at the plant entrance. The process of delivering the paper reel to the press and loading the new reel into position has been automated by the use of AGVs. These AGVs are basically cradles designed to carry one roll of paper. They are guided by a predetermined metal strip in the floor and controlled by an information system which links the vehicles to the presses. A sensor on each press will request a new reel once the previous spare has been loaded for use. An AGV arrives at the press and loads the reel into an initial position which is checked for alignment by the operator before the final loading is started. Once the roll reaches a lower limit, the new reel can be brought up to speed, ready for automatic change-over.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 269. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 3: FMS AT YAMAZAKI MAZAK

When the Japanese tool manufacturers, Yamazaki, opened their new European factory at Worcester in the UK, it represented at ,35 million investment, and was seen as the company's gateway into the European Union. They had already established successful bases in Japan and the United States. Fifteen million pounds of the initial costs was taken up by the installation of four fully computer-integrated FMS, making the factory one of the most advanced machine tool manufacturing operations in Europe.

The complete FMS which Yamazaki developed allow overnight unmanned production and thereby make the most of its investment in the technology. Of course, the Yamazaki products are built by an entirely Yamazaki FMS.

Behind the decision to invest in this system was the need to compete directly with European manufacturers. With a wide range of over 60 products, individual volumes are small. Because of this the company wanted an operation that would be so flexible it would not matter in which order items were processed. High utilization would be maintained by having very fast set-ups, which would also reduce the need for large batches. The operation can make individual pieces to suit its tight production schedules. This enables the company to offer typical order lead times of only four weeks, in comparison to competitors' lead times of eight or more for similar products.

All component work pieces are loaded into fixture mounted on special pallets. The operators prepare enough work to enable the system to run overnight unsupervised. At the centre of the FMS is a host computer which schedules and controls the activity of each machining centre and the materials handling devices. The computer predetermines the pallet locations and, as the machining centres becomes free, an automatic pick/load device will select the next work piece from the waiting queue and will place it into the available machine. Each machine is capable of handling almost any of the components, so that bottle-necks do not develop at any point in the system. Spare tools used for the machining centres are stored in a central tool bank at the ends of the area and are transported to the required machine when requested by the system. The tools are delivered by a holding device on a highway which runs above the machining centres. At the end of the shift, the incoming operator can consult the computer for a print-out of the tools that have been used and which may subsequently need to be replaced in the tool bank. Many of the materials are delivered from the warehouse to the factory by AGVs, which pick up the items on request from the central scheduling system and travel along a sunken wire track around the factory. This again allows unmanned production during the night.

The factory has won the *Management Today*. 'Best Factory Award' in its category and the Queen's Award for Export Achievement, with around 85 per cent of its output shipped overseas, a third of which goes to Germany. It has also been labelled as 'Best in the World' by the Royal Swedish Academy of Engineering Sciences.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 270-271. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 4: TECHNOLOGY AT THE ROBECO GROUP

The Robeco Group, a Netherlands-based financial services group, sells investments and offers its customers financial advice by telephone. With three central offices in Rotterdam, Paris and Geneva, the company deals with over 350 000 calls every year at each office. With almost half a million customers, Robeco relies on technology to give a prompt and efficient service each time one of them phones to seek advice, enquire on his or her account status, or to conduct a transaction (buying or selling shares in mutual funds). In addition, customers can obtain leaflets on particular financial products.

To transact their business, customers call investment advisers in the company. Each adviser is linked through the company's computer system to various sources of information and advice covering such issues as interest-rate movements, stock markets around the world, economic forecasts, business news and political developments which could affect investments. When a customer phones, the investment adviser can access all information regarding the customer's account: for example, the financial return the customer has been getting for his or her investment (by month or by year), the transactions associated with the account and a full record of advice given and literature sent to the customer. Access to this shared information enables any investment adviser to respond to any customer (although very large customers have their own assigned account adviser). The computer system includes expert systems and models which help the adviser respond to sometimes very general enquiries. For example, if a customer asks about the impact on his investments of a change in the London housing market, the system might include a list of factor which impact the customer's investments, the proportion of the funds invested in London and so on.

Robeco staffs its lines from 8.00 am to 9.00 pm and attempts to answer all calls in the shortest possible time. All responses made by advisers to customers' specific enquiries are noted in the customer's account files and any brochures sent out by the adviser (through another department which stocks the brochures) are dispatched on the same day the enquiry was received.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 287.
Operations management. Southern Africa Edition. Johannesburg: Pitman

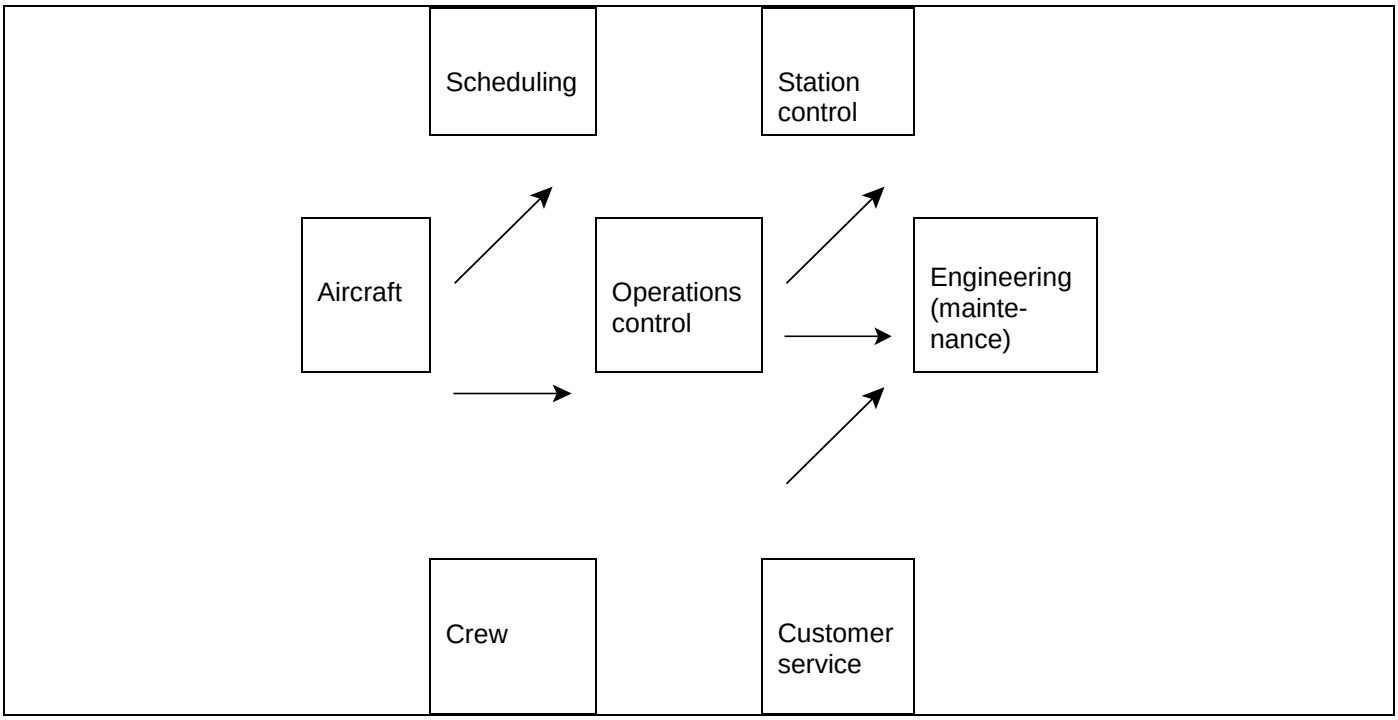
CASE STUDY 5: OPERATIONS CONTROL AT BRITISH AIRWAYS

British Airways (BA) is the world's largest international airline operator, with 240 aircraft flying between 155 destinations in 72 different countries. A BA flight takes off somewhere around the world, on average, every 90 seconds. The difficulties in planning a schedule which involves the world-wide resources of British Airways and ensuring that every flight leaves on time must be one of the most complex planning and control tasks in any operation.

The BA headquarters at Heathrow Airport near London is its busiest hub. It is there that you will find a small, but vitally important department known as Operations Control, which handles the seven days prior to take-off for long-haul flights, and the three days prior to take-off for short-haul flights. It is a full-time operation because there are flights in the air around the clock all over the world. Initial flight schedules are produced up to two years in advance, and the route schedules are negotiated at a six-monthly global conference. The planning and scheduling group at BA will then manage the production of a flight timetable, taking account of the longer-term implications of allocating certain aircraft types to each route. Any new routes or timings agreed are passed to Operations Control for comment on the practicalities of what is being proposed.

Operations Control inherits this final flight schedule, and can only make minor changes in order to cope with unexpected situations arising during the period prior to take-off. It is responsible for coordinating the three main resources required to provide the flight services, which are the schedule, the aircraft and the crew. They also are responsible for managing the knock-on effects of any delays, shortages or disruption to any of these inputs. The Operations control team is effectively still in charge of every flight until it lands, when departments such as engineering and Station control can take over. This handover is illustrated in Figure 1.

Figure 1 British Airways - Operations control centre



The performance of the Operations Control team is evaluated in terms of the *regularity* and subsequent *punctuality* of their flights. Regularity is defined as the percentage of flights actually taking off compared with the number scheduled. Passengers need to have total confidence that their flight will actually operate and current performance is almost 99 per cent (cancelling a flight is the very last resort for Operations Control). Punctuality is the measure of the timing of the take-offs. BA sets an internal standard whereby a flight is considered late if it does not take off at the time defined in the schedule. Thus a flight can only be early, dead-on-time, or late. Current performance standards are about 60 per cent punctuality.

The IATA standards allow for a 15-minute buffer the scheduled take-off time before a flight is defined as 'late'. Measured in this way, British Airways achieve a much higher punctuality figure.

Operations Control is organized such that staff work in teams of two. One focuses his or her efforts on continuous improvement, and the other takes control of the current activities. Peter Saxton, the Operations Control Manager, feels that the combination of these two perspectives ensures that both the day-to-day activities, and the longer-term thinking, are dealt with in equal proportions in a part of the business that has traditionally been viewed as reactive.

'Traditionally, the job in Operations control has been about fire fighting and that is what the staff have grown up with and enjoy doing. Now we are trying to switch the emphasis more towards developing systems that are more flexible, looking for longer-term issues, using more information to make better informed decisions, and building better relationships with our service partners in the British Airports Authority and Air Traffic Control, as well as other internal BA departments.'

Other component parts of the Operations Control Centre are the Emergency Procedures Information Centre (EPIC) and the Operations Control Intelligence Centre (OCIC) back-up centres. These are unmanned areas, set up to deal with certain types of incident at the 'press of a button'. The staff who would operate the centres are nominated, and are well trained in advance, even down to having simulated exercises on a regular basis. The EPIC centre is activated should BA, or any other contracted airline (there are over 60 subscribers to the service) be involved in an accident or serious incident, and it acts as a contact point for the public, and as a focal point for information regarding those on board. The OCIC centre is used only when a serious global incident, such as war, is affecting the entire BA business. Again the centre is manned by specially trained staff and headed by a BA board director. The team will then be on 24-hour action stations until the crisis has been resolved. These two crisis centres have become well known, and EPIC is frequently used by other organizations.

The strategy of having independent crisis centres means that the day-to-day business units do not have to cater for every eventuality.

They continue to work in the knowledge that an emergency situation will not be their responsibility, and they can thus focus more efficiently on the core operation.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 348-349. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 6: THE HOSPITAL TRIAGE SYSTEM

One of the most difficult-to-schedule environments in a hospital is the Accident and Emergency Department, where patients arrive at random, without any prior warning, throughout the day. It is up to the hospital's reception, and the medical staff, to devise very rapidly a schedule which meets most of the necessary criteria. In particular, patients who arrive having had very serious accidents, or presenting symptoms of a serious illness, need to be attended to urgently. Therefore, the hospital will schedule these cases first. Less urgent cases - perhaps where patients are in some discomfort, but their injuries or illnesses are not life-threatening - will have to wait until the urgent cases are treated. Routine non-urgent cases will have the lowest priority of all. In many circumstances these patients will have to wait for the longest time, which may be many hours, especially if the hospital is busy. Sometimes these non-urgent cases may even be turned away if the hospital is too busy with more important cases.

In situations where hospitals expect sudden influxes of patients, they have developed what is known as a *triage system*, whereby medical staff hurriedly sort through the patients who have arrived to determine which category of urgency each patient fits into. In this way a suitable schedule for the various treatments can be devised in a short period of time.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 364. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 7: OVERCOMING FORECAST PROBLEMS AT RACAL RECORDERS

Racal Recorders manufactures recording systems which are used in a wide variety of applications, from recording emergency telephone conversations through to recording automobile performance on the test track for later analysis. The technology of these products is sophisticated and the task of controlling their manufacture complex. Racal Recorders, through a combination of production of product superiority and manufacturing professionalism, are the market leaders with a turnover of around R250 million per annum.

One of its major production planning and control problems is how to coordinate the production and movement of all the parts which go into its product when virtually all products and systems are configured to meet the requirements of individual customers. An MRP system is needed to translate orders and forecasts into works instructions for purchasing and manufacturing parts, sub-assemblies and finished products. Its main problem was that after running the MRP process, the finished goods were put into stock to await customer orders. Yet the orders when they came never exactly matched what had been manufactured based on the forecast of demand. Some products remained in storage while others had to go back to the workshops to be re-manufactured to form the configurations which customers really did want.

Racal's solution to this was to analyse the common elements within its systems and manufacture 'models' which could be built up to make systems. Forecasts were prepared for the modules which, when manufactured, were kept on the shop floor until orders were firm. On the receipt of the confirmed order the modules could be assembled to form the finished system as specified by the customer.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 500. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 8: STAEDTLER: MANUFACTURING AND THE USE OF MRP

Staedtler is one of the world's premier manufacturers and suppliers of writing instruments with an annual turnover in the region of over R1,5 billion, and employing almost 4000 people. The Staedtler range extends from standard, high-volume consumer products such as pens, pencils, crayons and erasers, to highly specialized items designed for specific technical applications and for professional users. As the range has expanded, Staedtler has found that

it can achieve very high-quality production by careful selection of raw materials, and by using the latest precision manufacturing techniques. The technologies employed include wood and graphite processing, injection moulding and extrusion of plastics, and the fine engineering of metals. Modern automated assembly machines allow the low-cost mass-production of volume products such as ball-point pens.

In managing the production of its complex range of over 6000 products, Staedtler has been aided by the use of a well-tried MRP system. While some items, such as standard pencils, have a bill of materials with only a few levels, some of the more involved products require a breakdown of up to seven levels.

An example of a typical Staedtler bill of materials is shown in Table 1. This illustrates the different levels of production involved in manufacturing a '110-HB Tradition Pencil in Dozen Box' (level 0). The top level on the bill (shown as .1) gives all the items involved in the final packaging, including the finished pencil itself - coded FTRAD. The next levels in the bill are all required in the production of pencils themselves, with level 2 being the materials required to label the pencils with the Staedtler name and the paint for the dipping to give the traditional 'dipped end' on the end of the pencil. At level 3 are the lacquers and paints required to coat the basic pencil and finally level 4 details the raw materials, slats of wood, pencil lead slips, and glue which are used in the initial production of the pencil.

The bills of materials for every end product are stored on the MRP system, as well as routing and standard times for the products through each manufacturing and assembly process. An inventory file is kept for every end item, at every level. The master production schedule is initially analysed to ensure that the weekly loadings on each work centre are realistic, and then the full MRP output is created, which schedules all the production requirements at each level. Once a production order has been completed and booked back on to the system, the inventory levels of all items mentioned on the bill of materials are deducted accordingly. The production control staff at Staedtler has recognized that the key to running a successful MRP operation is to have simple, user-friendly systems. This will be their highest priority when they come to design and specify improvements to the system in order that the operations remain efficient, and the data accurate.

Table 1

Indented explosion	Sales Unit	Parent/Sales Number		Parent description
	GS	110-HB		Tradition pencil in dozen box
Pro-duction level	Com-ponent quality	Com-ponent unit	Component number	Component description
.1	12.000000	PC	V12TI	Tradition inners
.1	0.000600	PC	V12TF	Tradition Shrink-wrap
.1	0.050000	PC	V12C	Tradition carton
.1	1.000000	GS	FTRAD	Pre-packing tradition pencils
..2	0.007000	KG	DLW	White dip lacquer
..2	0.020000	KG	DLB	Black dip lacquer
..2	0.023000	PC	GFT	Tradition gold foil
..2	1.000000	GS	PTRAD	Pre-finishing tradition pencils
...3	0.100000	KG	PLR	Red polishing lacquer
...3	0.030000	KG	SLB	Black stripe lacquer
...3	1.000000	GS	RTRAD	Pre-polishing tradition pencils
....4	0.050000	PC	CCP2	Wood slats - CCP
....4	0.000600	KG	RASKG	Wood glue Tradition
....4	1.000000	GS	STRAD	pencil slips

Units: PC = Suppliers' unit KG = Kilogram
GS = Gross of pencils

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 509-510. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 9: FLEXIBILITY HELPS JIT AT L'ORÉAL

L'Oréal cosmetics is now world's largest toiletries and cosmetics group, with a presence in over 140 different countries. In the UK the 45 000 square metre purpose-built facility in mid-Wales produces 1300 product lines in a spotlessly clean environment which is akin to a pharmaceutical plant in terms of hygiene, safety and quality. The plant has 55 production lines and 45 different production processes, and the manufacturing system employed are of a flexibility that allows them to run each of the 1300 production lines every two months. That means over 150 different lines each week. But the plant was not always as flexible as this. It has been forced to enhance its flexibility by the requirement to ship over 80 million items each year. The sheer logistics involved in purchasing, storing and distributing the volume and variety of goods has led to its current focus on introducing JIT principles into the manufacturing process.

To help achieve its drive for flexibility and for just-in-time production, L'Oréal organized the site into three production centres, each autonomous and focused within technical families of productions. Their processes and production lines are then further focused within product sub-divisions. Responsible for all the activities from pre-weighing to dispatch within his area is the Production Centre Manager and his role encompasses staff development, training and motivation. Within the focused production centres, improvement groups have been working on improving shop-floor flexibility, quality and efficiency. One of the projects reduced the set-up times on the line which produces hair colourants from 2.5 hours to only 8 minutes. These new change-over times mean that the company can now justify even smaller batches and it gives them the flexibility to meet market needs just-in-time. Prior to the change in set-up time, batch size was 30 000 units; now batches as small as 2000 to 3000 units can be produced cost effectively.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 540. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 10: TOYOTA'S PRODUCTION SYSTEM

Toyota's version of JIT, which it calls the Toyota production System (TPS), has been the driving force behind its advance into what has been called a 'truly great manufacturing company'. The 'two pillars' of TPS are (and have always been):

JIT pull scheduling. The production and conveyance of what is needed, when it is needed in the amount that is needed.

Jidoka. Stopping the operations process in the event of problems, either by the staff who are process owners (who use a 'line-button), or by the machines themselves (which sense abnormalities automatically). In this way, defects cannot be passed on the next process and inspection is eliminated.

To Toyota the key control tool is their kanban system. The kanban is seen as serving three purpose:

1) It is an instruction for the preceding process to send more.

2) It is a visual control tool to show up show up areas of over-production and lack of synchronization.

3) It is a tool for *kaizen* (continuous improvement). Toyota's rules state that 'the number of kanbans should be reduced over time'.

Toyota uses two of the basic types of kanban to support JIT pull scheduling: the 'production' kanban and the 'move' kanban (what we call the conveyance kanban).

The number of parts per container is governed by factors such as part size and commonality between processes. Toyota believes that it is usually best that the number is divisible by 8 to facilitate hourly synchronization. This also means that the number of parts per container should be standardized where possible. The number of containers (hence the number of kanbans) is influenced by demand per hour, the lead time for the part and the number of parts per container. This is increased by a factor to allow for disruptions like breakdowns and absenteeism. This is

increased by a factor to allow for disruptions like breakdowns and absenteeism. The number of kanbans should of course never be fixed, but subject to *kaizen*.

Major sub-assemblies like engines are not controlled by kanban. There are numerous different end options for such major sub-assemblies, and inventory would simply be generated if separate kanbans were used for each one. Engines are therefore controlled by a different method. They are sequenced by *assembly line broadcasting*. In this approach, the exact customer requirements for a vehicle are broken down to major components and communicated ('broadcast') to the relevant production section. The procedure, therefore, is to sequence control major sub-assemblies, and to use kanbans for components and smaller sub-assemblies.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 549. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 11: ENTREPRENEURIAL QUALITY

In December 1995, Mr and Mrs Essay received some had news. One of their very profitable business had to be down as the owner of the property was going to demolish it within a short period of time. Mr Essay, an optimist by nature, saw this as an opportunity rather than a hurdle. Within no time he began scouting around for an alternative business.

After considering a number of options, he heard through the business network that a franchise was for sale. Crown Pies, as the name suggests, was a manufacturer of a variety of pies, based in the Carlton Centre in central Johannesburg. The existing owner was willing to sell the franchise for a reasonable amount. Considering that it was going concern, Mr Essay immediately knew that with a little creativity and a lot of hard work, the business could be successful. Since he took over, in January 1996, his business has been prosperous. Initially, due to a shortage of manpower, he had to assist with production, baking and delivering of pies. However, due to efficient organization, and trial and error, many of his problems and delivering of pies. However, die to efficient organization, and trial and trial and error, many of his problems have been overcome.

Crown Pies now employs a workforce of ten people. Each day they begin their work at 8.00 am and end at 5.00 pm. Mr Essay, however, since he is the owner of the business, has to put in additional hours in order to make his business, and, on average, he works 11 hours per day. During busy periods, casual labourers are called in to help meet demand.

Since a pie is a consumable product, quality is a very important aspect of production. As a result, it is vital that each pie fulfils the function of satisfying a customer's hunger. Mr Essay ensures that each pie is large enough and provides sufficient filling to meet the customer's expectation. In terms of their appearance, the pies look exceptionally appetizing, and if customers are still not convinced, one whiff and all resistance crumbles. Since each pie is made to a standard, the product is exceptionally reliable. Customers are aware that the same standard of quality will be obtained each time a purchase is made. In addition, each pie is reasonably durable for such a product. Baked pies can last for approximately three days and can be reheated to obtain a fresh-baked taste just prior to consumption. Frozen pies, which are delivered to wholesalers, last for up to three months in the refrigerator.

Crown Pies is a high-contact operation insofar as the majority of its 'value-adding' activities take place with the customer present. Customers in this type of operation have a relatively short waiting period. They are hungry people and will walk out if they are not served within a reasonable period of time. Quick service is vital and Crown Pies ensures that customers are seen to within a minute or less. Accordingly, Mr Essay emphasizes to his staff that *'the customer is always right'.* He believes that a satisfied customer is a regular customer B and a great advert. If the customers perceive that a member of staff is discourteous to them, they are likely to be dissatisfied. Given this, Mr Essay makes it his duty to train his staff to acquire good customer skills. Crown pies has to ensure that it produces a high-quality, satisfying and inexpensive product.

Mr Essay is constantly filled with new and creative ideas. He realizes that if he can expand his business by focusing more on the wholesale area, he could find his business being more profitable in the long run. In order for him to do this, however, additional premises will have to be acquired for the sole purposes of preparation, baking and storage. From here, pies can be dispatched. In the meantime, Mr Essay aims to concentrate entirely on his current procedures. He constantly seeks customer suggestions and almost always implements beneficial improvements accordingly. He constantly seeks customer suggestions and almost always implements beneficial improvements accordingly. After all, says Mr Essay, '*To make customers happy takes a lifetimes, but to lose them takes just one day!'*

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 618. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 12: THE CHANNEL TUNNEL

The channel Tunnel project was the largest construction project ever undertaken in Europe and the biggest single investment in transport anywhere in the world. For years there had been talk of linking the UK and France with a tunnel and it was only in 1986 that the two governments came to an agreement which allowed the project to get underway. The project, which was funded by the private sector, made provision for a 55-year concession for the owners to design, build and run the operation. The Eurotunnel Group (technically two holding companies, one French and one in the UK) awarded the contract to design and build the tunnel to TML (Trans-Manche Link), a consortium of ten French and British construction companies. The plan was for about half the capacity of the tunnel to be given to the national rail networks of the UK and France and the other half to be devoted to the local rail service 'Le Shuttle', to be run by Eurotunnel themselves. The finished operation was planned to be the busiest railway line in the world.

For the project managers it was a formidable undertaking. The sheer scale of the project was daunting in itself. Two main railway tunnels, split by a service/access tunnel, each 7.6 metres in diameter, run 40 metres below the sea bed. In total there are in excess of 150 kilometres of tunnel in the total project. The project was also subject to various types of uncertainty. During the early negotiations, political uncertainty surrounded the commitment of both governments. In the planning phase geological uncertainty had to be reduced by a complex series of tests. The financing of the project, which required investment by over 200 banks and finance houses, as well as over half a million shareholders, resulted in periodic financial uncertainty. Finally, the technical problems, both in the drilling itself and, more importantly, in the commissioning of the tracks and systems within the tunnel, needed to be overcome in order to reduce technical uncertainty.

The historic breakthrough came on 1 December 1990 when the French and English teams working on the service tunnel met at a point 22.3 kilometres from the UK and 15.6 kilometres from France. The real breakthrough came in 1994, however, when first freight, and then passenger services started to connect two countries through perhaps the greatest civil then passenger services started to connect two countries through perhaps the greatest civil engineering project management achievement of all time.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 583. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 13: ONCE IN A LIFETIME

The opportunity to carry out some projects comes once in a lifetime. Such projects cannot be late. The Giotto project was of this type. Giotto was the name given to the spacecraft designed to intercept Halley's Comet when it was 100 million miles away from Earth on 2 July 1985. The project was funded and managed by the European Space Agency and concentrated out in the main part to British Aerospace. The accepted payload consisted of ten experiments which were designed to establish, in more detail than ever before, the exact characteristics and composition of the comet. If the project missed the launch date significantly the whole project would have been judged a massive waste of million of ECU.

The ten experiments on board were contributed by various groups in 11 different member countries. Although this enhanced the international image of the project, it also added to the complexity of a project which was dominated by a demanding and inflexible completion requirement. Leading up to the delivery of the spacecraft, the project moved through four phases which were termed (1) concept, (2) sub-system definition and bids, (3) project definition and formal bid for delivery and (4) procurement and assembly. During the project, emphasis was placed by all parties on co-operation between the management team from the ESA and its international partners. The cost management involved initial capital proposals and then a re-assessment of the costs after the first two phases of the project. All the activities which made up the programme of work were planned in fine detail and all planning information placed on a central computer system which was visible to all involved. Any modifications were dealt with very quickly. The policy was never to have more than three or four outstanding modifications over any three-week period, so as to reduce the amount of uncertainty in the project. This relied on the team paying particular attention to ensuring visible and efficient contact or relationships. The team makes considerable use of network planning methods such as PERT which were particularly useful in keeping all information on the current of, and the future plans for, the project fully visible.

Like many large scientific organizations, the European Space Agency has an intricate hierarchy of standards and approval procedures, all of which are time consuming. The project could never have been completed to schedule if

the agency had not adopted a 'fast-track' procedure for getting approval through its various committees. It screened, in principle, aspects of technical compliance, feasibility and the financial resources backing any proposal.

The spacecraft was eventually shipped, on time, to the launch site on 29 April 1985 for trials and the final count-down to launch on 30 June 1985. The project itself was very successful, intercepting the comet as planned and contributing enormously to scientific knowledge and analysis of such phenomena. The final cost of developing and constructing the craft did overshoot its budget by about 10 per cent, which at the time was a relatively small amount for a project of this type. Good project planning and control, a clear project definition and disciplined project management had all played their part.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 591. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 14: XEROX BENCHMARKING

Possibly the best known pioneer of benchmarking in Europe is Rank is Rank Xerox, the document and imaging company, who created the original market for copiers. The virtual monopoly the company had in its sector almost become its undoing, however. By 1980 the threat to Rank Xerox from the emerging Japanese copier companies had become clear. An in-depth study within the company recognized that fundamental changes were needed. To understand how it should change, the company decided to evaluate itself externally B a process which became known as competitive benchmarking. The results of this study shocked the company. Its Japanese rivals were selling machines for about what it cost Xerox to make them. Nor could this be explained by differences in quality. The study found that, when compared with its Japanese rivals, the company had nine times more suppliers, was rejecting ten times as many machines on the production line and taking twice as long to get products to market. Benchmarking also showed that productivity would need to grow 18 per cent per year over five years if it was to catch up with its rivals.

Rank Xerox sees benchmarking as helping it achieve two objectives. At a strategic level it helps set standards of performance, while at an operational level it helps the company understand the best practices and operations methods which can help it achieve its performance objectives.

It experience of using this approach has led Xerox to a number of conclusions:

- The first phase, planning, is crucial to the success of the whole process. A good plan will identify a realistic objective for the benchmarking study which is achievable and clearly aligned with business priorities.
- A prerequisite for benchmarking success is to understand thoroughly your own processes. Without this it is difficult to compare your processes against those of other companies.
- Look at what is already available. A lot of information is already in the public domain. Published accounts, journals, conferences and professional associations all can provide information which is useful for benchmarking purposes.
- Be sensitive in asking for information from other companies. The golden rule is 'Don't ask any questions that we would not like to be asked ourselves'.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 656. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 15: EXL LABORATORIES

EXL Laboratories is a subsidiary of a large defence electronics organization which carries out research and development contracts and technical problem-solving work for a wide range of companies. Although a large number of its customers are companies within the same group, it operates as a profit centre and charges full commercial rates for the investigations it undertakes. EXL is particularly keen to improve the level of service which it gives to its customers. As the first stage of this improvement process it had discussions with all of its most important customers and based on these discussions it devised a list of the most important aspects of its service.

- *The quality of its technical solutions.* This means the perceived appropriateness of the results of its research and development projects.
- *The quality of its communications with customers. This means the frequency and use fullness of the*

information which it gives to customers while it is carrying out the investigations.

- *The quality of post-project documentation. This means the appropriate and usefulness of the instructions and documentations which it hands over to customers together with the final results of the investigation.*
- *The delivery speed of its investigations. This means the time between a customer requesting an investigation to be carried out and the final results of the investigation being delivered.*
- *The delivery dependability of the investigations. This means the ability of the laboratory to estimate the final project completion date accurately and deliver to that date.*
- *The delivery flexibility with which it conducts the investigation. This means the ability of the laboratory to speed up or slow down the investigation so as to deliver it to a revised delivery date.*
- *The specification flexibility of the investigation. This means the ability of the laboratory to change its investigation to cope with revised requirements from the customer.*
- *The price of the investigation. This means the total amount of money* charged to the customer for carrying out the investigation.

Again, based on its discussions with customers, the laboratory manages to assign a score to each of these factors on the 1 to 9 scale, where 1 means that the factor is extremely important to customers and 9 means that it has no importance (*see* Fig 1).

Figure 1 A nine-point scale of importance

Order winner	Strong	**1**	Provides a crucial advantage
	Medium	**2**	Provides an important advantage
	Weak	**3**	Provides a useful advantage
Qualifier	Strong	**4**	Needs to be up to good industry standard
	Medium	**5**	Needs to be up to median industry standard
	Weak	**6**	Needs to be within close range of the rest of the industry
Less important	Strong	**7**	Not usually of importance but could become more so
	Medium	**8**	Very rarely considered by customers
	Weak	**9**	Never considered by customers

Figure 2 shows how the managers of the laboratory rated the factors. This represents the 'profile of importance' of the various factors as far as the customer is concerned (as perceived by EXL's managers).

Figure 2 Rating 'importance to customers' on the nine-point scale

	1	2	3	4	5	6	7	8	9
Technical solution	X								
Communi-cations		X							
Documentation						X			
Delivery speed					X				
Delivery dependability				X					
Delivery flexibility						X			
Specification flexibility			X						
			X						
	1	2	3	4	5	6	7	8	9

Judging performance against competitors

At its simplest, a competitive performance standard would consist merely of judging whether the achieved performance of an operation is better than, the same, or worse than that of its competitors. However, in much the same way as the nine-point importance scale was derived, we can derive a more discriminating nine-point performance scale, as shown in Fig. 3.

Figure 3 A nine-point scale of performance

Better than Competitors	Strong	**1**	Considerably better than competitors
	Medium	**2**	Clearly better than competitors
	Weak	**3**	Marginally better than competitors
Same as Competitors	Strong	**4**	Sometimes marginally better than competitors
	Medium	**5**	About the same as most competitors
	Weak	**6**	Slightly lower than the average of most competitors
Worse than Competitors	Strong	**7**	Usually marginally worse than most competitors
	Medium	**8**	Usually worse than competitors
	Weak	**9**	Consistently worse than competitors

The management of EXL turned their attention to judging the laboratories' performance using the same factors as they had identified as being of relevance to their customers. Although they could not exactly judge how good all their competitors were on every aspect of performance, they could make some initial estimates. These are shown in Figure 4.

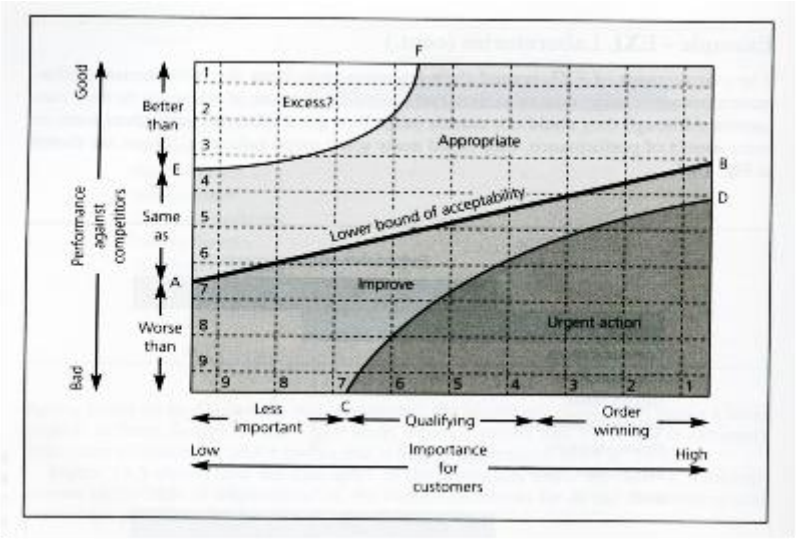
Figure 4 Rating 'performance against competitors' on the nine-point scale

	1	2	3	4	5	6	7	8	9
Technical solution		X							
Communi-cations								X	
Documentation		X							
Delivery speed						X			
Delivery dependability					X				
Delivery flexibility					X				
Specification flexibility				X					
							X		
	1	2	3	4	5	6	7	8	9

The importance-performance matrix

The priority for improvement which each competitive factor should be given can be assessed from a comparison of their importance and performance. This can be shown on an importance-performance matrix which, as its name implies, positions each competitive factor according to its scores or ratings on these criteria. Figure 5 shows an importance-performance matrix divided into zones of improvement priority. The first zone boundary is the 'lower bound of acceptability' shown as line AB in Figure 5. This is the boundary between acceptable and unacceptable performance. When a competitive factor is rated as relatively unimportant (8 or 9 on the importance scale) this boundary will in practice be low. Most operations are prepared to tolerate performance levels which are 'in the same ball-park' as their competitors (even at the bottom end of the rating) for unimportant competitive factors. They only become concerned when performance levels are clearly below those of their competitors. Conversely, when judging competitive factors which are rated highly (1 or 2 on the importance scale) they will be markedly less sanguine at poor or mediocre levels of performance. Minimum levels of acceptability for these competitive factors will usually be at the lower end of the 'better than competitors' class. Below this minimum bound of acceptability (AB) there is clearly a need for improvement, above this line there is not immediate urgency for any improvement. However, not all competitive factors falling below the minimum line will be seen as having the same degree of improvement priority. A boundary approximately represented by line CD represents a distinction between an urgent priority zone and a less urgent improvement zone. Similarly, above the line AB, not all competitive factors are regarded as having the same priority. The line EF can be seen as the approximate boundary between performance levels which are regarded as 'good' or 'appropriate' on one hand and those regarded as 'too good' or 'excess' on the other. Segregating the matrix in this way, results in four zones which imply very different priorities.

Figure 5 Priority zones in the importance-performance matrix



The 'appropriate' zone

This zone is bounded on its lower edge by the 'lower bound of acceptability', that is the level of performance which the company, in the medium term, would not wish the operation to fall below. Moving performance up to, or above, this boundary is likely to be the first-stage objective for any improvement programme. Competitive factors which fall in this area should be considered satisfactory, at least in the short to medium term. In the long term, however, most organizations will wish to edge performance towards the upper boundary of the zone.

The 'improve' zone

Any competitive factor which lies below the lower bound of the 'appropriate' zone will be a candidate for improvement. Those lying either just below the bound or in the bottom left-hand corner of the matrix (where performance is poor but it matters less) are likely to be viewed as non-urgent cases. Certainly they need improving, but probably not as a first priority.

The 'urgent-action' zone

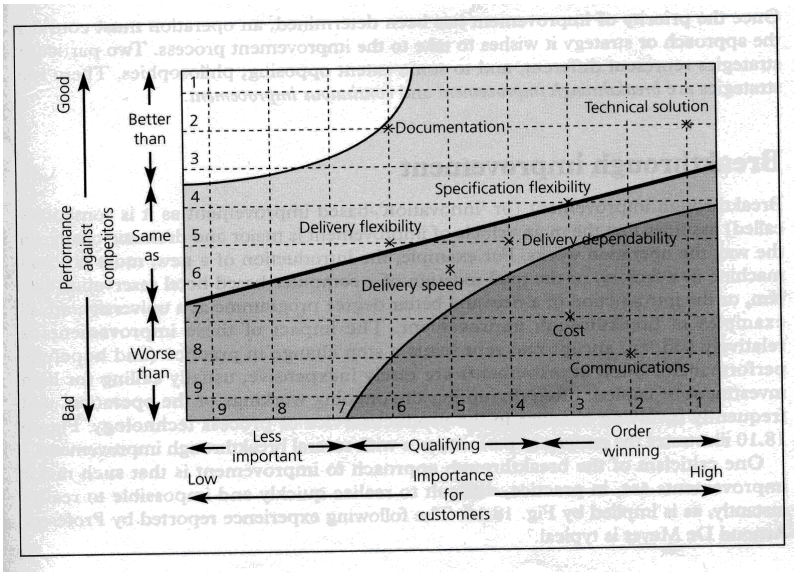
More critical will be any competitive factor which lies in the 'urgent-action' zone. These are aspects of operations performance where achievement is so far below it ought to be, given its importance to the customer, that business is probably being lost directly as a result. Short-term objective must be, therefore, to raise the performance of any competitive factors lying in this zone at least up to the 'improve' zone. In the medium term they would need to be improved beyond the lower bound of the 'appropriate' zone.

The 'excess' zone

The question mark is important. If any competitive factors lie in this area their achieved performance is far better than would seem to be warranted. This does not necessarily mean that too many resources are being used to achieve such a level, but it may do. It is only sensible therefore to check if any resources which have been used to achieve such a performance could be diverted to a more needy factor B anything which falls in the 'urgent-action' area, for example.

The laboratory plotted the importance and performance ratings it had given to each of its competitive factors on an importance-performance matrix. This is shown in Figure 6. It shows that the most important aspect of competitiveness B the ability to deliver sound technical solutions to its customers B falls comfortably within the appropriate zone. Specification flexibility and delivery flexibility are also in the appropriate zone, although only just. Both delivery speed and delivery dependability seem to be in need of improvement as each is below the minimum level of acceptability for their respective importance positions.

Figure 6 The importance-performance matrix for EXL Laboratories



However, two competitive factors, communication and cost/price, are clearly in need of immediate improvement. If the manager's estimates of their importance and performance ratings are realistic, both could be losing business for the laboratory. These two factors should therefore be assigned the most urgent priority for improvement. The matrix also indicated that the company's documentation could be regarded as 'too good'.

The matrix did not reveal any total surprises to the laboratory staff as such. The competitive factors 'communication' and 'cost/price' were known to be in need of improvement. However, the exercise was regarded as useful for two reasons.

- It did help to discriminate between many factors which were in need of improvement. Prior to the exercise, the factors 'delivery dependability' and 'delivery speed' were also regarded as equally in need of improvement.
- The exercise gave a purpose and structure to a rather ill-defined debate on improvement priorities which had been ongoing for some time. It was the process of performing the exercise, as much as the results, which was regarded by the managers as being particularly useful.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 659-664. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 16: NISSAN MOTORS (UK) LTD

The first and most publicised of the Japanese motor company's European manufacturing 'implants', the Nissan Motor Manufacturing (UK) plant in the North-East of England is widely admired for its quality.

'They are the McDonald's of manufacturing,' said the Chief Executive of the local development corporation. *'Everyone was striving for quality before they arrived but no one had set their aspirations quite so high.'*

Their arrival had a significant impact on competitors, who saw the new European plant as posing a considerable challenge.

Nissan's approach and commitment to improving its already excellent reputation for operations performance was not the least of the reasons for the competitors regarding it in this way. Quality improvement was quite explicitly put forward, along with team-working and flexibility, as part of its core philosophy. From the beginning the company's local management decided on three guiding principles for its quality and improvement policy.

- First, any programme had to be about more than quality. It needed to be integrated into the overall company activity instead of being a 'bold-on'. Its purpose was partly instrumental, seen

'as a means of improving individual and team development and the participation of staff in the general day-to-day running of their work areas'.

- Second, it should be a natural extension of the way teams would normally operate. Team orientations, says Nissan, create the environment in which quality and improvement can prosper. For example, five minutes at the beginning of each shift is spent in the team meeting. Quality problems and potential solutions are discussed, along with the results of the product audit known as VES (vehicle evaluation system). This evaluates quantitatively the quality of several vehicles from each shift. Results are analysed and immediately fed back to the relevant teams.
- Third, quality should not be swamped by an external quality bureaucracy. There is a Quality Assistance Department at Nissan but its main objectives are to provide support and feedback to the rest of the company. Similarly the (unavoidable) steering committee operated with the minimum necessary formality and was firmly under the chairmanship of the Director of Production.

Choosing an overall approach and philosophy of improvement which would support these three principles was clearly an important decision for the company. Paradoxically, staff at the British plant chose the Japanese term 'Kaizen' teams, rather than the better known Quality Circles', to describe their team-based activity. Kaizen conveys the idea that all improvement should be a continuous process which may involve the use of analytical techniques to solve problems and certainly does involve team-based problem solving. Teams even have access to 'Kaizen workshop' B areas of the plant where manufacturing staff can go to make improvements.

Nissan South Africa has gone through some rather traumatic changes recently. The fiercely competitive car market in South Africa has brought its problems and as a result there is now much greater Japanese participation in the company. There have been many top management changes. It remains to be seen how improvement will be achieved at their manufacturing facility just outside Pretoria.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 669. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 17: HEWLETT-PACKARD'S INTERNAL CUSTOMER CHECKLIST

The computer industry has always been in the forefront of developing and utilizing quality concepts. Quality failures of hardware, software or service are both immediately obvious to customers and seriously damaging to their trust in the supplier. Hewlett-Packard, the world-wide information systems company, is no exception. It was one of the first companies to make a success of the internal-customer concept in its operations. One part of the way it used the concept was a short, but effective, checklist 'pocket guide' which came out of its South Queensferry plant in Scotland. The Pocket Guide which it developed was distributed throughout the company. It suggests each part of the organization should ask itself seven questions which it regards as fundamental to the operation:

- Who are my customers?
- What do they need?
- What is my product or service?
- What are my customers' expectations and measures?
- Does my product or service meet their expectations?
- What is the process for providing my product or service?
- What action is required to improve the process?

H-P then went on to device a problem-solving methodology, based on its seven questions, the stages for which were as follows:

Select the quality issue.
Write an issue statement.

Identify the process.
Draw a flow chart.
Select a process performance measure.

Conduct a cause-and-effect analysis.

Collect and analyse the data.
Identify the major cause of the quality issue.

Plan for improvements.
Take the corrective action.
Collect and analyse the data again.
Are the objectives met?
If yes, document and standardize the changes.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 739. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 18: ISO 9000 AT SASOL SYNTHETIC FUELS

Although ISO 9002 certification was a competitive advantage for those who had it five years ago, it is now a competitive disadvantage for those who do not have it. This is one of the reasons why Sasol Synthetic Fuels decided to seek ISO 9000 certification. Sasol Synthetic Fuels in Secunda started the ISO 9002 journey with those production units and supporting functions that produce, handle, test and dispatch high-volume, high-value, mostly export products. It was decided that all new plants would be included in the programme. A large number of support functions are centralized which means that Sasol had to include the relevant ones in the programme. They are now certified for the production and delivery of chemical solvents, anode and green coke as well as hydrogen-rich and methane gas.

Sasol Synthetic Fuels has 60 000 drawings, kept, copied and distributed from a central point away from the plant. Three microfilms, one hard copy master and a further 18 additional copies are made for approval of all new and revised drawings. An average of 39 000 copies are made per month. Anybody that wants a drawing has to fill in a request, wait at least three hours, and more likely drive there by car, pick-up or motor cycle. It is, therefore, not surprising that people in the plant did not destroy their drawings after use, but hung on to them for future use. Small modifications were marked up on these private drawings, but were not fed back to the drawing office. Before implementing ISO 9000 people used to spend hours driving up and down in search of relevant documents in order to do their job. Sasol had 250 procedure libraries when Sasol Two and Sasol Three were still managed as two separate plants. This was reduced to 190 when they were combined into Sasol Synthetic Fuels (Pty) Ltd. Sasol developed and implemented computerized indexing systems to control and manage documentation, equipment and records and the changes thereto.

"It has become evident to Sasol,' says Jan Hatting, Total Quality Manager, *'that you cannot become a world-class producer if you do not, among other things, have proper control over and trust in the accuracy of your documentation, data and records. Complying with the ISO 900 standard requirements has helped Sasol Synthetic Fuel achieve that goal. We believe that ISO 9002 is a good minimum standard foundation on which to build a total quality management programme. The same applies for the compilation and continuous improvement of our manufacturing policy, strategy, procedures and work instructions."*

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 749. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 19: FAILURES PUNCTURE HOECHST'S REPUTATION

The spring of 1993 was not a happy time for Hoechst, the giant German chemical company. For years it had been justly proud of its reputation for safety and environmental protection. The previous year it had spent DM1.3 billion on environmental protection. Then between 22 February and 2 April the company was hit by three serious accidents and 15 less serious safety failures. The first involved the company contaminating part of Frankfurt with 10 tonnes of toxic chemicals. A night-shift operator had neglected to switch on a stirrer in a reaction tank. This resulted in an uncontrollable build-up of pressure which caused the explosion and the resulting pollution. The second accident also involved an explosion and this time one worker was killed and another seriously injured. The final serious incident resulted in several hundred kilograms of fuming sulphuric acid leaking into the environment. All the accidents involved human failure of some sort, although, technically, they were all dissimilar. No single technology failure could be blamed for the trio of disasters. Human failure was also the root cause of the barrage of criticism which Hoechst faced during and after the accidents. Its response was seen by some as being arrogant, disorganized and defensive. Partly because of communication failures, the company's staff underestimated the seriousness, especially of the first accident. To compound the impression of aloofness, the Chairman of the company did not give a press conference or make any statement until ten days after the first accident. By the time of the third serious accident on 2 April the company had learnt some lessons. It immediately made all the board of the company jointly responsible for safety. Even so, a reputation built up over the years had been damaged in a few weeks.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 695. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

CASE STUDY 20: FAILED PHILOSOPHER

Sleek, fast and smooth, the TGV trains of France's SNCF rail look more like aircraft than the traditional train. They provide a service which speeds passengers throughout Europe at speeds in excess of 175 mph. Inside, too, the trains show the influence of air travel. Seats are wide and comfortable with space for leg-stretching relaxation. Descriptions in the French press described the TGV as being like 'an airbus on rails'. SNCF also decided to emulate the airlines by buying a high-tech seat reservation and ticketing system which they named after the Greek philosopher Socrates. That was when their problems began. Design flaws in the booking systems software, combined with inadequate training of SNCF staff, caused chaos for months after the system was introduced. Socrates refused to believe in the existence of some places. Suddenly it refused to issue tickets for Rouen or Barcelona, insisting that neither city existed. It also failed at times to recognize the existence of several of the trains which ran between Paris and Lyon. As a result the trains made the trip with only four passengers on board. However, these straightforward system design errors have been compounded by over-complexity of some parts of the system: the automatic ticket-vending machines often stand unused by passengers because they have given up trying to understand how to use them. The graffiti outside the Gare de Lyon station reads 'One hour from Lille to Paris Y one hour to buy a ticket!' Although the problems were eventually sorted out, the reputation of what was essentially a fast and efficient operation took longer to recover.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 696. *Operations management.* Southern Africa Edition. Johannesburg: Pitman

CASE STUDY 21: TWO MILLION TO ONE

As the number of people travelling by air has grown, the chances of suffering a fatal accident have fallen substantially. Air crashes still do happen, however. Predominantly, the reason for this is not mechanical failure but human failure such as pilot fatigue. Boeing, which dominates the commercial airline business, has calculated that over 60 per cent of all the accidents which have occurred in the past ten years had flight crew behaviour as their 'dominant cause'. In other words, the accidents probably would not have happened had there not been some error by the aircraft's crew.

The chances of an accident are still very small, however. One kind of accident which is known as 'controlled flight into terrain', where the aircraft appears to be under control and yet still flies into the ground, has a chance of happening only *once in two million flights.* For this type of failure to occur a whole chain of minor failures must happen. First, the pilot at the controls has to be flying at the wrong altitude B there is only one chance in a thousand of this. Second, the co-pilot would have to fail to cross-check the altitude B only one chance in a hundred of this. The air traffic controllers would have to miss the fact that the plane was at the wrong altitude (which is not strictly part of their job) B a one-in ten chance. Finally, the pilot would have to ignore the ground proximity warning alarm in the aircraft (which can be prone to give false alarms) B a one-in-two chance.

Small though the chances of failure are, aircraft manufactures and airlines are busy working on procedures which make it difficult for aircrew to make any of the mistakes which contribute to fatal crashes. For example, if the chances of the co-pilot failing to check the altitude are reduced to one in 200, and the chances of the pilot ignoring the ground proximity alarm are reduced to one in five, then the chances of this type of accident occurring fall dramatically to one in ten million.

Source: Pycraft, M, Singh, H, Phihlela, K, Slack, N, Chambers, S, Harland, C, Harrison, A, & Johnston, R. 1997: 697. *Operations management.* Southern Africa Edition. Johannesburg: Pitman.

Addendum C: SOLUTIONS AND FEEDBACK ON ASSIGNMENT 03/2018

ASSIGNMENT 03 SELF-ASSESSMENT ASSIGNMENT
This assignment for module MNO3701 consists of essay type questions and covers all topics at random (90 marks).

QUESTION 1 **(30 marks)**

Question 1.1

This question asked your opinion on possible reasons for a resurgence of interest in production and operations management (POM) at universities and business over recent years. You may have either agreed or disagreed with the statement. In both cases, however, it is difficult to know exactly or predict what your reasons were. If we were to assess your answer to this question, our emphasis would be on judging how well you justified your reasons rather than on simply identifying a "right" or "wrong" reason.

We, of course, wholeheartedly agree with the statement on the resurgence of interest in production/operations management. We receive increasingly more enquiries from students and businesses interested in sending their employees for an introductionary course in production and operations management. However, it would be more convincing to consider some of the following points:

(1) Many popular or "fashionable" managerial concepts have their origin in the POM function such as BPR (business process re-engineering), TQM (total quality management), etc.

(2) The realisation that the potential of this function can "add value" which has a positive impact on securing competitive advantages for the business.

(3) The central nature of this function and the prominent role it fulfils has again been emphasised by supply chain management and this reminds businesses of the importance of this function.

(4) There is an inherently strong link between this function and the essence of a business, namely to produce/deliver products/services that meet the needs of customers/clients.

(5) Any person working in a business, other institution or organisation should have at least a basic knowledge of the strategic importance, role and activities of this function.

Award yourself one mark for each of the reasons you provided and convincingly justified.

Your own assessment of your answer = __ marks out of 5

Question 1.2

This question asked you to illustrate how the production/operations function of four different examples which operate at stage 4 of Hayes and Wheelwright's four-stage model, could contribute to their long-term competitive success. Before illustrating the operation of each of the four examples, it is important to first explain what is meant by a "stage 4 production/operations function". According to Hayes and Wheelwright's four-stage model, if a company or business's production/operations function is seen to be operating at stage 4 (i.e.being externally supportive) this means that the function itself becomes the foundation of the business's future competitive success. In this case, production/operations-based strategies are developed to enable the business to compete in future markets. [Two marks would be awarded for this part of your answer]. Hereafter the application in the case of each example should follow. [Each example would be awarded two marks]. In the example of an airline, we could refer to a company like SwissAir where the emphasis typically reflects a stage 4 operation (i.e.they emphasise their extensive network of flight destinations [they use the slogan "Sail smoothly through the united skies of Europe" and serve 200 destinations in Europe alone and 300 worldwide], the reliability of their operation, the quality of service, etc, rather than factors such as the "friendliness of cabin staff", variety of cuisine and alcoholic beverages, etc).

Your own assessment of the four examples = __ marks out of 10

Question 1.3

This question asked you to illustrate how the strategy hierarchy would work in a "not-for-profit" organisation such as charity organisation. As a first step in answering this question, it is important that we first consider what is meant by the concept "a strategy hierarchy". Basically, this refers to the different levels at which strategic decisions about the positioning of a business or organisation in its environment are made. Typically three levels are identified for large businesses comprising the corporate strategy, the business strategy (or strategies where more than one business unit exists) and functional strategies. [Two marks would be awarded for this

part of your answer.] In the case of the “not-for-profit” organisation, we believe that a strategy hierarchy similar to the one described above is appropriate and will thus be used to answer this question. At corporate level, the decisions would also concern the positioning of the charity within its global environment (i.e.the environment affected by broad political, social, economical, technological, etc influences) while at business level, the concern would once again similarly be directed towards guiding the organisation through its environment consisting of its customers/clients, “competitors”, “market”, etc. We use these words in inverted commas (“”) because they are normally not associated or used in the context of nonprofit organisations. Though we are not sure exactly how welfare organisations are functionally structured they are sure to perform financial, operations, public relations, purchasing, etc activities, but because of the size of the organisation, one or more may be grouped together under one functional department. Strategies that will guide the actions of the various functional departments in the organisation (referred to as functional strategies) will thus also need to be formulated and implemented. [One mark should be awarded for each of the explanations of the three strategy levels.]

Your own assessment of your answer = __ marks out of 5

Question 1.4

This question asked you to explain the importance of the volume-variety dimension as a way of understanding operations and their approach to design. In chapter 1, section 4 of the prescribed book entitled “Types of operations”, four measures used to distinguish between different types of operations were described. They included the dimensions of volume, variety, variation and degree of customer/client contact. As mentioned later in chapter 4, section 5 of the prescribed book entitled “The volume-variety effect on design”, the first two dimensions listed above namely, volume and variety, usually go together. In this regard, high-volume operations are usually associated with low variety in products/services while low-volume operations with high variety in products/services. [One mark should be awarded if you made this point.] Remember, however, that different approaches can be found even within a single operation. Viewed in this way, the actual volume-variety position that a particular operation occupies, will provide a significant clue about or insight into how the resources within it, are or should be arranged. [One mark should be awarded.] Similarly, the particular volume-variety position of an operation will affect the approach adopted for the design of its products or services and the processes for their manufacture/provision. [One mark should be awarded.] In this regard, the various aspects of the design activity namely, design emphasis (product/service versus process design),

product/service standardisation (high verus low), location (decentralised versus centralised), flow (intermittent versus continuous), process technology (general purpose versus dedicated) and staff skills (task specific versus systems oriented) all will be influenced by the particular position with regard to the volume-variety continuum. [Two marks should be awarded.]

Your own assessment of your answer = __ marks out of 5

Question 1.5

This question asked you to discuss the relationship between product/service and process technology for a product or service with which you are familiar. Since we do not know exactly what example you chose, we will use the example of a motor vehicle to discuss this particular relationship. As a starting point, however, it is important that we briefly explain, firstly, what product/service technology, and secondly, what process technology entail. For instance, in the case of a motor vehicle, the electronics used in their engine systems these days to monitor and control fuel mixtures, revolutions, etc, are an example of product/service technology. On the other hand, the technology used in the actual manufacture of the vehicle such as robotic welding arms, automatic overhead-carrier assembly line, are examples of process technology. [Two marks should be awarded.] The relationship between these two may be described by focussing on the comparative paths of their distinctive life-cycles. In this regard, the emphasis during the introduction stage of the product/service falls on the product/service technology itself, while later, during the maturity stage of the product/service, the emphasis would fall on the process technology utilised. [Two marks should be awarded.] Finally, it should be mentioned that it is much easier to distinguish between product technology and process technology in the case of products that are manufactured than services that are rendered. [One mark should be awarded.]

Your own assessment of your answer = ___ marks out of 5

QUESTION 2 (30 marks)

Question 2.1

This question asked you give as many applications of automation as you could for the operations at a hospital and a university. Note: the emphasis of your answer should be on identifying applications of **automation** (i.e.typically a manual process which, through the use of some form of technology, is now performed automatically). A useful framework which could be used to list various examples of automation at the hospital and university follows the

categorisation of the three types of processing technologies suggested in your prescribed book (i.e.materials, information or customer/client processing). One mark was awarded if you used an appropriate framework to structure your answer, and two marks for an example (1/2 mark for each application of automation you identified in the case of the hospital and university). For example, at the university, we could identify examples of automated material-processing technologies in the production and distribution of study material (i.e.the machines that print, cut and staple study guides and tutorial letters), examples of automated information-processing technologies in the computerised network of electronic communication between all staff (i.e.the PC link by means of network and GroupWise) and examples of automated customer/client-processing technologies at student registrations (i.e.computerised registration and issue of study material).

The assessment of your answer = ___ marks out of 5

Question 2.2

This question asked you to explain what was meant by a closed-loop MRP system. Two marks were awarded if you first briefly explained what a MRP system (material requirements planning) entails (see fig 14.4 in ch 14 of your prescribed book) and what its purposes was (i.e.to reconcile the supply and demand of resources by deciding on the volume and timing of materials flow in dependent demand conditions). Next you had to explain specifically what a closed-loop MRP system entailed (i.e.feedback loops for checking whether the planned production plan were actually achieved) [one mark awarded] and also have described two of its applications (i.e.either two of the resource requirements plan [RRP], the rough-cut capacity plans (RCCP] or the capacity requirements plan [CRP]) [three marks awarded].

The assessment of your answer = ___ marks out of 5

Question 2.3

This question asked you to discuss the advantages and disadvantages of working just-in-time. Working "just-in-time" basically means that we "only do something when it is asked for" (i.e.manufacture a product or render a service only when the customer/clients asks for it, not earlier or before it is needed and not later) [one mark awarded]. Primarily, its application would mean zero or low inventory levels (clearly a saving in working capital). It also enhances the operation's ability to improve on its intrinsic efficiency (this allows the operation to address productivity problems of high work-in-process, defective deliveries, high downtime, rework,

scrap, etc, more effectively) [one mark awarded]. Just-in-time or JIT, however, may be seen as an overall philosophy of production and operations management (POM) but also includes a collection of tools and methods which support its aims. It concerns three overlapping elements from which its advantages may be derived, namely the elimination of waste of all forms, the inclusion of all staff in the operation in its improvement and that the improvement should be on a continuous basis [two marks awarded]. Finally, one or more possible disadvantages could be described for one mark. Here you could have mentioned the need created by JIT for a much closer reliance on suppliers (i.e.a business could not truly follow JIT principles if its suppliers do not follow suit).

The assessment of your answer = ___ marks out of 5

Question 2.4

This question asked you to recommend which of the two machines (machine 1 or 2) used to slice plastic extrusions should be replaced on the basis of its ability (or lack of) to do its job properly.

To determine which machine has the best capability to do the job (thus noting that the machine with the "lowest ability" to do the job is likely to be the best candidate to be replaced), we may calculate the process capability or Cp index for each machine.

Machine 1

Specification range = 17,3 - 16,7 = 0,6 cm

Natural variation in process = 6 x standard deviation or equal to the normal variation = 0,5 cm

$$Cp = \frac{UTL - LTL}{6s}$$

Cp = 0,6 / 0,5 = 1,2 [Two marks awarded]

Machine 2

Specification range = 26 - 22 = 4 cm

Natural variation in process = 6 x standard deviation or equal to the normal variation = 1,9 cm

$$Cp = \frac{UTL - LTL}{6s}$$

Cp = 4 / 1,9 = 2,1 [Two marks awarded]

While a Cp value greater than 1 generally indicates that the process is "capable", machine 2 is "more" capable than machine 1. Machine 1 is thus likely to be replaced first [one mark awarded]. Finally, although not specifically asked (and with the very limited information given in the problem), it appears that the actual outputs from the machines (i.e.machine 1 which produces items which are normally distributed around 17cm with a standard deviation of 1,7cm and machine 2 which produces items which are normally distributed around 24cm with a standard deviation of 2,1 cm) in many cases would not fall within the specification limits (i.e.for machine 1 17,3 - 16,7 cm and for machine 2 26 - 22 cm) that have been set. Thus, while both machines may be "capable" of meeting the specification limits, the actual outputs due to assignable causes of variation which will have to be eliminated, in many cases appear to be "unacceptable". This matter would need to be investigated further.

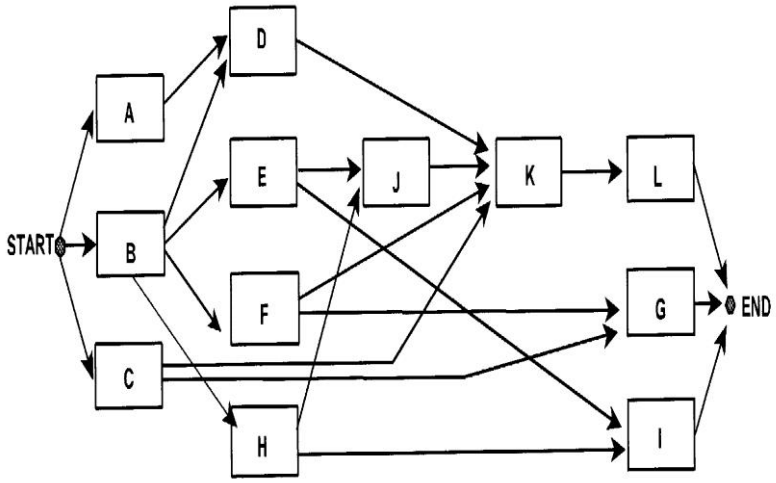
The assessment of your answer = ___ marks out of 5

Question 2.5

This question asked you construct a network diagram based on the precedence relationships given in the problem according to the CPM method of analysis. Your answer would look something like the diagram which follows (note it might not look exactly because the placement of the activity nodes could differ and therefore also the arrows which link them to indicate the precedence relationships).

One mark would be awarded for correctly showing each of the precedence relationships of A, B, C, D, E, F, H and J [8 marks] and a half mark for correctly showing the relationships for G, I, K, L (1/2 x 4 = 2 marks), thus in total 10 marks for the diagram.

To quickly check whether a constructed diagram shows the required precedence relationships between the different activities correctly, we may draw up and compare it against an immediate follower activity list which would look something like this:



ACTIVITY	IMMEDIATE FOLLOWER(S)
A	D
B	D , E , F , H
C	G , K
D	K
E	J , I
F	G , K
G	END OF PROJECT
H	I , J
I	END OF PROJECT
J	K
K	L
L	END OF PROJECT

The assessment of your answer =___ marks out of 10

QUESTION 3 (30 marks)

Question 3.1

This question asked you to explain the differences between breakthrough improvement and continuous improvement and discuss the advantages and disadvantages of each. As a starting point, you should point out that the production/operations activity of improvement entails measuring the performance of the operation, selecting improvement priorities and deciding which approach or strategy to improvement will be adopted. With this in mind, both breakthrough and continuous improvement thus represent somewhat different and even opposing views or philosophies to improvement. [One mark should be awarded.] Next you should have briefly described what each approach entails - i.e.breakthrough improvement being "innovation-based" with major, dramatic changes taking place in the way the operation works and continuous improvement (also known as *kaizen*) involving much more gradual, slower, incremental steps or changes in the operation. Some of the distinctive features of the two approaches could further be included as part of your description. [Two marks should be awarded.] Finally, you had to discuss some of the advantages and disadvantages of each approach. You could refer to some of the features listed in table 18.3 in your prescribed book (page 557) from which you could deduce both advantage and disadvantages of each approach. [Two marks should be awarded - one mark for an advantage and disadvantage for each approach.]

Your own assessment of your answer =___ marks out of 5

Question 3.2

This question asked you to find out more about one of the so-called "quality gurus", describe his/her background, approach to quality, key contribution(s) to the subject and probable contribution to TQM. Again, unfortunately, we would not know exactly which one of the "quality gurus" you selected in order to answer this question. However, your answer could have more or less reflected the following basic structure:

- a description of the person's background (i.e.where the person is from, qualifications, work experience, etc) [Two marks to be awarded.]
- a description of his/her approach to quality (i.e.how the person views quality) [Two marks to be awarded.]
- a description of the key contributions that the person made to quality [Four marks to be

awarded.]

- an explanation of how the person's the approach and key contribution(s) to quality fit and form part of the TQM philosophy [Two marks to be awarded.]

Your own assessment of your answer =___ marks out of 10

Question 3.3

This question asked you to calculate the failure rate, the mean time between failures and the availability of the example of an ATM machine outside a Bank.

To calculate the failure rate (in time) (FR) we need to take the number of failures and divide it by the operating time. The number of failures and the duration of the failures were as follows:

Failure 1 3 hours
Failure 2 33 ½ hours

Failure 3	30	hours
Failure 4	19	hours

4 failures 85 ½ total duration

The operating time equals the total time minus the nonoperating time

Total time = 24 hours x 7days = 168 hours and the nonoperating time = 85 ½ hours, thus the operating time is 168 – 85 ½ = 82 ½ hours

$$FR = \frac{4}{82\frac{1}{2}\text{ hours}}$$

= 0,04848 [Two marks to be awarded.]

To calculate the mean time between failures (MTBF) which is the reciprocal of the failure rate (in time), this time we merely need to take the operating time and divide it by the number of failures.

$$MTBF = \frac{82\frac{1}{2} \text{ hours}}{4}$$

= 20,625 hours [One mark to be awarded]

To calculate the availability (A) of the machine we need to take the mean time between failures (MTBF) and divide it by itself (MTBF) plus the mean time to repair (MTTR). Unfortunately, in the problem we are not given any indication of how long time it takes to repair the machine thus we cannot calculate the MTTR or the availability based on this formula. Note it would not be a fair assumption to assume that the nonoperating time equals the MTTR. However, given the definition of availability, that is "the degree to which the operation (the ATM machine is this case) is ready to work" we could, with reasonable justification, calculate the availability as the operating time divided by the total time.

$$A = \frac{82\frac{1}{2} \text{ hours}}{168 \text{ hours}}$$

= 0,4911 [Two marks to be awarded.]

Your own assessment of your answer =___ marks out of 5

Question 3.4

This question asked you to explain why the formulation of a production/operations strategy was important and worthwhile for a business. Furthermore, you had to indicate why such as strategy had to be ethical. Firstly, you could point out that it is agreed that the ultimate goal of a business is "to satisfy customers' immediate needs" BUT in order to do this, the business needs to formulate a production/operations strategy which it must also successfully implement. [One mark to be awarded.] Next, the point made is that an effective production/operations strategy helps the business to compete more effectively because it provides a basic structure or central core around which all individual decisions in the business may be linked in order to point in the same direction. [One mark to be awarded.] You could then point out the potential of the production/operations function in terms of its increasing competitive role of internal neutrality,

external neutrality, internally supportive and ultimately of externally supportive (see Hayes & Wheelwright's four-stage model), the generic production/operations strategies labelled "caretaker", "marketer", "innovator" and "reorganiser" - all of which emphasise the importance of production/operations function and therefore its strategies. [Four marks to be awarded.] Next you could describe the formulation procedures for individual production/operations strategies that will take a business's own competitive circumstances into account. [Two marks to be awarded.] In summary, you will have to integrate and logically explain all the aspects mentioned above to enable you to make a case to a production/operations manager why he/she needs to spend time and effort formulating a production/operations strategy for the business. Finally, as part of the strategy challenge for the future, it is essential that such production/operations management strategies are seen as "ethical". This means they should, against a framework of moral behaviour, be judged as either right or wrong. Obviously, this makes the formulation extremely difficult because frameworks for moral behaviour differ from country to country, in societies and even between individuals. [Two marks to be awarded.]

TOTAL: 90