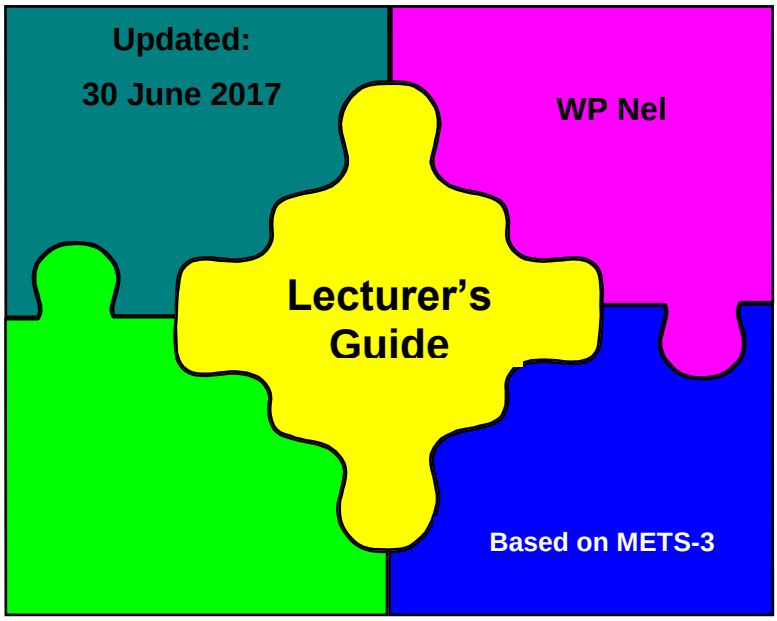
Workbook for students

Chapter 12 – The Engineer, User of Information and Communication Systems



Based on: 'Management for Engineers, Technologists and Scientists' (METS-3)

Students' workbook

Chapter 12 - The Engineer, User of Information and Communication Systems

Dear reader

Please refer to this workbook as follows:

Nel, W.P. 2017. Workbook for the 3rd edition of "Management for Engineers, Technologists and Scientists": Chapter 12. 6 February 2017.

I suggest that you use this workbook as follows:

- *Study **section 12.1** "**Introduction**" (METS-3: 246-248) from the textbook (METS-3).*
- *Go to section 12A of this workbook and answer the true/false questions from section 12A.1.*
- *Next, go to section 12B of the workbook and attempt all the multiple choice questions from section 12B.1.*
- *Now try to answer all the short and long questions from section 12C.1 of the workbook.*
- *Repeat the above for the different sections of the textbook and workbook – sections 12.2, 12.3, etc.*

I hope that this will work for you.

Regards

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Section 12 A – True/false questions

This section consists of true/false questions. State whether the following statements are true or false. In your answer book, write down 'true' or 'false' and provide a brief explanation for your answer where appropriate.

12A.1 The following **true/false questions** are based on **section 12.1** "**Introduction**" (METS-3: 246-248) of the textbook.

12A.1.1 Information and communication technologies (ICTs) can be used to streamline the business value chain. (1)

Answer: True, (METS-3: 247) (1)

12A.1.2 Unlike biotechnology and nanotechnology, ICTs are used by all organisations. (1)

12A.1.3 Organisations that adapt methods of experimenting and learning call themselves learning organisations. (1)

12A.2 The following **true/false questions** are based on **section 12.2** "**Data, information and knowledge**" (METS-3: 249-250) of the textbook.

12A.2.1 Information should be accurate and provided timely. (1)

12A.2.2 Engineers are knowledge workers. (1)

12A.2.3 A knowledge worker spend a lot of time communicating and collaborating in teams, creating, using and distributing information. (1)

12A.2.4 Information is more useful for decision-making than data. (1)

12A.3 The following **true/false questions** are based on **section 12.3** "**Information needs and responsibilities**" (METS-3: 250-251) of the textbook.

12A.3.1 The backing up of data is one of the responsibilities that must be attended to in an organisation. (1)

12A.4 The following **true/false questions** are based on **section 12.4** "**Information systems**" (METS-3: 251-253) of the textbook.

12A.4.1 An information system is any organised combination of people, hardware, software, communication networks, and data resources that collects, transforms, and disseminates information in an organisation. (1)

12A.4.2 Computers are excellent devices for data storage and retrieval. (1)

12A.5 The following **true/false questions** are based on **section 12.5** "**Uses, advantages and disadvantages of information systems**" (METS-3: 253-256) of the textbook.

12A.5.1 Information technology and systems can assist engineers and managers when managing complex systems. (1)

12A.5.2 Information and communication technologies (ICTs) can assist companies with increasing the rate at which new products are designed. (1)

12A.6 The following **true/false questions** are based on **section 12.6** "**IT in design and product development**" (METS-3: 256) of the textbook.

None.

12A.7 The following **true/false questions** are based on **section 12.7** "**IT in production and manufacturing**" (METS-3: 256, 257) of the textbook.

None.

12A.8 The following **true/false questions** are based on **section 12.8** "**ICT in engineering management**" (METS-3: 256, 257) of the textbook.

12A.8.1 The purpose of a decision support system is to provide the manager with the necessary information to make intelligent decisions. (1)

12A.8.2 Expert systems can assist decision makers. (1)

12A.9 The following **true/false questions** are based on **section 12.9** "**E-business**" (METS-3: 259-261) of the textbook.

12A.9.1 E-commerce is about the buying, selling, marketing and servicing of products and services across a variety of networks. (1)

12A.9.2 "Bricks and clicks" is a hybrid business model in which companies use both traditional and e-business. (1)

12A.9.3 The WWW-project was started by Tim Berners-Lee at CERN as a means to share research and ideas with employees and researchers around the world. (1)

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Section 12 B – Multiple choice questions

12B.1 The following **true/false questions** are based on **section 12.1** "**Introduction**" (METS-3: 246-248) of the textbook.

12B.1.1 Read the following three statements:

a) Organisations that adapt methods of experimenting and learning call themselves learning organisations.

b) Information and communication technologies can be used to streamline the business value chain.

c) Unlike biotechnology and nanotechnology, ICTs are used by all organisations.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] b

[5] None of the options (1, 2, 3, or 4) is correct.

12B.2 The following **multiple choice questions** are based on **section 12.2** "**Data, information and knowledge**" (METS-3: 249-250) of the textbook.

12B.2.1 Read the following three statements:

a) Information should be accurate and provided timely.

b) Engineers are knowledge workers.

c) Information is more useful for decision-making than data.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] b

[5] None of the options (1, 2, 3, or 4) is correct.

12B.3 The following **multiple choice questions** are based on **section 12.3** "**Information needs and responsibilities**" (METS-3: 250-251) of the textbook.

None.

12B.4 The following **multiple choice questions** are based on **section 12.4** "**Information systems**" (METS-3: 251-253) of the textbook.

12B.4.1 The use of CAD (computer-aided design) reduces the time and money spent to produce and update design drawings. In some cases, the CAD is being used to control other computers and machines to manufacture basic components of equipment. Because the CAD software has the capability to perform design checks and make changes to designs as they are approved, there has been … (2)

[1] a significant reduction in engineering errors

[2] less rework required because of design errors

[3] improved updating of designs over the former manual methods

[4] more timely posting of changes to designs

[5] all of the above

(Adapted from:
http://www.yancy.org/research/project_management/quality_sample_questions.html)

Answer

12B.4.1 [5] (2)

12B.5 The following **multiple choice questions** are based on **section 12.5** "**Uses, advantages and disadvantages of information systems**" (METS-3: 253-256) of the textbook.

None.

12B.6 The following **multiple choice questions** are based on **section 12.6** "**IT in design and product development**" (METS-3: 256) of the textbook.

None.

12B.7 The following **multiple choice questions** are based on **section 12.7** "**IT in production and manufacturing**" (METS-3: 256, 257) of the textbook.

None.

12B.8 The following **multiple choice questions** are based on **section 12.8** "**ICT in engineering management**" (METS-3: 256, 257) of the textbook.

None.

12B.9 The following **multiple choice questions** are based on **section 12.9** "**E-business**" (METS-3: 259-261) of the textbook.

12B.9.1 Read the following three statements:

a) E-commerce is about the buying, selling, marketing and servicing of products and services across a variety of networks.

b) "Bricks and clicks" is a hybrid business model in which companies use both traditional and e-business.

c) One of the reasons why businesses should try to use the WWW for e-commerce is its size and reach.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] b

[5] None of the options (1, 2, 3, or 4) is correct.

12B.10 The following **multiple choice questions** are based on **Chapter 12** "**The Engineer, User of Information and Communication Systems**" (METS-3: 246-262) of the textbook.

12B.10.1 Read the following three statements:

a) Organisations that adapt methods of experimenting and learning call themselves learning organisations.

b) Engineers are knowledge workers.

c) The backing up of data is one of the responsibilities that must be attended to in an organisation.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] b

[5] None of the options (1, 2, 3, or 4) is correct.

12B.10.2 Read the following three statements:

a) Computers are excellent devices for data storage and retrieval.

b) Information and communication technologies (ICTs) can assist companies with increasing the rate at which new products are designed.

c) Expert systems can assist decision makers.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] a and c

[5] none (not a, b, or c)

12B.10.3 Read the following three statements:

a) Information should be accurate and provided in good time.

b) Information technology and systems can assist engineers and managers when managing complex systems.

c) The purpose of a decision support system is to provide the manager with the necessary information to make intelligent decisions.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] a and c

[5] none (not a, b, or c)

12B.10.4 Read the following three statements:

a) Some software assists mining engineers with mine design and optimisation.

b) A knowledge worker is probably involved in the creation of new information.

c) The purpose of a decision support system is to provide the manager with the necessary information to make intelligent decisions.

Which of the above statements is/are **correct**? (2)

[1] b and c

[2] a and b

[3] a, b and c

[4] a and c

[5] none (not a, b, or c)

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Section 12 C – short and long questions

12C.1 The following **short and long questions** are based on **section 12.1** "**Introduction**" (METS-3: 246-248) of the textbook.

Question 12C.1.1

What is done if complete knowledge or information is lacking? (3)

Question 12C.1.2

Choose any engineering discipline (e.g. mining, electrical, mechanical, civil, industrial or chemical engineering) and briefly explain how computers, networks and various types of software are used by engineers in this discipline. (3)

12C.2 The following **short and long questions** are based on **section 12.2** "**Data, information and knowledge**" (METS-3: 249-250) of the textbook.

Question 12C.2.1

Explain the difference between data and information, and list four criteria that information should meet. (6)

Question 12C.2.2

Describe the various activities/jobs that a knowledge (or information) worker may do. (6)

12C.3 The following **short and long questions** are based on **section 12.3** "**Information needs and responsibilities**" (METS-3: 250-251) of the textbook.

Question 12C.3.1

How are the information needs of decision makers determined? What questions will you ask a decision maker in your company to answer when you try to establish the information needs of the person? (8)

12C.4 The following **short and long questions** are based on **section 12.4** "**Information systems**" (METS-3: 251-253) of the textbook.

Question 12C.4.1

Define "information system" and briefly describe the various components of an information system.

12C.5 The following **short and long questions** are based on **section 12.5** "**Uses, advantages and disadvantages of information systems**" (METS-3: 253-256) of the textbook.

Question 12C.5.1

Discuss the advantages/benefits of information systems. In other words, how can information systems be used to gain a competitive advantage? (8)

12C.6 The following **short and long questions** are based on **section 12.6** "**IT in design and product development**" (METS-3: 256) of the textbook.

None.

12C.7 The following **short and long choice questions** are based on **section 12.7** "**IT in production and manufacturing**" (METS-3: 256, 257) of the textbook.

None.

12C.8 The following **short and long questions** are based on **section 12.8** "**ICT in engineering management**" (METS-3: 256, 257) of the textbook.

Question 12C.8.1

Differentiate between the two types of managerial decisions, and the process involved in making these decisions. (4)

Question 12C.8.2

Briefly describe the purpose of a management information system (MIS). (2)

Question 12C.8.3

Mention the three phases of management decision-making. (3)

Question 12C.8.4

Briefly discuss the purpose of a decision support system. (2)

12C.9 The following **short and long questions** are based on **section 12.9** "**E-business**" (METS-3: 259-261) of the textbook.

Question 12C.9.1

Briefly describe the opportunity that e-commerce holds for businesses.

12C.10 The following **short and long questions** are based on **Chapter 12** "**The Engineer, User of Information and Communication Systems**" (METS-3: 246-262) of the textbook.

Question 12C.10.1

Discuss the importance of information and knowledge. [7]

Question 12C.10.2 (Minerals industry)

What information is needed by mine management and other staff in the following cases:

- Preparing the mine or quarry's long-term plan
- Preparing the mine or quarry's short-term plan
- Making a decision on upgrading the mine's equipment fleet (6)

Question 12C.10.3

Explain why you need to receive correct information in good time to function effectively and efficiently at a workplace. (8)

Question 12C.10.4

Briefly explain how information technology and information systems can be used to improve services, competitiveness and efficiency. (4)

Question 12C.10.5

Explain why a business should gather data and information. (2)

Question 12C.10.6

Define the following terms:

- data (2)
- information (2)
- hardware (2)

Question 12C.10.7

Match each of the following terms on the left of the table with the correct definition on the right. In your answer book, write down the number of each term, and next to it the letter representing the correct option e.g. 1. z. (5)

1. Data		a. Processed data.
2. Information		b. It supports the process of making unstructured or semi-structured decisions by performing some of the phases of the decision-making process and providing supporting information for other phases.
3. Management information system		c. Processors, terminals, storage devices and communications networks.
4. Knowledge worker		d. Measurements, facts, figures, codes and names are examples of data.
5. Hardware		e. Creates and records information

Question 12C.10.8

In its Global Risks Report 2016 the World Economic Forum (WEF) identified a number of risks. It found that the risk of large-scale cyberattacks continues to be considered a high impact/high likelihood risk. Briefly explain why the WEF came to this conclusion. (4)

You may find the following source useful:

- WEF Oct 2016 White paper: Understanding systematic Cyber Risk.

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Section 12D – Project work

Note: You will find general guidelines for the answering of projects and the writing of reports in Annexure C, at the end of this document.

Project 12D.1 (The role of information and communication technologies for management and other decision-makers in a specific industry or organisation)

Describe the role of information and communication technologies (ICTs) for management and other decision-makers in a specific industry or organisation. If you choose the minerals industry, for example, you may decide to focus on the role of ICTs in geological modelling, mine planning and scheduling.

Project 12D.2 (E-commerce)

The managing director of the company that you are employed by has noticed that one of your competitors is fairly successful in terms of its e-commerce activities and that it is slowly gaining market share. She has asked you to write a report on how your company could possibly benefit by expanding its current brick-and-mortar operations into the e-commerce domain. She has also asked you how this could be done and what skills the company would have to obtain to do so. Write a report in response to this request. (You may select any company as your employer for the purpose of this assignment.)

Project 12D.3 [The implications of cyberattacks for industry and the Internet of things]

A number of cyberattacks have recently had a negative effect on the operations of organisations and the functionality of processes and products. Examples of such cyberattacks include the following:

- The Stuxnet worm, which was developed by the governments of the USA and Israel, was used to interfere with Iran's uranium enrichment activities. It is described by Zetter (2014) as the world's first digital weapon.
- The first confirmed hack to disable a power grid took place in Western Ukraine and affected about 230 000 residents. It left them without electricity for several hours in winter (Zetter 2016; Williams 2016).
- A number of banks have been hacked, and millions of dollars have been stolen (Pagliery 2016).
- The Shamoon virus infected the computer network and affected the business processes of Aramco, Saudi Arabia's national oil and gas company, on 15 August 2012 (Rashid 2015).
- Hackers have taken control of a vehicle on more than one occasion (Prigg & Bates 2016).
- Drones and other unmanned aerial systems can be hi-jacked or sky-jacked (Goodin 2013; Greenberg 2016).

Write a report on your analysis of the threat that cyberattacks pose to industry and the Internet of things (IoT).

References

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Zetter, K. 2016. Inside the cunning, unprecedented hack of Ukraine's power grid. Wired Magazine. Available at: https://www.wired.com/2016/03/inside-cunning-unprecedented-hack-ukraines-power-grid/.

In the following video Mr Ben Kruger from Standard Bank talks about Cybersecurity:
https://www.youtube.com/watch?v=-ShkCIPnwGs

(I recommend that you watch the movie, "Zero Days" to help you understand how cyberattacks are carried out and what implications they may have.)

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Section 12E – Case studies

Case 12E.1 ()

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Section 12F – Sources on the world wide web

- - - - End of suggested solutions (Chapter 12) - - - -