5 Unit 5: Problem Solving Using ICT
[AS level, double award, optional, internally assessed]

5.1 ABOUT THIS UNIT

This AS level unit is an optional part of the double award only and is internally assessed

In this unit you need to understand the difference between *data, information* and *knowledge*.

The data and information which are used by an organisation can come from a variety of sources. Some of these will be external to the organisation and others will be internal. In today's world, much of the information used by an organisation may come from the Internet. In order to solve the problems of an organisation through the use of ICT, you need to identify where the information used by the organisation comes from and how it is used within the organisation.

You need to:

- define the term *data*, clearly identifying that data itself has no meaning;
- describe what is meant by the term *information*;
- describe what is meant by the term *knowledge*;
- understand the importance of information and data within an organisation and how the use of information and data will affect the solution to a problem;
- investigate and understand the differing types of software which may be used to solve problems within an organisation;
- understand how a solution to a problem may have an impact on other parts of the organisation;
- appreciate the need for planning, decision making and control when solving problems in organisations.

This unit is assessed through your portfolio work. The mark on that assessment will be your mark for the unit. You will produce, for a familiar context:

- the identification and explanation of the problem to be solved with the benefits of the solution to the organisation;
- a proposed solution to the problem;
- a description of the information which will be used by the proposed solution to include the levels at which the information will be used;
- an identification, providing examples, of the differing types of software which are used in an organisation and the levels at which they are used;
- an identification and explanation of the quality procedures which need to be used to include the aims, goals and objectives of the proposed solution;
- an identification and explanation, to include diagrams, of the system boundaries and environments which will be affected by the proposed solution;
- an evaluation of the proposed solution and your performance in solving the problem.

5.2 WHAT YOU NEED TO LEARN

You need to learn about:

- information;
- software;
- quality procedures;
- systems;
- evaluating the solution.

5.2.1 Information

Information has a range of definitions which you need to know about. These include:

- the meaning of information extracted by people;
- semantic and syntactic aspects of information;
- different methods of representing information to convey meaning, e.g. symbols.

Different information used within an organisation will be used at different levels within the organisation. There are **three** main levels found within any organisation. These are:

- operational information;
- tactical information;
- strategic information.

Operational Information lies at the bottom of the information-gathering process. Typical information used at this level will be the number of units sold of any item in a shop or the overtime hours worked by staff in a given department.

Tactical Information is used in the day-to-day running of an organisation and the decisions which have to be made by middle management. These decisions will be based upon information which comes up through an organisation, as well as information which comes into the organisation from outside sources.

Strategic Information is used by top-level management in making decisions which will affect the whole organisation and its future. These decisions tend to be long-term and involve high levels of expenditure. The decisions may include issues like investment, foreign trade and expansion of the organisation. Strategic information is very closely linked with strategic planning.

Information can also be classified in relation to the time-frame in which it will be used. Information may be categorised into historical, current or future usage. When solving problems, it is important that past information is considered as well as how the information is currently used. If a problem is to be solved with a long-term success, then the way in which information is to be used in the future also needs to be considered to ensure that the solution to the problem is to be long-term.

The quality of information may also be affected by many factors. You need to learn about the following factors and how they affect the quality of information:

- accuracy;
- relevance;
- age;
- completeness;
- presentation;
- level of detail.

There are many other characteristics of information which you need to know about when developing a solution to a problem. Different organisations will use information in different ways.

You need to identify the different characteristics of information and how you will use the different characteristics of information to solve the problem. You have already seen that information can be used at different levels within an organisation and how the time-frame of the information is important. The other characteristics you need to identify are:

- source:
  – internal;
  – external;
  – secondary;
  – primary;
- nature:
  – qualitative;
  – quantitative;
  – formal;
  – informal;

- frequency:
  – real-time;
  – scheduled;
  – ad-hoc;
- use:
  – planning;
  – control;
  – decision;
- form:
  – written;
  – visual;
  – formal;
- type:
  – disaggregated;
  – aggregated;
  – sampled.

5.2.2 Software

You need to know about the different types of software that an organisation could use, including:

- general-office software;
- MIS (management-information system);
- expert systems;
- KBS (knowledge-based system);
- profiling systems;
- EIS (executive-information system);
- DSS (decision-support system).

Each level of information will be processed using differing types of software. Before any problem within an organisation is solved, it is important that the level at which the information is to be used, and the software which is used at that level, is determined.

At *operational* level, the software which is most likely to be used will be standard office software such as word-processing, databases and spreadsheets. At *tactical* level, the software most likely to be used will be management-information systems (MIS), expert systems, knowledge-based systems (KBS) and profiling systems. At *strategic* level, software used will include decision-support systems (DSS) and executive-information systems (EIS).

You need to identify and explain the purpose of the type of software which needs to be used to solve any problem based on the level at which the problem occurs. You also need to know that the raw data for processing is the information produced by the lower level.

5.2.3 Quality Procedures

When developing a solution to a problem, it is very important that the aims, goals and objectives of the problem and solution are detailed. If the aims, goals and objectives are defined at the beginning of the problem-solving process, then they can be referred back to at any point during the process. By doing this, it is possible to ensure that the solution stays 'on track' and, at completion, solves the organisation's problem. When the aims, goals and objectives are being developed, it is an opportunity for the organisation to be consulted to ensure that the problem has been defined correctly and that the proposed solution is acceptable.

There are many tools which can be used during problem-solving to ensure that the quality of the solution is acceptable. Total quality management (TQM) is the most popular tool used. You need to investigate TQM and explain how it can be used during the problem-solving process, paying particular attention to the aims, goals and objectives.

5.2.4 Systems

A problem within an organisation may only affect **one** system or sub-system within the organisation. You need to identify and establish the boundaries of the system in order to solve fully the organisation's problem. It is sometimes difficult to identify clearly the boundaries between systems within the organisation, especially when the same information is used by more than **one** system or sub-system. If the organisation has a very closely integrated system then it may be very difficult to identify clearly where the solution to the problem will have the most impact. However, a clearly-defined boundary will help to determine the functional area in which the solution will fully solve the problem. Diagrams may be used to demonstrate the system boundaries and to show interaction with other systems within the organisation.

There are many systems' environments which need to be taken into account when solving a problem. You need to investigate the environments and properties to enable the appropriate selection when developing a solution.

You need to understand:

- systems;
- subsystems.

You need to:

- draw system-boundary diagrams;
- identify the environment affected by the system.

5.2.5 Evaluation of the Solution

It is very important that the effectiveness of a solution is clearly analysed once it has been developed. The solution needs to fully solve the organisation's problem and satisfy all the information requirements of the system or subsystem within the organisation. At this point the aims, goals and objectives which were developed at the beginning of the problem-solving process need to be referred to so as to ensure these are fully met.

5.3 ASSESSMENT EVIDENCE GRID

Please see over.

Unit 5: Problem solving using ICT

What you need to do:

You need to produce, for a familiar context:

a [AO2] the identification and explanation of the problem to be solved with the benefits of the solution to the organisation [**3**];
b [AO3] a proposed solution to the problem [**8**];
c [AO3] a description of the information which will be used by the proposed solution to include the levels at which the information will be used [**7**];
d [AO1] an identification, providing examples, of the differing types of software which are used in an organisation and the levels at which they are used [**6**];
e [AO2] an identification and explanation of the quality procedures which need to be used to include the aims, goals and objectives of the proposed solution [**5**];
f [AO1/2] an identification and explanation, to include diagrams, of the system boundaries and environments which will be affected by the proposed solution [**14**];
g [AO4] an evaluation of the proposed solution and your performance in solving the problem [**7**].

How you will be assessed:

Task	Assessment Objective	Mark Band 1	Mark Band 2	Mark Band 3	Mark Awarded
a	**AO2**	You identify the problem to be solved; **[0 1]**	you give a simple explanation of the problem with some of the benefits to the organisation explained; **[2]**	you give a detailed explanation with the benefits of the solution to the organisation fully explained. **[3]**	**/3**
b	**AO3**	You produce a simple solution which does not fully solve the problem; **[0 1 2]**	you produce a limited solution to the problem which is appropriate to the organisation; **[3 4 5]**	you produce a detailed solution which fully solves the problem and is appropriate to the organisation. **[6 7 8]**	**/8**
c	**AO3**	You give an incomplete description of the information which is used by the proposed solution; **[0 1 2]**	you give a simple description of the information which is used by the proposed solution, including identification of the levels at which the information is used; **[3 4]**	you give a detailed description of the information which is used by the proposed solution, including a detailed explanation of the use of the information at each level. **[5 6 7]**	**/7**
d	**AO1**	You identify the differing types of software which are used at the different levels within an organisation; **[0 1 2]**	you identify, giving a limited range of examples, the differing types of software which are used at the different levels within an organisation; **[3 4]**	you identify, giving a wide range of examples, the differing types of software which are used at the different levels within an organisation. **[5 6]**	**/6**
e	**AO2**	You identify the quality procedures which could be used when developing the proposed solution; **[0 1]**	you give a simple explanation of the quality procedures which could be used when developing the proposed solution; **[2 3]**	you give a detailed explanation of the quality procedures which could be used when developing the proposed solution. **[4 5]**	**/5**
f	**AO1**	You produce incomplete system boundary diagrams; **[0 1 2 3]**	you produce complete system diagrams showing either the inputs or outputs of the system; **[4 5 6]**	you produce detailed system diagrams showing the inputs and outputs of the system. **[7 8 9]**	**/14**
	AO2	You identify the system boundaries and environment which are affected by the proposed solution; **[0 1]**	you give a simple explanation of the system boundaries and environment which are affected by the proposed solution; **[2 3]**	you give a detailed explanation of the system boundaries and environment which are affected by the proposed solution. **[4 5]**	
g	**AO4**	You produce a simple evaluation of the proposed solution, including a comment on your actions and role in proposing a solution; **[0 1 2]**	you produce an evaluation of the proposed solution discussing the aims, objectives or goals, including comments on your own actions and roles in proposing a solution; **[3 4 5]**	you produce a detailed evaluation of the proposed solution discussing the aims, objectives and goals, including reflection of your experiences to improve your own performance, suggesting how you might approach a similar task in the future. **[6 7]**	**/7**
				Total mark awarded:	**/50**

5.4 GUIDANCE FOR TEACHERS

5.4.1 Guidance on Delivery

This unit looks in more detail at the type of information and systems used within organisations.

Candidates need to be taught the importance of information and data within an organisation and how the use of information and data will affect the solution to a problem. This could be done through real-life examples looking at documentation and methods of communication within a number of large organisations. Candidates need to look at the flow of information up through the hierarchy of an organisation. They need to see how the information is used.

In this unit, candidates need to be made familiar with the different types of computer systems and software that can be used by organisations. Again, the use of real life examples needs to be used to make the theory more meaningful. Candidates need to know how the impact of changes within **one** section of an organisation can affect other departments.

An appreciation of the need for planning, decision-making and control when solving problems in organisations needs to be made. Candidates need to realise that solutions to problems don't just happen and that there is a lot of work involved to ensure that a solution can be implemented.

5.4.2 Guidance on Assessment

It needs to be stressed that you determine only the *mark* for a candidate's portfolio evidence and not the *grade* which will be determined by OCR.

Regular, early and constructive feedback to candidates on their performance is essential and crucial. Help with planning and structuring their portfolio work in a logical manner throughout the course will lead to better understanding of their work and is likely to achieve higher marks.

Giving candidates deadlines for the completion of various sections of their work, and encouraging them to adhere to them, is also essential if candidates are not going to rush to complete and possibly finish up with marks below their potential.

You need to mark each portfolio according to the assessment objectives and content requirements in the *Assessment Evidence Grid* (Section 5.3).

The information on this *grid* will eventually be transferred onto a *Unit Recording Sheet* to be attached to the front of each candidate's piece of work at the point when the work is submitted for moderation. A *Coursework Administration Pack* will be supplied, containing all relevant *Unit Recording Sheets*. Where marking for this unit has been carried out by more than **one** teacher in a centre, there must be a process of internal standardisation carried out to ensure that there is a consistent application of the criteria as laid down in the *Assessment Evidence Grids*.

Each row in the grid reflects the development of an assessment objective from a task or sub-task in the banner (there may be one or more assessment objectives to any particular task/sub-task).

The maximum mark for each *strand* of work (each row) is shown in the far right-hand column of the grid and this maximum mark is further broken down into a number of mark bands across each row with a range of descriptors.

You use your professional judgement to determine which descriptor in a strand (row) best suits the candidate's work and from the range of marks available within that particular mark band, you circle the mark that best fits the work. You then record this mark in the column headed *Mark*.

You should use the full range of marks available. You must award *full* marks in any strand for work which *fully* meets the criteria. This is work which is the best one could expect from candidates working at AS level.

Only **one** mark per strand/row will be entered. The final mark for the candidate is out of a total of **50** and is found by totalling the marks for each strand of work.

The further guidance below clarifies the criteria in the *Assessment Evidence Grid* and will help you to determine the appropriate mark to be awarded for each strand of work.

Amplification of Criteria			
Task	**AO**	**Mark Band**	**Characteristics of the work one may expect to see at this mark band can be summarised as follows:**
a	**AO2**	**1**	Candidates provide a simple identification of the problem to be solved;
		2	candidates provide a simple explanation of the problem to be solved; they are able to identify and explain some of the benefits of a solution to the organisation;
		3	candidates provide a detailed explanation of the problem to be solved; they are able to identify and explain all the benefits that this solution will bring to the organisation.
b	**AO3**	**1**	Candidates provide a simple solution which does not fully solve the defined problem;
		2	candidates provide a limited solution to the defined problem; the solution does solve the defined problem and is appropriate for the organisation;
		3	candidates provide a detailed solution to the defined problem which fully solves the problem and is appropriate for the organisation.
c	**AO3**	**1**	Candidates provide an incomplete description of the information which will be used by the proposed solution; there is no consideration of the inputs/outputs of the system and no identification of the levels, within the organisation, at which the information will be used;
		2	candidates provide simple description of the information which will be used by the proposed solution; there is limited consideration of the inputs/outputs of the system and some identification of the levels, within the organisation, at which the information will be used;
		3	candidates provide detailed description of the information which will be used by the proposed solution; there is full consideration of the inputs/outputs of the system and a detailed explanation of the levels, within the organisation, at which the information will be used.
d	**AO1**	**1**	Candidates provide an identification of the differing types of software which are used at different levels within an organisation;
		2	candidates provide an identification of the differing types of software which are used at different levels within an organisation; a limited range of examples of the different types of software identified is provided;
		3	candidates provide an identification of the differing types of software which are used at different levels within an organisation; a wide range of examples of the different types of software identified is provided.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
e	AO2	1	Candidates provide an identification of the quality procedures which could be used when developing the proposed solution;
		2	candidates provide a simple explanation of the quality procedures which could be used when developing the proposed solution; candidates will provide either the advantages or the disadvantages of each quality procedure;
		3	candidates provide a detailed explanation of the quality procedures which could be used when developing the proposed solution; candidates will provide the advantages and disadvantages of each quality procedure.
f	AO1	1	Candidates provide incomplete system boundary diagrams which do not conform to any industry standard conventions;
		2	candidates provide system boundary diagrams showing either the inputs or outputs from, and the interaction with, any existing systems within the organisation; the system boundary diagram follows industry standards and conventions;
		3	candidates provide detailed boundary diagrams showing both the inputs and outputs from and the interaction with any existing systems within the organisation; the system boundary diagram follows industry standards and conventions.
	AO2	1	Candidates provide an identification of the system boundaries and environment which will be affected by the proposed solution; there is no consideration of how the proposed solution will affect other systems within the organisation;
		2	candidates provide a simple explanation of the system boundaries and environment which will be affected by the proposed solution; there is some consideration of how the proposed solution will affect the other systems within the organisation; there is some attempt to solve any conflict which the candidate may have identified between the proposed solution and other existing systems within the organisation;
		3	candidates provide a detailed explanation of the system boundaries and environment which will be affected by the proposed solution; there is detailed consideration of how the proposed solution will affect the other systems within the organisation; there are proposals to solve any conflict which the candidate may have identified between the proposed solution and other existing systems within the organisation.

Task	AO	Mark Band	Characteristics of the work one may expect to see at this mark band can be summarised as follows:
g	AO4	1	Candidates provide an incomplete evaluation leading to a simple conclusion for the proposed solution; the impact of the new system is not fully discussed;
		2	candidates provide an evaluation leading to a conclusion; the benefits or disadvantages of the new system are considered; the impact of the new system is not fully discussed;
		3	candidates provide a detailed evaluation leading to a justified conclusion; the benefits and disadvantages of the new system are fully discussed; the impact of the proposed solution is fully discussed.

5.4.3 Resources

Textbooks	Dayton D	*Computer Solutions for Business*	Microsoft Publishing International
	Hollander A (ed)	*Accounting, IT & Business Solutions*	Irwin
	Ray R	*Technical Solutions for Growing Businesses*	Amacon
Websites	http://www.bcs.org.uk – The home page for the British Computer Society http://www.computer.org – The home page for the IEEE Computer Society		