

In this chapter you will learn to:

- diagrammatically represent a given scenario that involves an information system
- explain how an information system impacts on its environment and how it in turn impacts on the information system
- describe the environment and purpose of an information system for a given context
- explain how a given need can be supported by an information system
- describe an information system in terms of its purpose
- for a given scenario, identify the people who are:
  - in the environment
  - users of the information system
  - participants in the information system
- describe social and ethical issues that relate to:
  - information system users
  - participants
- ensure that relevant social and ethical issues are addressed
- identify and explain reasons for the expansion of information systems, including:
  - advances in technology
  - suitability of information technology for repetitive tasks

Which will make you more able to:

- describe the nature of information processes and information technology
- classify the functions and operations of information processes and information technology
- identify and describe the information processes within an information system
- recognise and explain the interdependence between each of the information processes
- identify and describe social and ethical issues
- describe the historical developments of information systems and relate these to current and emerging technologies.

In this chapter you will learn about:

### Information systems in context

- diagrammatic representation of an information system in context
- the environment – everything that influences and is influenced by the information system
- the purpose – a statement identifying who the information system is for and what it needs to achieve
- who the information system is for includes individuals and organisations
- the information system – a set of information processes requiring participants, data/information and information technology built to satisfy a purpose
- information processes – computer based and non-computer based activities
- information technology – hardware and software used in information processes
- data – the raw material used by information processes
- information – the output displayed by an information system
- user – a person who views or uses the information output from an information system
- participant – a special class of user who carries out the information processes within an information system

### Social and ethical issues

- social and ethical issues arising from the processing of information, including:
  - privacy of the individual
  - security of data and information
  - accuracy of data and information
  - data quality
  - changing nature of work
  - appropriate information use
  - health and safety
  - copyright laws
- the people affected by social and ethical issues, including:
  - participants within the information system
  - users of the information system
  - those in the environment
- the ethical and social responsibility of developers
- current government legislation to protect the individual and organisations
- the use of information systems in fields such as manufacturing as well as the traditional fields of observation and recording
- global information systems:
  - where the purpose involves international organisations, or
  - where the data and processes are distributed across national boundaries

# INTRODUCTION TO INFORMATION SYSTEMS

What is an information system? The answer to this question is the central aim of this chapter. To understand information systems let us first consider the broader questions of 'What is a system?' and 'What is information?'

## WHAT IS A SYSTEM?

A system is a collection of resources and processes that operate together to achieve some common purpose and hence fulfil some need. For example, the braking system in a car fulfils the need to slow down the car. Its purpose, or reason for existence, is to slow down the car. To achieve this purpose requires resources or components such as the brake pedal, brake pads, brake disks, together with tyres and many other components. Even the driver is an essential component of the braking system. These components or resources must work together to successfully slow down the car. The ways in which they interact are known as the processes of the system. Processes are actions that when systematically followed will cause the resources to achieve the specified purpose. In our braking system example the driver applies pressure to the brake pedal, which in turn causes fluid to move from the master cylinder to a calliper on each wheel. At each wheel calliper the fluid pressure causes the brake pads to push against the brake disk causing friction and hence slowing down the wheels rotation. Because the tyres are gripping the road surface the reduction in rotation speed also slows down the road speed.

Almost all systems are themselves made up of smaller sub-systems and similarly almost all systems are part of larger systems. Everything that influences or is influenced by the system is said to be in the environment. In our braking system the complete car is a larger system that has the braking system as one of its sub-systems. Most of these other sub-systems affect or are affected by the braking system and hence are in its environment. For example, the braking system interfaces with the electrical system via a switch that turns the brake lights on or off as the brakes are activated or deactivated. Each of the component parts of the braking system can themselves be seen as a system, for example the master cylinder. Even within the master cylinder there are a number of sub-systems that each achieves a specific purpose within the larger master cylinder system.



### System

Any organised assembly of resources and processes united and regulated by interaction or interdependence to accomplish a common purpose.

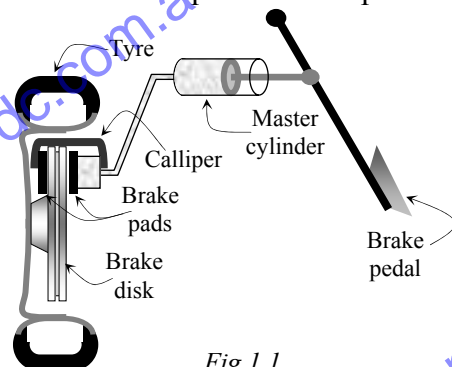


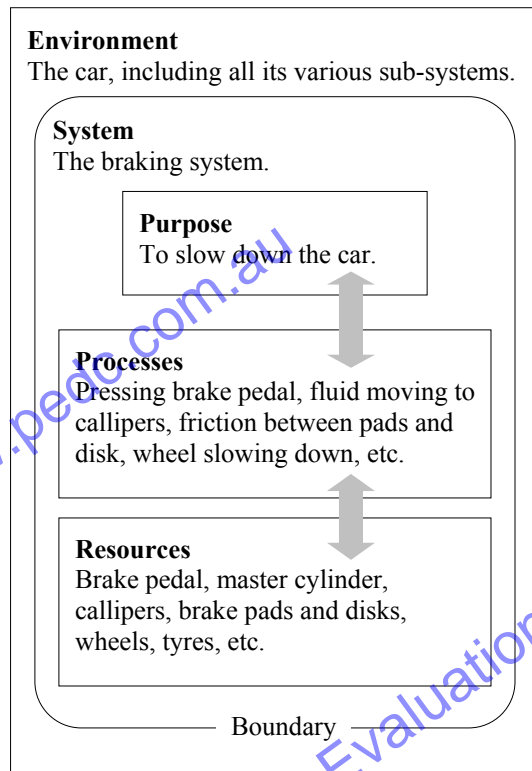
Fig 1.1

*The braking system is a sub-system of the car and is also made up of sub-systems.*

## DIAGRAMMATIC REPRESENTATION OF A SYSTEM

System engineers from all fields use diagrams and models to describe systems. Different types of diagrams are used to describe different aspects of the system. The diagram at right *Fig 1.2*, describes an overview of the resources and processes of a system, together with its purpose and environment. The arrows on the diagram show that the resources are used by the processes and in turn these processes work to achieve the system's purpose.

There are many different methods for representing systems diagrammatically, including context diagrams, data flow diagrams, flowcharts and IPO charts. Context diagrams are used to model the data movements to and from the system and its environment. Data flow diagrams model the data movements within the system. Flowcharts describe the logic of the system's processes. IPO charts identify how specific inputs are transformed into outputs. Throughout the IPT course we shall learn to use a variety of these techniques.

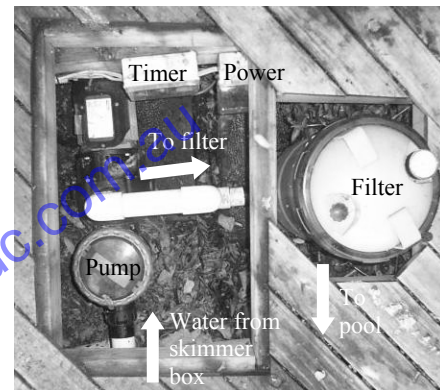


*Fig 1.2*  
Diagrammatic representation of the braking system on a car.



Consider the following:

A backyard swimming pool contains a filtration system that includes a timer, a pump, a filter, various pipes and electrical connections and a skimmer box. These components work together to keep the pool water clean and healthy. *Fig 1.3* shows many of these components, together with the flow of water.



*Fig 1.3*  
Pool filtration system.



### GROUP TASK Discussion

What is the purpose of this filtration system? What are the resources and processes of the system? Describe this systems environment and how it achieves its purpose within this environment?



### GROUP TASK Activity

Draw a diagram, like the one shown in *Fig1.2* above, to model the swimming pool filtration system.

## WHAT IS INFORMATION?

The word ‘information’ appears to be the catchword of the century. Apparently we are living in the information age. Information is supposed to help us all and the more we have the more enlightened and fulfilled our lives are supposed to be. There are even charitable organisations devoted to making information more accessible to those in third world countries. Information is traded as a commodity, like oil or even gold. The Internet is often referred to as the information super highway. So what is this stuff called information?

Information leads to knowledge and knowledge is acquired by being aware of and understanding the facts. The facts or data must be processed into information before humans can use the data to obtain knowledge. We may have access to a large store of facts or data but it is not until these facts are understood and their meaning derived that we have information.

This is really the primary aim of this course, to examine the processes and technologies used to turn raw facts or data into meaningful information. We must be careful with our understanding of facts in this context, the information resulting from the data will only be correct if indeed the data is factual. The cliché ‘garbage in – garbage out’ holds true, if the data is rubbish then the resulting information will also be rubbish.

Information is therefore the output displayed by an information system that we, as human users, use to acquire knowledge. When we receive information concerning some fact or circumstance we interpret the information to acquire knowledge. For example, ‘123456.65’ is data; ‘your savings account balance is \$123,456.65’ is information; whereas ‘I’ve got enough money to buy that Ferrari’ is knowledge.



Fig 1.4

*Data is transformed into information using information processes and technology.*



### Information

Information is the output displayed by an information system. Knowledge is acquired when information is received.



Consider the following list of data items:

- All the HSC results for a given year.
- The daily rainfall over the last ten years in your area.
- The number of cars passing your school each minute.
- Details on each take-off and landing at Mascot airport.



### GROUP TASK Activity

List at least 2 types of information that may be derived from each of the above sets of data.



### GROUP TASK Discussion

Discuss how humans may use the above information to acquire knowledge.

## INFORMATION SYSTEMS IN CONTEXT

An information system is a system whose primary purpose is to process data into information. The data is collected, processed using various resources of the system and finally the resulting information is output.

In this section we examine the general nature of information systems including:

- the environment
- the boundary
- the purpose
- information processes and
- resources.

The resources used by all information systems includes the participants, the data and information, together with all the various forms of information technology. As computers are particularly suited to data processing tasks, it is common for the information technologies used to include computer hardware and software.

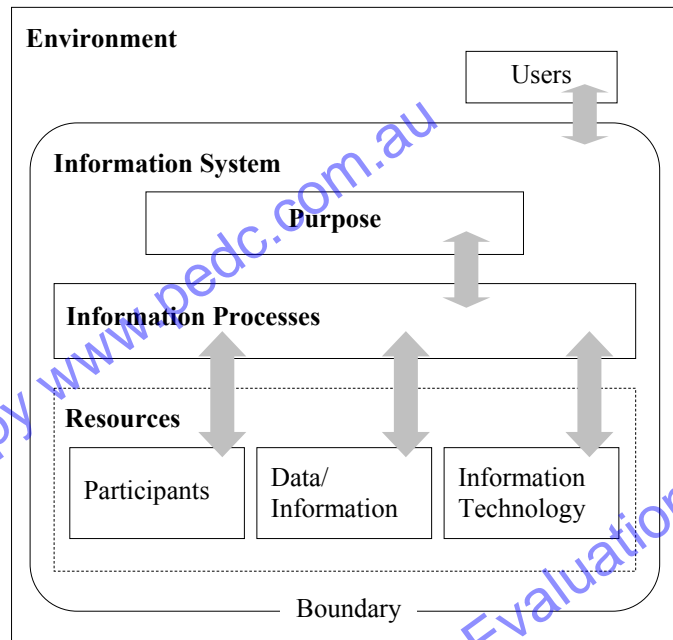


Fig 1.5

Diagrammatic representation of an information system.

### ENVIRONMENT

The environment in which an information system operates is everything that influences, and is influenced by, the information system but is not part of the information system. It encompasses all the conditions, components and circumstances that surround the system. This includes those users who do not directly interact or perform processes within the system. That is, users who are not participants are part of the environment. The information system may collect data from and display information to these indirect users, however they do not participate in the information system's operation.



#### Environment

The circumstances and conditions that surround an information system. Everything that influences or is influenced by the system.

The word environment is often used in terms of the natural environment in which we or some plant or animal live. The natural environment contains many complex and interrelated systems that are so intricate that we can never hope to understand or control them in their entirety. The environment for most information systems is less complex yet in most cases it contains many aspects that cannot be controlled or even predicted. For example, many information systems require network access; however the network is commonly part of the information systems environment. Hence the system must know how to communicate using the network but correcting faults within the network is beyond the scope of the information system. Information systems must aim to minimise any environmental effects that could hinder the system as it operates to achieve its purpose.

## BOUNDARY

The boundary defines what is part of the information system and what is part of the environment. It is the delineation between the system and its environment. For example, an online ordering system designed to process orders for a business may use the services of a payments system to process and approve credit card payments. The payments system is in the environment of the online ordering system, however the ordering system must be able to interface with the payments system but cannot affect how payments are processed by the payments system.



### Boundary

The delineation between a system and its environment. The boundary defines what is part of the system and what is part of the environment.

When developing new information systems it is critical to define the boundaries of the system as clearly as possible so that all parties understand what a new system will do and often more importantly what it will not do. All the processes and resources that will form part of the new system are said to be within the scope of the system. If there is likely to be confusion about whether some process or resource is or is not included then a specific statement should be included to remove any doubts. Consider a new online ordering system. The system scope may include collecting order details from customers and storing them in a database. It is reasonable that a client may expect the system to include approval of credit card payments as payment approval is closely related to ordering. The developer would be wise to clearly state whether payment approval is or is not within the systems scope.



Consider the following:

Automatic Teller Machines (ATMs) are now common items in every bank, shopping centre and even in most service stations. An ATM is an information system, its primary purpose is to process data into information. Account details, PINs and transaction details are entered by the user and result in a combination of outputs in the form of cash, receipts and information displayed on the monitor. These processes occur within an environment that cannot be fully controlled by the ATM system.

Let us consider some aspects of the environment that could potentially cause disruptions to the ATM information system achieving its purpose:

- Power failure – consider the consequences of loss of power half way through a transaction.
- Problems with network connection – could be a physical loss of the complete connection or an issue with response times.
- Incorrect output of cash – could be the result of crumpled notes or notes sticking together.
- Insufficient receipt paper, receipt ink or cash – how can this be detected and what response is reasonable.
- Fraudulent use – consider techniques for dealing with incorrect PINs, physical tampering with the machine, unusual transaction patterns for individuals, etc.



**GROUP TASK Discussion**

How is it that each of the above points relates to the environment within which ATMs operate? Discuss.

**GROUP TASK Discussion**

Discuss suitable techniques that are, or could be used to overcome or at least lessen the impact should any of the above disruptions occur.

**PURPOSE**

The purpose of an information system is to fulfill some need or needs. To achieve this purpose is the aim or objective of the system. In fact the purpose of the system is the whole reason for the system's existence. To accurately realise the system's purpose requires an understanding of who the information system is for and what it is they need to achieve. Therefore the purpose of an information system is very closely linked to the needs of those for whom the system is created.

**Purpose**

A statement identifying who the information system is for and what it needs to achieve.

The purpose of an information system should be stated clearly and in achievable terms. The word purpose implies a conscious and determined act, which is achieved through guided and thoughtful processes. The purpose of the system should remain at the forefront during the creation and use of any information system.

Information systems can be designed for individuals or for organisations. Information systems for organisations must meet the common needs of the individuals that make up the organisation. Determining these needs and then translating them into a common purpose can often be quite a daunting yet crucial task.



Fig 1.6

*Understanding needs leads to a clear and achievable purpose.*

Determining the purpose of an information system involves the following steps:

1. Identify the people whose needs the information system should meet.
2. Formulate a list of needs that the information system should realise.
3. Translate these needs into objectives that form the purpose of the information system.

When developing new information systems the purpose is used as the basis for developing a series of definite and achievable requirements. If the requirements are achieved then the purpose has also been achieved.



Consider the following scenarios:

- The territory manager for an oil company has some 500 service station, factory and rural customers to service. Their job is to maintain contact with existing customers as well as to promote the oil company to potential customers. A

separate department processes all orders and deliveries so the territory manager's only input in this area occurs when a problem arises with one of their clients. Most of the territory manager's time is spent visiting each of their customers to ensure personal contact as well as to provide information on new products.

There are some twenty territory managers across the country and each is free to use any information system that suits their needs. Some territory managers use a traditional diary/planner whilst others utilise electronic versions and even laptop computers. The oil company provides either printouts or computer files containing all customer details and sales histories for their area.



#### GROUP TASK Discussion

Assume you have just gained employment as a territory manager. What are your information needs? How would you decide which form of information system you would use? Discuss.

- Each school needs a timetable to operate effectively. The requirements relate to each teacher and student knowing where they should be and what they should be doing at any given time.



#### GROUP TASK Discussion

What is the purpose of timetable systems in schools? What needs do they address? Discuss.



#### GROUP TASK Discussion

Discuss the processes and resources used at your school to create, maintain and publish the school's timetable. Do these processes and resources achieve their purpose successfully?

## INFORMATION PROCESSES

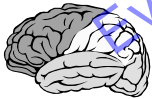
Collecting, organising, analysing, storing and retrieving, processing, transmitting and receiving and displaying are all examples of information processes. Together these seven basic activities are what needs to be done to transform the data into useful information. The bulk of the preliminary course deals with these information processes and their related tools. We therefore need to be crystal clear about the concept of information processes before we proceed further.

In general, information processes are computer and non-computer based activities that are carried out using the resources or tools of the information system. These activities coordinate and direct the system's resources to complete the required task and achieve the system's purpose. Therefore information processes use participants, data and information and information technologies to achieve the system's purpose. Information processes are not necessarily performed by computer-based technologies; they can equally be performed using other means.



#### Information Processes

What needs to be done to collect and transform data into useful information. These activities coordinate and direct the system's resources to achieve the system's purpose.



Consider the following:

Most of us own an address book; this is an example of an information system. Let us consider some of the information processes necessary for this information system to operate:

- We collect names, addresses and phone numbers of our friends, relatives and other acquaintances. This does not happen all at once, we revisit this information process each time we wish to add a new contact.
- We decide on the format we will use in our address book. Perhaps each page has three columns; one for names, another for addresses and a third for phone numbers. To enable us to later locate an individual we setup individual pages for each letter according to surname.
- We recognise the first letter of the surname to enable us to correctly store the data. We also isolate the name, address and phone number. This process, although it seems trivial in this example, is where we make sense of the data, that is, it is transformed into information.
- We locate the correct page in the address book and write in the new contacts details.
- We locate the correct page and then scan to the required contact's name and read their details.
- When a contact moves house or changes their phone number we find their name and edit the changed details.
- We skim through our address book and prepare a list of individuals to be invited to a party.
- We use the phone numbers or addresses to contact individuals.



#### GROUP TASK Discussion

Classify each of the above information processes as either collecting, organising, analysing, storing and retrieving, processing, transmitting and receiving or displaying. Discuss your responses.

### PARTICIPANTS

Participants are a special class of user who carry out or initiate the information processes. Users are all the people who view or make use of the information output from an information system. Participants also view or use information from the system; however they are also actively involved in the operation of the information system. The word participate involves sharing and having a part in something, therefore participants in an information system share and have a part in its operation. They perform or carry out the system's information processes.

For most information systems there are a variety of different personnel; some directly use the system, others indirectly use the system and some create or develop



#### Users

People who view or use the information output from an information system.



#### Participants

A special class of user who carries out (or initiates) the information processes within an information system.

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## ACCURACY OF DATA AND INFORMATION

Inaccurate data results in incorrect information being output from the information system. The consequences of such incorrect information can be minor, for example a letter addressed incorrectly, or major, for example a country going to war. The term ‘data integrity’ is used to describe the correctness, accuracy and validity of data. All information systems should include mechanisms for maximising data integrity.

There are various techniques used including: data validation and data verification checks. Data validation involves checking the data is in the correct format and is reasonable as it is entered into the system. For example your HSC assessment mark in this course must be a number between 0 and 100, the software can perform such validation and ensure this is the case. However, knowing the mark entered is your actual result is a different matter. Data verification checks ensure the data entered is actually correct. For example, although 97 is a legitimate HSC mark, perhaps it was mistyped as 79, data verification aims to correct such errors. In this case, the data entry operator may be required to physically check each entered mark before pressing the submit button. Verifying data as correct is a much more difficult task than validating it as reasonable. Data can become inaccurate over time, for example addresses change, so verifying the accuracy of data is an ongoing process.

The accuracy of collected data is improved when the format of data collection forms ensure data is in the required format and required range. For example computer-based forms can use check boxes ☒, radio buttons ☐, or list boxes to ensure input is of the type required. These items are said to be ‘self-validating’ – they ensure the data entered is reasonable in terms of format and range. Both computer and paper-based forms can include masks that provide a template to indicate the format of the data required. For example a phone number mask could be ( \_ \_ ) \_ \_ \_ \_ \_ , a post code mask could be \_ \_ \_ \_ \_ .

## DATA QUALITY

Quality data meets the requirements of all information systems that will make use of the data. For example, a database that processes customer orders is not just used by the ordering system; it is also used for stock control, analysing sales patterns, marketing and numerous other tasks. Quality data meets the needs of all systems. Many organisations develop data quality policies and standards to ensure the data within its systems will meet the needs of all its current and future systems.

There are a number of perspectives that should be considered when assessing data quality. Accuracy, timeliness and accessibility are three common data quality perspectives (there are many others). The importance of each perspective is closely related to the particular information systems that will utilise the data. The different perspectives are not separate, rather they each have an effect on the others. For instance, inaccurate data occurs when data is not updated in a timely manner. In terms of accuracy, data quality encompasses the above section on “Accuracy of data and information”.

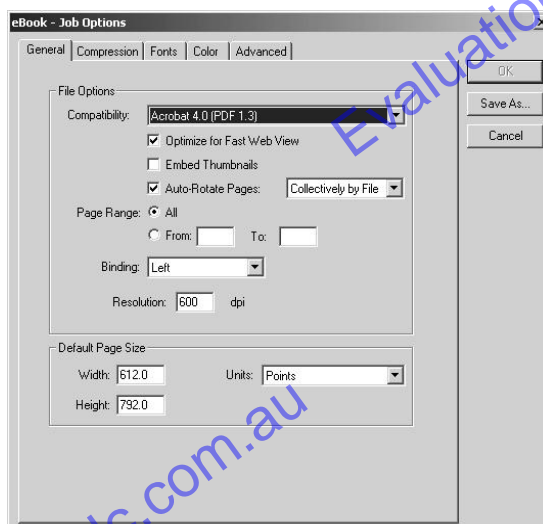


Fig 1.11

Adobe Acrobat screen showing a number of self-validating screen elements.

The timeliness of data relates to how soon changes to data are actually made and also how soon such data changes are available to other processes or systems. For example, purchases made using a credit card can take some time to be reflected in both the purchasers account and the merchants account. If the purchase is processed using an online facility then both accounts are adjusted in close to real time, however if the purchase is processed manually then it can be some days for the account balances of the purchaser and merchant to reflect the change.

Accessibility of data refers to the availability and suitability of data for processing. For example, many organisations maintain separate databases at each branch. Management at head office requires access to all branch databases if it is to accurately produce sales totals. If the business only calculates monthly sales totals then online access to each branch database may not be a priority, however if sales totals are monitored on an hourly basis then online access is needed. In addition, if the organisation of the data within each branch database is different then it will be difficult for the head office system to calculate the sales totals efficiently. For instance, some branches may add GST to each product within each order whilst others may add GST to the total of each order.



Consider the following:

A time and motion study is being undertaken for a white goods manufacturer. Each worker on the assembly line is asked to keep records on the time taken to assemble each component. The results of the study are used to pinpoint bottle necks in the manufacturing process.

The results are compiled and as a consequence various recommendations are made to management. Management disagrees with many of the recommendations and doubts the accuracy of the data used. It is later found that the times submitted by many of the individual workers were inaccurate. When these times are totalled the result is far greater than the time they actually worked.



#### **GROUP TASK Discussion**

Discuss reasons why the workers recorded inaccurate times? What techniques could have been used to improve the quality of the data?

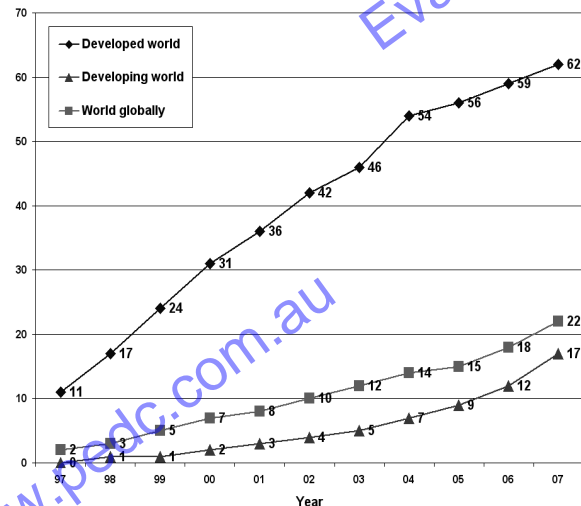
### **CHANGING NATURE OF WORK**

The nature of work has seen significant change since the 1960s. These changes have been both in terms of the types of jobs available and also in the way work is undertaken. The widespread implementation of computer-based systems, including computer-based information systems, has been the driving force behind most of these changes. In the early 1970s many thought that the consequence of new technologies would be a reduction in the total amount of work needing to be done; this has not occurred. Rather new industries and new types of employment have been created. Many people are now working longer hours, in more highly skilled and stressful jobs than ever before.

The term 'Information Technology Revolution' has been widely used to describe changes occurring over the last few decades, however more recently the term 'Global Knowledge Economy' has emerged. Information and communication technologies can be regarded as truly global technologies; they provide the ability to code information and share it globally at high speed and at minimal cost. Consider the

growth in Internet usage (see *Fig 1.12*). In the ten years from 1997 to 2007 the percentage of Internet users globally has risen from 2% up to 22% and it continues to climb. Globalisation means markets have expanded and international competition has increased. Furthermore components, services and capital used by business can be sourced from a worldwide market place.

These changes in the nature of the economy are having profound affects on the nature of work for the majority of employees. They have altered the type of jobs available to employees as well as altering the way employees perform these jobs. Let us now examine what these changes are and how they affect workers.



*Fig 1.12*

*Internet users per 100 inhabitants 1997-2007*  
 Source: International Telecommunication Union



#### **GROUP TASK Brainstorm**

There are many jobs now that just did not exist in the 1960s, and there are also many jobs that have almost totally disappeared. Make up a list of all the different types of jobs that have been created since the 1960s and another list of those jobs that have virtually disappeared.

#### **Changes in the type of employment**

During the 1960s there was much concern in regard to the automation of many tasks traditionally undertaken using manual labour. These jobs were predominantly found within goods producing industries such as agriculture, mining, manufacturing, construction and utilities. The fear, at the time, was that unemployment rates would spiral out of control. Although there has been a significant decline in the number of jobs within goods producing industries there has also been a corresponding increase in knowledge and person based service industries. The data and graph shown *Fig 1.13* uses information from the Australian Bureau of Statistics to illustrate this trend. Knowledge and person based service industries include finance, property, education, health, entertainment and communication industries.

Jobs within knowledge and person based service industries require skills in regard to using technology rather than skills that substitute for technology. For example, a clerk no longer needs to manually search through filing cabinets, rather they need to be able to use software to query a database. In other words, the technology performs the search under the clerk's direction; the clerk requires more advanced skills to direct the search than were required to carry out the manual search. Similarly an increase in the importance of inter-personal skills and a decrease in the importance of manual skills is occurring. There is little need for physical strength and coordination in knowledge and person based service industries rather there is an increased need for people to communicate more effectively with each other.

Industry	1970	1975	1980	1985	1990	1995	2000	2005
Goods producing	44.4	40.3	37.4	33.4	30.7	27.8	26.9	24.7
Knowledge and person based services	26.1	29.5	32.4	36.4	39.2	42.5	48.4	50.6
Other – includes retail, government admin, transport and storage	29.5	30.2	30.2	30.2	30.1	29.7	24.7	24.7

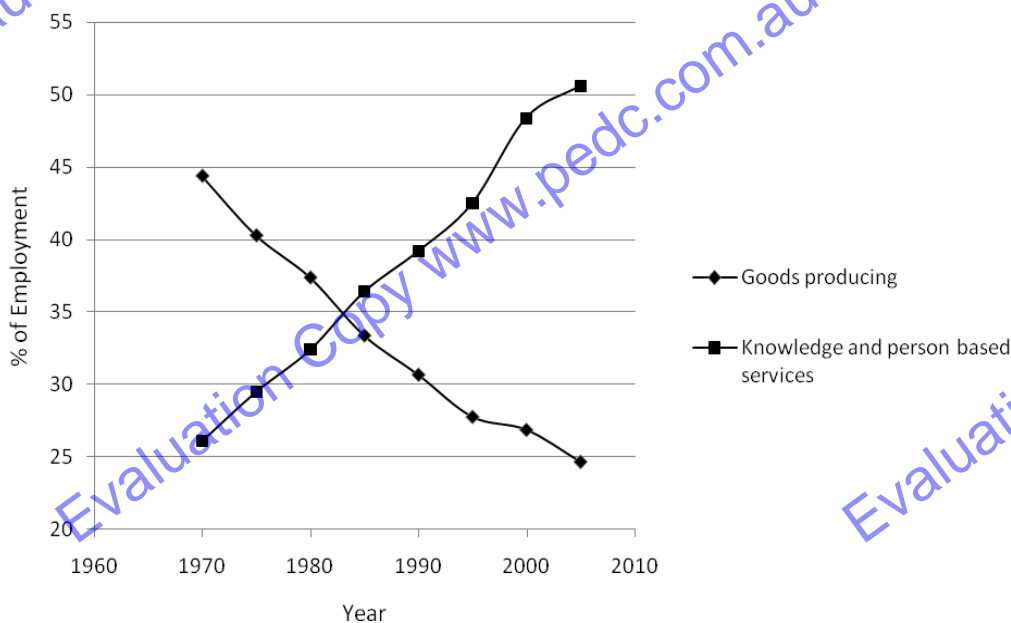


Fig 1.13

Employment in Australia by Industry Group. Data sourced from Australian Bureau of Statistics



Consider the following:

In 1967, when the HSC was first introduced, about 18,000 students sat for examinations in 28 different courses and only approximately 20% of Year 10 students completed the HSC. Now more than 65,000 students sit for examinations in around 70 courses and about 70% of Year 10 students complete the HSC.



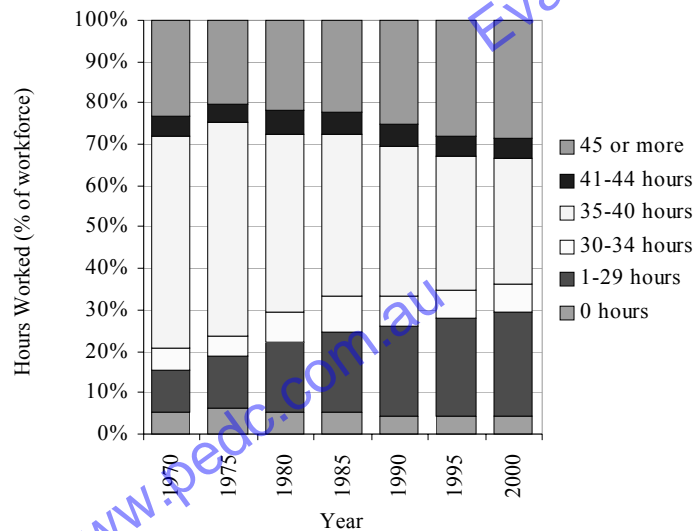
#### GROUP TASK Discussion

Discuss possible links between the changes to the types of available employment and the HSC statistics in the above statement.

#### Changes in the way work is undertaken

Traditionally we think of employment providing a steady wage or salary and involving regular working hours, usually somewhere between 35-40 hours per week; the tasks performed at work being well defined, consistent and directed by management. Most people had the expectation that throughout their working life they would work for a single employer; changes in employment only occurring for grossly sub-standard performance or by choice. This is no longer the case.

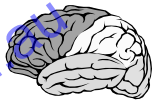
The chart in *Fig 1.14* describes the number of hours worked per week by employees across Australia. The small percentage working 0 hours is made up of those on leave of some type during the survey week. The changes in working hours reflect the trend that many more people are now employed part time, as casuals or on fixed term contracts. From the chart we see that about 30% of people worked a 35-40 hour week in 2000, where as in 1970 this number was around 51%. It is becoming less common to work, a so called standard 35-40 hour week. It is common for many people to work a different number of hours in different weeks due to various flexible work arrangements such as rostered days off and nine day fortnights.



*Fig 1.14*

*Hours worked by employees shown as percentage of total workforce. Data sourced from Australian Bureau of Statistics.*

It is also interesting to note that the number of people working less than 30 hours or more than 45 hours per week has steadily increased. Although flexible work arrangements account for some of this change, it is also true that those working long hours are generally professionals in highly skilled and varied jobs. Research indicates that these people not only earn significantly larger incomes than average, but that they also experience higher levels of job satisfaction.



Consider the following:

The data used to produce the chart in *Fig 1.14* is based on a particular survey week in each of the included years; remember that today there are many workers whose hours are flexible; they may work 10 hours one week, 45 the next and 25 the following week. This may well account for some of the increase in employees working 1-29 hours however the significant increase from around 10% in 1970 to around 25% in 2000 requires examination.



#### **GROUP TASK Discussion**

Why do you think there has been such an increase in the number of employees working between 1 and 29 hours per week?



#### **GROUP TASK Discussion**

“The rich are getting richer and the poor are getting poorer”. Discuss this statement in regard to both income and job satisfaction.

## APPROPRIATE INFORMATION USE

Information is created to fulfill some purpose, however often this same information is also useful to assist in achieving some other purpose. The possibility for inappropriate use of information arises. Inappropriate use of information can occur intentionally or it can be quite innocent and unintentional. It is vital to thoroughly understand the source, nature and accuracy of any information before it is used.

Some examples of inappropriate information use include:

1. Client's email addresses, collected by a business, are sold to a direct mail company. The direct mail company then sends out mass advertising or spam mail.
2. A student adds up their trial HSC marks, and converts the total to a percentage in an attempt to estimate their UAI.
3. Credit checks are made on all applicants for a job based solely on their name. The employer incorrectly culls some applicants when in fact it is someone else, who has the same name, that has the poor credit rating.
4. A graph showing a steady increase in sales over the past few years is used to predict future sales. Management insists each salesman increases their sales to match this future prediction.
5. A newspaper reporter uses the number of students who gained a band 6 in IPT to rank the effectiveness of schools.



### GROUP TASK Discussion

Consider each of the above numbered points. In each case is the inappropriate use of information intentional or unintentional?

The appropriate use of information systems is often detailed as a policy statement for the organisation. The policy outlines inappropriate activities together with the consequences should a user violate any of the conditions. Typically such a policy statement would include the following activities as inappropriate usage:

- Unauthorised access, alteration or destruction of another user's data, programs, electronic mail or voice mail.
- Attempts to obtain unauthorised access to either local or remote computer systems or networks.
- Attempts to circumvent established security procedures or to obtain access privileges to which the user is not entitled.
- Attempts to modify computer systems or software in any unauthorised manner.
- Unauthorised use of computing resources for private purposes.
- Transmitting unsolicited material such as repetitive mass mailings, advertising or chain messages.
- Release of confidential information.
- Unauthorised release of information.



### GROUP TASK Discussion

Consider the policy statements above in conjunction with the five examples at the top of the page. Would such a policy assist in ensuring the appropriate use of information for each of these five examples?

## HEALTH AND SAFETY

All workers are exposed to potential health and safety problems whilst undertaking their work. Employers are responsible for ensuring these risks are minimised. In NSW the *Occupational Health and Safety Act 2000*, together with the *Occupational Health and Safety Regulation 2001* are the legal documents outlining the rights and responsibilities of employers and employees in regard to occupational health and safety. Workcover NSW administers this act in NSW to ensure and monitor compliance. Employers must setup a procedure for identifying and acting on occupational health and safety (OHS) issues. This requirement is often fulfilled by appointing either an OHS representative or by forming an OHS committee.

Ergonomics is the study of the relationship between human workers and their work environment, it is not just about the design and placement of furniture, rather it is about anything and everything that affects the work experience. This includes physical, emotional and psychological aspects of work.



### Ergonomics

The study of the relationship between human workers and their work environment.

Most participants in information systems primarily work in offices at computer workstations. Some broad ergonomic issues relevant to this type of work environment include:

- Furniture and computer hardware design and placement should be appropriate to the task. This includes desks, chairs, keyboards, monitors, pointing devices, etc.
- Artificial lighting should appropriately light the work area. Outside and overhead lighting should not cause glare.
- Noise levels generated by equipment, but also from other workers, to be at reasonable levels. Research shows that conversations from fellow workers are a major distraction to most workers.
- Work routine should include a variety of tasks designed to minimise boredom and discomfort. Working continuously on the same task is the greatest cause of repetitive strain injury (RSI).
- Software design should be intuitive and provide shortcuts for experienced users. The user should drive the software, the software should not drive the user. Training should be thorough and ongoing.
- Procedures for reporting potential OHS problems should be in place and understood by all employees.

Further details in regard to ergonomic considerations particular to information systems will be examined in later chapters. Be aware that lack of job satisfaction has been shown to be closely linked to poor ergonomics. Health and safety is not just about minimising and dealing with injuries, rather it concerns the total work experience.



### GROUP TASK Discussion

Do you work part-time? If so, consider each of the above dot points in relation to your job. Discuss potential problems in regard to health and safety at your work place.

## COPYRIGHT LAWS

Copyright laws are used to protect the legal rights of authors of original works. The *Copyright Act 1968*, together with its various amendments, details the laws governing copyright in Australia. Copyright laws are designed to encourage the creation of original works by limiting their copying and distribution rights to the copyright owner. The copyright owner is normally the author of the work, except when the work was created as part of the author's employment; in this case the employing organisation owns the copyrights. Without copyright laws there would be little economic incentive for authors to create new works.

Copyright does not protect the ideas or the information within a work, rather it protects the way in which the idea or information is expressed. For example, there are many software products that perform similar processes, however these processes are performed in different and original ways, hence copyright laws apply. Generally copyright protection continues for the life of the author plus a further fifty years.

All works are automatically covered by copyright law unless the author specifically states that the copyrights for the work have been relinquished. The use of the familiar copyright symbol ©, together with the author's name and publication date is not necessary, however its use is recommended to assist others to establish the owner of a work's copyrights.

Computer software, data and information is easily copied, and the copy is identical to the original. This is not the case with most other products. As a consequence special amendments to the Copyright Act have been enacted.

In regard to software:

- One copy may be made for backup purposes.
- All copies must be destroyed if the software licence is sold or otherwise transferred.
- Decompilation and reverse engineering is not permitted. The only exception being to understand the operation of the software in order to interface other software products.

In regard to compilations of information (such as collected statistics and databases of information):

- The information itself is not covered.
- There must have been sufficient intellectual effort used to select and arrange the information; or
- The author must have performed sufficient work or incurred sufficient expense to gather the information even though there was no creativity involved.



Consider the following:

1. An employee takes a copy of a customer database with them when they leave.
2. A friend gives you a copy of a computer game they got for Christmas.
3. You create a digital phone book using name, address and phone numbers downloaded from Telstra's white pages web site.



### GROUP TASK Discussion

Discuss the implications, in terms of Copyright Law, for each of the above scenarios.



## HSC style question:

Car Guide is a business that collects details on the sale of motor vehicles and then sells this information to subscribers. Subscribers pay an annual fee and then receive regular printed reports through the mail. Many of the subscribers are motor vehicle dealers, although individuals are also welcome to subscribe.

Each report is personalised to suit the requirements of each individual subscriber. Subscribers can specify search criteria including date range, vehicle manufacturer, vehicle model, year of manufacture and postcode of sale. Also various other report details can be specified, such as summary information, charts or even the raw motor vehicle sales data.

Collecting the raw data is the most time consuming and costly part of Car Guide's operation. Car Guide pays dealerships to supply details of each vehicle sold, however they must telephone private sellers to obtain similar details.

- (a) Some subscribers have expressed concern with regard to the accuracy of the reports they receive from Car Guide. Identify areas where inaccuracies may be introduced into Car Guide's information system and suggest strategies to minimise these inaccuracies.
- (b) The collected data is entered into Car Guide's database and is then processed to create each subscriber's report. Discuss who owns the copyrights over the database and who owns the copyrights over the final reports.

**Suggested Solution**

- (a) There could be problems in the data entry of the received data from Dealerships and/or private sellers. This could be picked up by appropriate validation checks in the software to highlight obviously unreasonable values as data is entered. Appropriate verification processes should also be insisted on where the data entry people are trained to check every paper form carefully (or read back their entered data on the phone to private sellers) before pressing the submit button.

Private sellers may tend to exaggerate the sell price to reflect their advertised price rather than admit to selling for a lower price. Perhaps Car Guide should not even try to contact the people selling the car, but go to the RTA where all transfers of cars are registered and ask if the data can be transferred electronically (and of course ethically) to them.

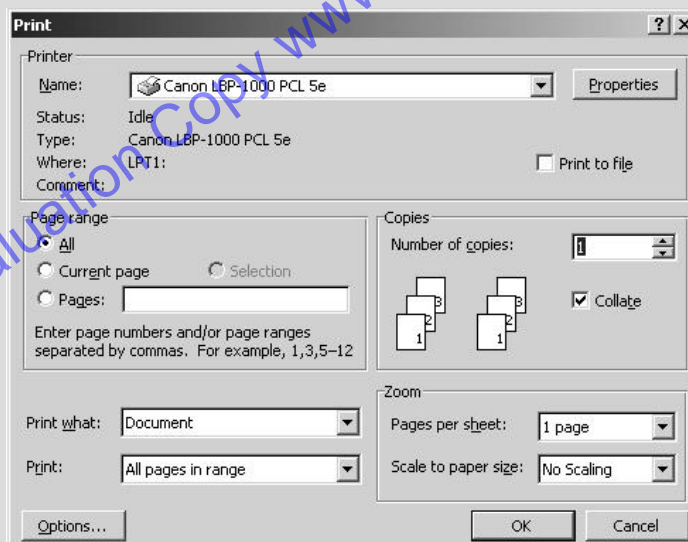
Payment to Dealerships could also cause errors in the data collected. They may be eager to submit extra data and include sales that are too high or even fictitious to impress Car Guide. This could be pre-empted by only accepting exports of real sales data transmitted directly from the various Dealerships computer systems.

- (b) There has been significant effort on the part of Car Guide to collect and compile the sales data, therefore they own the copyrights over the database. These copyrights are in terms of the organisation and other processing performed by their database system. The reports are also produced by this system hence Car Guide owns the copyrights over the reports (unless the subscriber contracts specify otherwise). The individual sales records within the database are raw facts so although this data originates from the dealerships and private sellers it is unlikely to be covered by copyright law as no significant intellectual activity was needed to create the data.

**SET 1B**

1. A business that is unable to explain why they are collecting personal information is in breach of the:
  - (A) Copyright Act 1968.
  - (B) Occupational Health and Safety act 2000.
  - (C) Privacy Act 1988.
  - (D) None of the above, they are just being unethical.
2. Passwords can be used to:
  - (A) increase security.
  - (B) protect the privacy of sensitive information.
  - (C) stop unauthorized copying of files.
  - (D) All of the above.
3. The difference between data validation and data integrity is:
  - (A) there is no difference, they are interchangeable terms.
  - (B) Validation ensures the data is reasonable and is in the correct format at entry time, integrity is about ensuring it is correct.
  - (C) Validation is about the screen items used to make up computer-based forms, whereas integrity is to do with the underlying data.
  - (D) Integrity checks ensure the data is reasonable and is in the correct format at entry time, validation is about ensuring it is correct.
4. Restoring files after the complete failure of a file server can only happen if which of the following has occurred:
  - (A) Anti-virus software was installed and regularly upgraded.
  - (B) All files have password protection.
  - (C) an audit trail is maintained by the system.
  - (D) Regular backups have been made.
5. Automation of many tasks traditionally undertaken by manual labour has resulted in:
  - (A) high unemployment within the total population.
  - (B) a decline in jobs available within goods producing industries.
  - (C) an increase in jobs within knowledge and person based service industries.
  - (D) manual labourers now working in knowledge and person based industries.
6. A government employee creates an information system for his department. In terms of copyright:
  - (A) he is able to sell licenses to other parties to use this system, provided he does not include the government department's data or information.
  - (B) he is the author and possesses the copyrights.
  - (C) the government owns the copyrights and he may not take the system if he leaves their employ.
  - (D) the law is not precise in this regard, he should seek the services of a copyright lawyer if he wishes to market the system.
7. Ergonomics is concerned with:
  - (A) furniture design and placement.
  - (B) reducing work place injuries.
  - (C) the total work environment.
  - (D) ensuring OHS principles are enforced.
8. For copyright law to apply, works must:
  - (A) display the copyright symbol ©.
  - (B) be copied and distributed for profit.
  - (C) contain original ideas or information.
  - (D) None of the above.
9. It is true to say that over the past 30 years or so:
  - (A) the number of people working longer hours has decreased and the number working shorter hours has increased.
  - (B) there has been very little change in the hours worked by employees.
  - (C) the number of hours worked by most people has decreased significantly.
  - (D) the number of people working longer hours has increased and so too has the number of people working shorter hours.
10. The term 'Global Knowledge Economy' has arrived as a consequence of:
  - (A) the increase in knowledge and person based service jobs compared to those in other industries.
  - (B) automation within goods producing industries resulting in lowered manufacturing costs.
  - (C) the widespread implementation of computer-based technologies across the globe.
  - (D) the ability to code and share information across the world at high-speed and low cost.

11. Consider each of the following scenarios. For each, describe suitable methods available for rectifying the situation:
- A number of data entry operators are experiencing muscle strain, particularly in their wrists.
  - A software developer discovers that one of their products is being distributed illegally over the Internet.
  - You continue to receive spam mail from a company despite informing them to remove you from their mailing list.
  - A business continues to send you an invoice for products you never ordered or received. They are now threatening legal action.
12. A number of legal documents are discussed in the text. Make a list of these documents and briefly describe their purpose.
13. Examine the screen shot below:



There are a number of different types of controls on the above screen. Identify those that are 'self-validating' and those that are not. For the controls that are not self-validating describe appropriate checks that could be used to ensure the data input is reasonable.

14. Doctors hold much private information on each of their patients. It is therefore crucial that their patient files and records are kept secure and the information is used appropriately. List and describe a number of techniques suitable for ensuring this occurs.
15. 'Work is a necessary evil. You put in your 8 hours labour each day, get a pay packet at the end of the week and a bit of a holiday every so often. This just the way it is!'
- Do you agree with the above quote? Discuss, in relation to the changing nature of work over the past 30 years or so.

## CHAPTER 1 REVIEW

1. Information processes include:
  - (A) participants, data, information and information technology.
  - (B) environment, purpose, resources and participants.
  - (C) collecting, organising, analysing, storing, processing and displaying.
  - (D) data, information and knowledge.
2. A system that is itself an integral part of another system is called a(n):
  - (A) information system.
  - (B) system resource.
  - (C) sub-system.
  - (D) information technology.
3. Which of the following is true of information technology?
  - (A) It is the result of science being applied to a practical problem.
  - (B) It includes hardware and software.
  - (C) It is all the tools used to perform a system's information processes.
  - (D) All of the above.
4. When assessing data quality, which of the following should be considered?
  - (A) accuracy, timeliness, accessibility.
  - (B) privacy, security, copyright.
  - (C) text, numbers, images, audio, video.
  - (D) users, participants, developers.
5. Passwords are used to:
  - (A) assign particular access rights to users.
  - (B) confirm that a user is who they say they are.
  - (C) block unauthorised access to a network.
  - (D) restrict the activities of employees, both past and present.
6. Privacy of the individual is primarily concerned with:
  - (A) protecting an individual's personal information.
  - (B) ensuring all individuals have access to their personal information.
  - (C) making sure personal data held is accurate.
  - (D) enforcing the 10 National Privacy Principles specified in the *Privacy Act 1988*.
7. Systems that maintain an audit trail are doing so to ensure:
  - (A) fair and equitable access to information.
  - (B) all transactions can be traced to their source.
  - (C) copyright is respected at all times.
  - (D) employee's actions can be observed and monitored.
8. A hacker is someone who:
  - (A) knowingly and maliciously creates and/or distributes viruses.
  - (B) uses data and/or information inappropriately.
  - (C) uses their skills to circumvent the security of computer systems.
  - (D) has extensive knowledge of computer systems.
9. All information systems:
  - (A) contain participants, data/information and information technology.
  - (B) process data into information; this is their primary purpose.
  - (C) operate within an environment which influences, and is influenced, by the information system.
  - (D) All of the above.
10. Jack downloads some images from the web to include on a commercial website. Apparently, the images do not include any sort of copyright notice or license agreement. Which of the following is true?
  - (A) As there is no copyright mark, notice or license agreement; Jack is free to use the images as he pleases.
  - (B) Images cannot be copyrighted, so it is legal for Jack to use the images.
  - (C) The images may or may not be covered by copyright, but as there is no copyright notice and the images were found on the web then it is reasonable to assume they are in the public domain.
  - (D) Jack should assume the images are covered by copyright. It would be wise to contact the website and find out the copyright status of the images before using them.

11. Define each of the following terms:

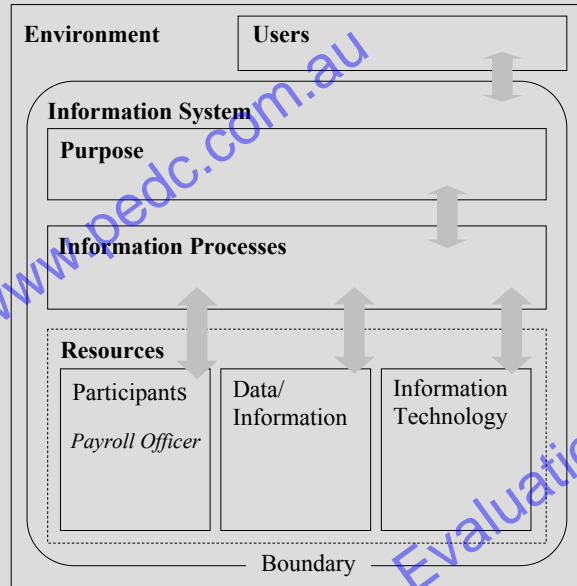
- |                 |                 |                            |
|-----------------|-----------------|----------------------------|
| (a) system      | (c) environment | (e) information technology |
| (b) information | (d) purpose     | (f) information processes  |

12. Describe three factors that should be considered when assessing the quality of data.

13. Describe, at least five, strategies you would hope your bank uses to ensure the privacy and security of your personal information and money.

14. Copy and complete the system diagram at right for the scenario that follows. For example: The payroll officer is clearly a participant so “Payroll Officer” should be written in the participant section of the diagram.

*A factory employs approximately 50 workers. There is also an attached office where the payroll officer has a computer attached to the company's local area network. Her secretary, in the adjoining office, enters each employee's hours worked into the payroll system each day. On Thursday mornings the payroll officer calculates the gross pay, tax and net pay for each employee. She then generates pay slips for each employee together with a summary page for the factory manager. The factory manager must sign the bottom of the summary before the transfer of any money is permitted. Given that the summary sheet is approved the payroll officer then checks for sufficient funds in the company's accounts, electronically transfers each employee's pay into their individual accounts and generates a cheque for the taxation office. The secretary then distributes the pay slips and posts the tax cheque to the taxation office.*



15. Consider the following:

- The gas company reads each of their customer's meters every 3 months.
  - These meter readings are used to calculate total consumption for the period and hence to generate accounts.
  - In about 10% of cases it is not possible to read the customer's meter. When this occurs a notice is sent to the customer requesting them to do a "self read" of the meter. If no response is received within 14 days then an estimate of consumption is made based on the previous year's consumption.
  - Sometimes a problem is revealed as a consequence of the meter reading. These problems are referred to the troubleshooting team for further investigation. Some examples of problems include:
    - ⇒ The reading is identical to the previous one, seemingly indicating there has been no consumption.
    - ⇒ The reading indicates consumption is radically different to previous years.
    - ⇒ The reading is excessively high.
- (a) Describe the data used by this system and the information generated by the system.
- (b) List the different groups of participants within this information system. Describe the tasks performed by each of these groups.
- (c) Each team of meter readers is allocated particular suburbs and towns. Their performance is monitored by head office in terms of total meters read and percentage of successfully read meters. Suggest possible problems that could emerge if performance is measured solely on these statistics.