KEY TERMS AND CONCEPTS

Understanding the problem

Problem	Existing system	System requirements	User needs	Analysing
Gantt chart	Data flow diagrams	System flow charts	Funding	Communication management plan (project plan)
Interview	Survey	Requirement report	Task scheduling	Journal and diary

Making decisions about solutions

Budget feasibility	Technical feasibility	Schedule feasibility	Operational feasibility	Requirements/ feasibility/ analysis report
Constraints	Analysis	Design tools	Organisational charts	Gantt chart
Data flow diagrams (DFD)	System flow chart	Design specification	New techniques	System development cycle

Designing solutions

techniques development cycle

Designing solutions

Context diagrams	Diagrammatic view of solutions	Gantt chart	Data flow diagrams (DFD)	System flow charts
Technical specifications	Documentation	Test data (beta test)	Evaluation	Future maintenance
Top-down design	System design	Software package	Custom software	Design report
User interface	Design tools	Prototypes	Programmers	Participants concerns/needs

Implementing solutions

Implementation	Conversion	Parallel conversion	Direct conversion	Pilot conversion
Phased conversion	Training	Testing	Training specialists	Computer operators

Testing, evaluating and maintaining solutions

Testing the solution	Evaluating the solution	Maintaining the solution	Performance measures	Comparison with original stated requirements

Social and ethical issues related to solutions

Crime	Copyright	Equity	Power and control	OH&S (Occupational Health and Safety)
Ergonomics	Repetitive strain injury (RSI)	Carpel tunnel syndrome (CTS)	Tenosynovitis	Deskilling
Machine-centred systems	Human-centred systems	Changing nature of work	Changing relationships between participants	Safe working environment
Job routine	Multi-skilling	Telecommuting	Security	Privacy

The System Development Cycle/Planning Design and Implementation

The planning, design and implementation of a new information system usually involves collaboration between a systems analyst and the management and users of a company. Each of the following steps in this process involves a set of typical activities and the analyst works methodically through them. This process is known as the **system development cycle** and includes:

- Understanding the problem
- Making decisions about solutions
- Designing solutions
- Implementing solutions
- Testing, evaluating and maintaining solutions.

3.1 UNDERSTANDING THE PROBLEM

Understanding the Problem

Understanding the 'problem' is often easier to comprehend if it is rephrased 'understanding the requirements' for a new system/program/technological change of any kind. The 'problem' is that an individual or company is unable to achieve the outcomes they want to achieve with the present set of hardware, software, personnel, data and input and output mechanisms.

Some reasons for wanting to change an information (computer) system may include:

- Release of new software requiring updated hardware
- Release of new hardware techniques
- The need to remain competitive in a changing market environment
- New management
- Expansion of company.

expansion of company.

In establishing the requirements of the new system the analyst or project leader will consider the following:

- Who are the participants? Who are the people involved with the information processing by interacting with the information system at any level, from data entry to system management?

- What data (input) and information (output) is involved in the system?
- What hardware and software is required in the system?
- What processes are completed on the data to transform it into information within the system?

Approaches to Identifying Problems with Existing Systems

Approaches to Identifying Problems with Existing Systems

Before a new solution is designed it is importa
that the existing system (if any) is thoroughly
examined or analysed. The analyst analyses the
existing system to find out **how it works**, what it
does and **who uses it**. He or she will then be able
to establish why the existing system does not suit
the needs of the company at the present time. It
may be that a quick fix to the existing system is
possible or alternatively a whole new system may
be required. The **preliminary**

be required. The **preliminary investigation** considers the needs and concerns of all participants. Information about the existing system is collected from participants using surveys, questionnaires, observation and so on.

The table on the next page shows a variety of ways that information about the existing system can be collected and the advantages and disadvantages of each method.

Data collection technique	Features	Advantages	Disadvantages
Interview For example, an analyst interviews company management to find out the requirements of a new computer system.	• Specific questions about a person's feelings, opinions, ideas and knowledge. • Questions can be open ended allowing for a free response or closed for a specific type of response. • Usually conducted face-to-face, or on the telephone.	• Directed questions can vary with interviewee. • Allows for further questions following certain types of answers. • Data is immediate. • Body language or voice intonation data can be gained.	• Time consuming as is one-on-one. • Personality differences may interfere with perceived answers. • Training of interviewers needed. • Questions may vary. • Possible smaller sample size.
Questionnaires/surveys	• Specific		

	telephone.		
Questionnaires/surveys For example, users complete written questions about their computer use habits and opinions about the system they use.	• Specific questions about a person's feelings, opinions, ideas and knowledge. • Mostly closed questions with minimal free response questions, eg. T or F, multiple choice.	• Allows for large sample size. • Less expensive to deliver. • Standarised questions with set selection of answers for easy analysis. • Anonymity is more likely. • Data may or may not be immediate.	• Mailed responses have low response rates. • Wording of question set may be restrictive, resulting in non-comprehensive answers. • Time consuming to complete.
Observation For example, computer users are observed to determine their reactions to new software.	• Gathering data about people's behaviours, reactions, occurrences of specific activities.	• Data is immediate. • Body language or voice intonation data can be gained. • Provides a record of actual happenings.	• Time consuming. • Due to lack of structure, limited data is collected.

An important consideration for data collection is to ensure that it is **reliable** (accurate), free from **bias** (data inclusion, affected by the collector's prejudice) and **valid** (truly representative of the population being surveyed). Collected data is usually analysed for common trends and other pointers that provide the analyst with accurate insights into the true needs of the company in relation to a new information system.

Diagrammatically Representing the Existing System

An important part of evaluating the requirements of a company for a new system is the need to examine the existing system. This gives the analyst insights into what the present system can and cannot do and what needs to be changed in order for the desired outcomes to be achieved. The analyst uses a

number of graphical tools to demonstrate how the existing system operates. These include the:

- Context diagram
- Data flow diagram (DFD)
- System flow chart.

The context diagram is a small 'version' of the data flow diagram showing a single process, with its input and output. As the name implies the diagram is designed to put each process into 'context' as it contributes to the whole system.

Three of the DFD symbols are used in a context

Three of the DFD symbols are used in a context diagram:

- The square (external entity) for input and output
- The circle for process
- The arrow for direction of data flow.

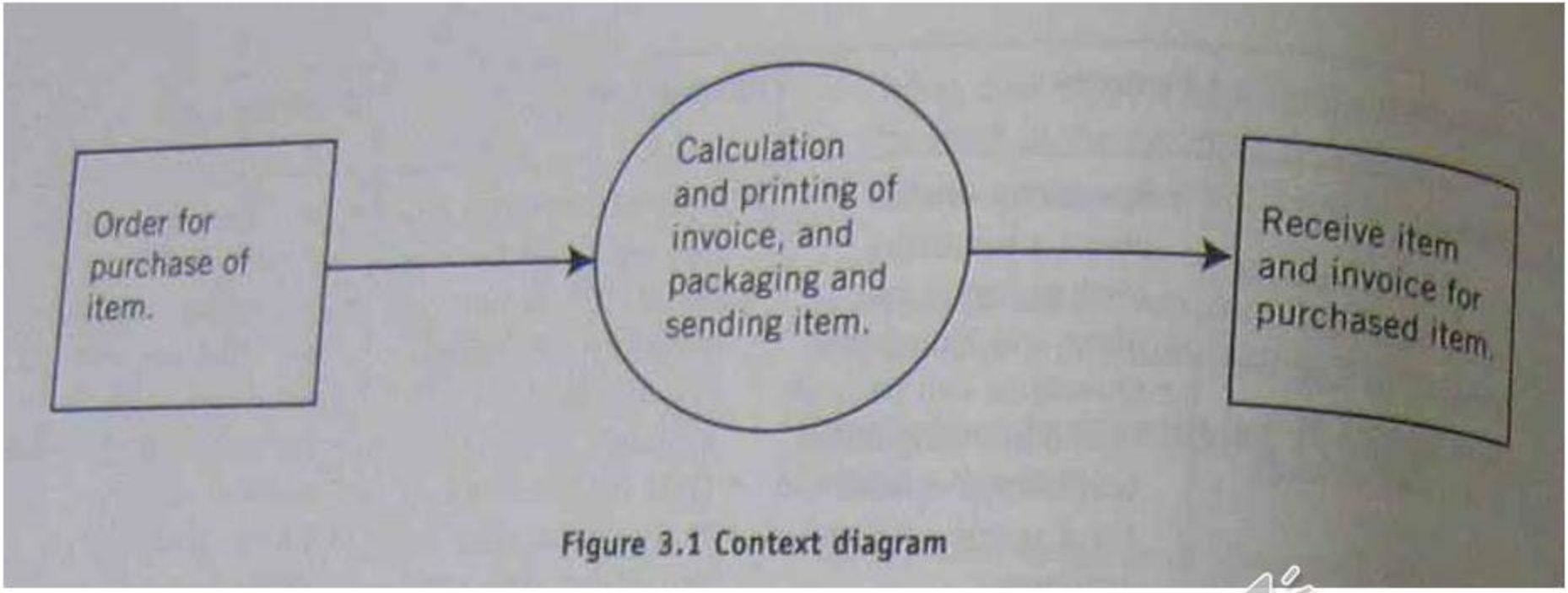


Figure 3.1 Context diagram

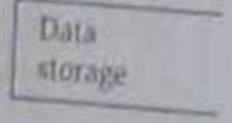
Figure 3.1 context diagram

Figure 3.1 above illustrates a context diagram for purchasing a book, including the customer placing the order, the book shop printing the invoice and packaging the book and finally, the customer receiving the book and invoice.

The **data flow diagram** (see table below) is a diagrammatic method of representing a system by showing the logical flow of data through the system by including a series of processes, inputs and outputs as well as storage.

The symbols used in a data flow diagram are:

- A square (external entity) for input and output
- A circle for process
- An arrow for direction of data flow
- A rectangle opened at the right-hand side for data storage.

Symbol	Function
Square 	The square or external entity represents the origin or destination of data/information. This can be a person or organisation that sends data or the destination of processed information.
Circle 	A circle represents the processes or actions that change data into information. This can include searching a database, completing a calculation or printing out the results of a calculation.
Arrow 	The arrow shows the direction of data flow between processes, external entities and data storage.
Open ended rectangle 	An open rectangle shows where the data is stored. This could be a magnetic disk, storage tape, CD or filing cabinet.

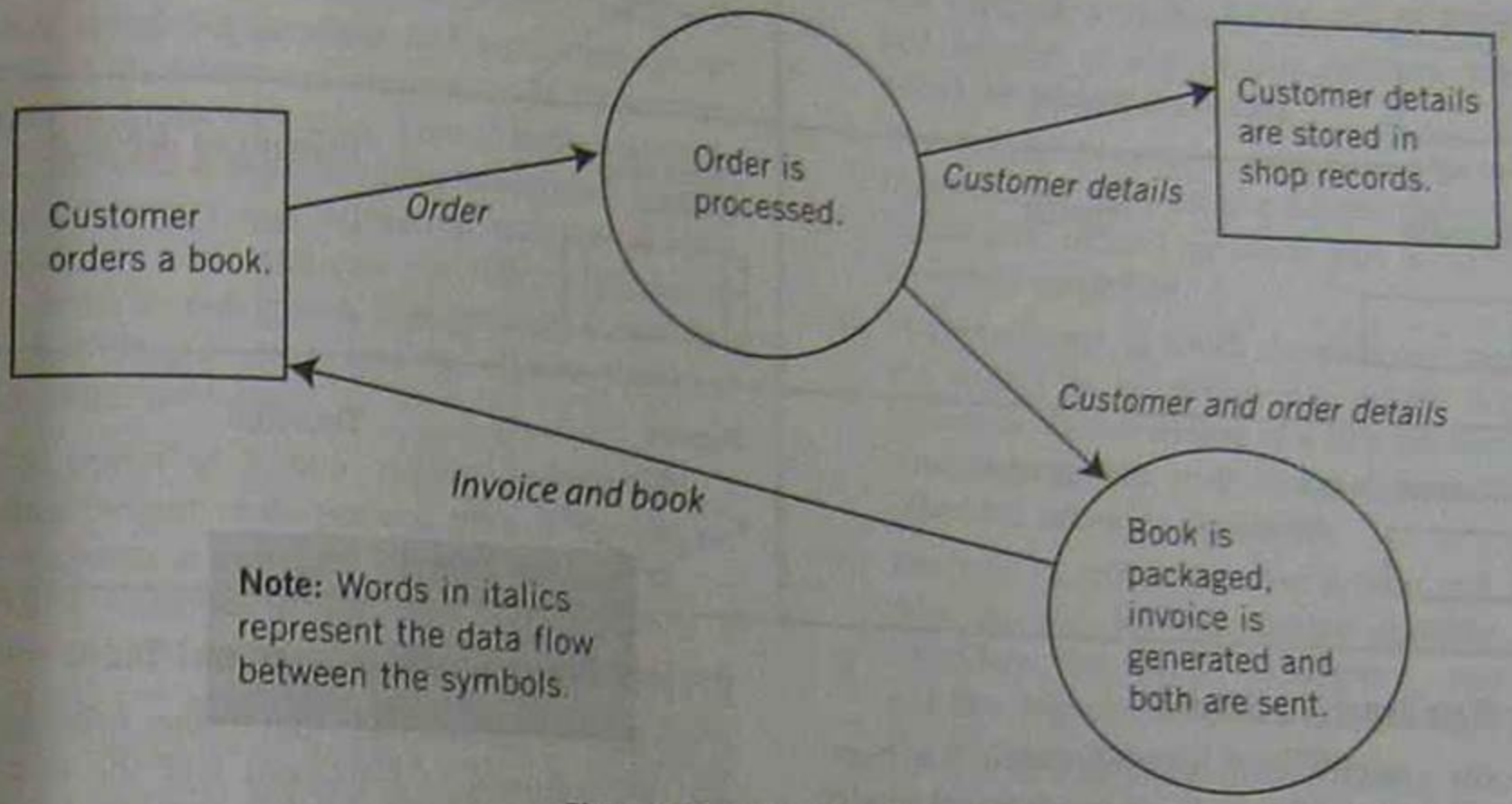
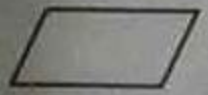
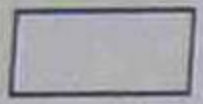
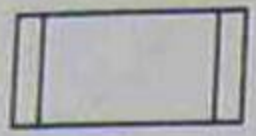
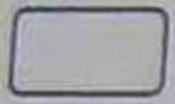


Figure 3.2 A data flow diagram

The **system flow chart** is a graphical method that represents both the flow of data and the logic of the system, including the hardware and software and manual operations involved.

System flow chart symbols and their functions

Symbol	Function	Symbol	Function
Parrallelogram 	Input/ouput	*Upside down trapezium* 	Manual operation
Rectangle with one curved side 	Paper document	*Whistle shape* 	Magnetic tape
Oval with triangular end 	On-line display	*Cylinder* 	Direct access
Rectangle with one sloping side 	On-line input	*Arrows with and without a head* 	Flowlines

Rectangle with one corner cut  Punched card	*Zig Zag*  Telecommunications link
Rectangle  Process	*Double lined rectangle*  Predefined decision
Rounded rectangle  Terminator	*Diamond*  Decision

User Requirement Report

Once the analysis of the existing system has been completed, the analyst writes a **requirement report** which summarises the needs of the company based on the findings from the surveys and so on. The requirement report typically includes:

- A statement of the user requirements of the new system
- An explanation of how the new system will help the organisation achieve stated aims and objectives
- A brief overview of the proposed new system in terms of input, output, processing hardware and software.

The requirement report is used to develop feasible solutions to the company's problem.

One of the most important parts of the requirement report is the **recommendation** by the analyst whether to leave the system as is, improve the system or develop a new system.

Project Plans and Management Tools

If the analyst recommends that further investigation and development is warranted and the company accepts the recommendation the analyst will develop a **project plan**.

The project plan is a method of organising 'who, what, when, where and how' a solution will be developed. Several standard tools are used to represent important information during this stage of the cycle:

- Gantt charts
- Journals and diaries
- Budget plan
- Communication management plan.

The **Gantt chart** is diagram showing the **time frame** for the **scheduling of tasks** during the systems development cycle (project). It depicts the list of tasks, proposed timing of tasks and the proposed sequence of tasks. The analyst or project leader can use a Gantt chart to schedule other tasks within the cycle.

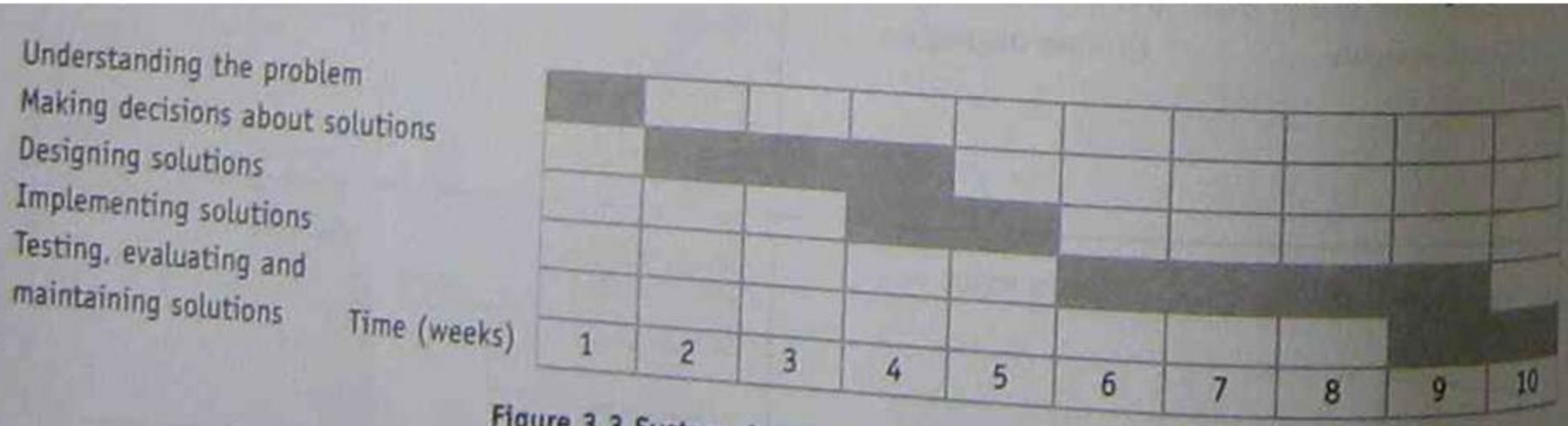


Figure 3.3 System development cycle task

Journal and diary entries are an essential part of the formal documentation of a project. These will include scheduled meetings and significant events as well as decisions and summaries of discussions leading to those decisions. This documentation is best completed using management software such as electronic diaries and calendars, word processors spreadsheets and databases for journal entries as they can be stored, edited, manipulated, sorted and searched. Progress can also be shown by using presentation software.

At the outset of a new system development, a **funding/budget management plan** is developed. This includes a cost and benefits analysis of the proposed changes in the new system. This is important because it needs to be determined if costs will or will not be offset by benefits. There are many different categories of benefits that may be derived such as speeding up the system and improving efficiency resulting from reduction of redundancy or errors in input. Probably the most desired benefit is improved cash flow from increased production, however, benefits can also include greater efficiency,

ease of work load for staff and other social and environmental gains. The analyst selects software that will make it easy to give an overview of budget considerations. The costs of a system involve more than just dollars. They may include time, environment, social changes and so on.

Throughout the development of a new system it is important that communication between key personnel is maintained. This requires a formal plan of scheduled meetings and planned activities such as presentations and discussions at key points in the project. A **communication management plan** is established to ensure that adequate communication is maintained throughout the project.

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- The company's budget in relation to the costs and benefits of a particular solution. This is called the **budget feasibility**.
- The availability or even existence of particular hardware and software to complete the required information technology tasks. This is called the **technical feasibility**.

Analysis

The project leader or analyst guides the company management through the selection process using the above 'constraints' as selection criteria. A solution is chosen and then further analysis is completed to examine how the solution will operate within the company. **Gantt charts** are used to show the proposed lists of tasks, time frames and sequences of activities within the proposed solution. **Organisational charts** can be used to show a top-down structure of the proposed system's personnel.