Topic 1: Project Work

Project work in the HSC course is intended to give students an opportunity to plan, design and implement an information system that has a purpose. The chosen information system should be based on one of -

• a database information system
• a communication system
• an automated manufacturing system, or
• a multimedia system.

Note: Students should be able to identify the purpose of each of the above information systems and work systems they support prior to commencing the project.

Outcomes
A student:
H1.1 applies an understanding of the nature and function of information technologies to a specific practical situation
H1.2 explains and justifies the way in which information systems relate to information processes in a specific context
H2.1 analyses and describes a system in terms of the information processes involved
H2.2 develops solutions for an identified need which address all of the information processes
H3.1 evaluates the effect of information systems on the individual, society and the environment
H3.2 demonstrates ethical practice in the use of information systems, technologies and processes
H4.1 proposes ways in which information systems will meet emerging needs
H5.1 justifies the selection and use of appropriate resources and tools to effectively develop and manage projects
H5.2 assess the ethical implications of selecting and using specific resources and tools
H6.1 analyses situations, identifies a need and develops solutions
H6.2 selects and applies a methodical approach to planning, designing or implementing a solution
H7.1 implements effective management techniques
H7.2 uses methods to thoroughly document the development of individual and/or group projects.

Project Development
The construction of the information system will follow the stages detailed in the Preliminary topic Planning, Design and Implementation.

Projects
Projects have a definite beginning and end and should include clearly defined goals costs and schedules. Following are the general steps involved in carrying out an Information, Communication and Technology (ICT) project:
1. Project selection and approval
2. Project requirements
3. Project scheduling
4. System development cycle - Understanding the problem to be solved
   - Making decisions

Westfields Sports        IPT - HSC                 J.Smith  2004   Page 1
- Designing solutions
- Implementing
- Testing, evaluating and maintaining

Note: ICT projects are often **not successful**. They fail to achieve their goals, run over budget or time, or involve technology that is superseded before the project is ever implemented.

**Project management**
The purpose of project management is to ensure that the project is completed on time, within budget and to the satisfaction of the participants and clients involved. To achieve this the project leader needs to carefully **plan, schedule** and **control** all the activities that take place within the project.

**Project Management Skills**

- **Planning**
  - States what should be done
  - Estimates how long it will take
  - Estimates what it will cost
- **Leading**
  - Adapts to changes and deals with setbacks
  - Manages and supports the project team to increase performance maximise outcomes
- **Controlling**
  - Monitors Progress Reports and Documented Deliverables
  - Compares Plans with Actuals and sets priorities.
- **Organising**
  - Resources and staffs the Systems Project Team
  - Brings together users, managers, and team members

**Exercise 1**

1. Discuss the importance of project management.
2. Why is planning, scheduling and controlling the project so important to the success of the project?

To be completed by - ............................................................

**System Development Cycle**
Within the Project Work topic particular emphasis will be given to understanding and applying the activities that take place within each stage of the system development cycle.
By following the System Development Cycle it is hoped that the project management aims of delivering the new system within an acceptable timeframe, on budget and meeting the purpose and needs of the users will be achieved.

Before proceeding to the section on project planning complete the system development summary (Ex 2) below.

Note: The summary should be completed without reference to texts or other resources as it is designed to assess your current understanding of the System Development Cycle.
**Exercise 2**
Complete the table -

<table>
<thead>
<tr>
<th>Stage</th>
<th>Summary of the System Development Cycle activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td></td>
</tr>
</tbody>
</table>

To be completed by - ..........................................................

**Project Plan**
A project plan is an important tool used to organise and schedule the project. Students should identify specific activities and determine what, by whom, how and when the activity is to be accomplished. Planning can be broken into three broad categories:
- The project **Goals** are the desired results of the successful project.
- **Deliverables** are the tangible items or end products of a task or stage.
- **Scheduling** should include the sequence and timing of major tasks and identify staff assigned to complete the task(s).
Exercise 3
1. Read the scenario which follows for the Midtown Art Gallery.
2. Develop a project plan for the Midtown Art Gallery. The project plan should include -

- An overview of the organisation and project (Management Summary)
  - Overview of the organisation including an organisational chart, etc.
  - Project outline including a description of the problem or opportunity
- The scope of the project (What the project includes and constraints)
- The objectives and outcomes of the project (What the project hopes to achieve)
  - Project goals and deliverables
- How the project is to be achieved (Technical and quality control plan)
  - Specifications including purpose of the new information system, participants, data and information technology (Diagram)
- Scheduling the project activities and resources including funding, staffing and materials (Gantt chart)
  - Sequence and timing of major tasks
  - Allocation of staff to task(s).

To be completed by - .........................................................

Midtown Art Gallery Information System
A Case history is a written description of a real situation faced by an individual or group outlining a given problem or opportunity. It gives the reader a snapshot of the needs of the individual or group and some background on the business, organisation or general environment. You as the reader assume the role of analyst and must try to answer, “What are the best alternatives for this given situation” and offer justification for your answer as you present your proposed solution.

The Midtown Art Gallery is a large art gallery located in a major city centre. The gallery collects a variety of artwork types including watercolours, sculptures, and pastels. The pieces range in period from Modern to Renaissance, including several unique and quite expensive pieces. The art gallery displays its works every day to the public and regularly holds auctions.

As interest in artwork exhibits has grown in recent years, more "untrained" employees have been hired to work as customer service agents in the gallery. Unlike the seasoned employees, they do not know all of the information about the current exhibit pieces and often cannot answer questions effectively. This problem has cost the gallery sales since many collectors do not want to work with a novice who is not familiar with the desired artwork.

The management of Midtown Art Gallery wants to begin tracking information about its artworks on a personal computer rather than in the current manual form in the hope that this change will allow all employees to easily obtain information about the individual or collective pieces. For example, all of the gallery employees need the ability to enter the name of an artwork and quickly determine information about it, such as period or type. As a starting point, management suggests they need such information as artist name, artwork name, type, period, age, value, cost, and date purchased.

In addition to the above problem, management suspects that some of the artworks are not priced properly, and fear that many of the older pieces are underpriced. However, they have no way of determining such information without hiring someone to manually piece and analyse the information from disparate sources. Also, as growing interest in Impressionist pieces continues, they need to know how many such pieces they have, the value and cost of these pieces, and evaluate whether they need to purchase additional ones. In general, they need summarised information regarding the value and cost of all artworks categorised by artwork type.

Lately, customers have also requested information about the artists themselves. The gallery needs to provide an easy way to display the artist name, age, nationality, speciality, and years of experience.
People in Information Systems

The project manager is responsible for all aspects of the project and reports to the sponsor (usually top management) and the client. The project team usually consists of a system analyst, programmer(s), information technology (IT) specialists and other experts in a range of disciplines relevant to the project.

### Exercise 4

1. Collect several (2 or 3) job adds (newspaper or net job guide) for workers such as project leader, project manager, system analyst, programmer. Stick these onto a page to hand in.
2. For one of these positions (in your job add) summarise the academic qualifications for an applicant and print this on the page with the ads.

To be handed in by - ..............................................................

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**Roles of information system professionals in building and maintaining information systems.**

- In small projects people will often assume numerous roles.
- Large system development projects involve many roles such as the following.

1. **Project managers** manage the people doing the work to make sure that project goals are accomplished. Among other things, project managers develop schedules, monitor work for completeness and quality, and help in resolving conflicts and questions that arise. Project managers in IS departments typically started as programmers or systems analysts and showed they could take responsibility for larger parts of projects.

2. **Application programmers** convert a general understanding or written description of a business problem into a set of programs that accomplish the required computer processing. Their jobs include designing the programs and database, coding and testing the programs, and producing the related program documentation.

3. **Systems analysts** perform the analysis to decide how a new or updated system can help solve a business problem or exploit a business opportunity. They communicate part of the results to programmers who write the programs.

4. **Programmer-analysts** play the role of both programmer and analyst in situations where it is more effective to combine these roles.

5. **Technical writers** produce user documentation and training material.

6. **Computer operators** make sure that a computer is running, that tapes and removable disks are loaded and unloaded, and that jobs such as backups and database reconfigurations are performed on time.

7. **Database administrators** control the definition of all items in a shared database and monitor the performance of the database.

8. **System managers** manage computer installations and make sure that the hardware is configured properly and that the operators do their jobs.

9. **Systems programmers** write programs related to the operating system and internal operation of the computer system. This is a more specialised job than programmer, which generally refers to someone who produces programs related to business applications.
10. **User support staff** help the users use the system by providing training, answering questions, and collecting change requests.

Source - [Information Systems 3rd Edition Steven Alter 1999 Addison-Wesley]

**Communication Skills**

Project participants need to be able to work effectively as part of a team and good communication skills are very important when dealing with a wide range of people.

These communication skills include:

**Active listening** involves restating, or summarising the comments of others, thus providing opportunities for clarification and elaboration. Active listening assists in minimising misunderstandings between participants and clients.

**Conflict resolution** is concerned with addressing tensions caused when individuals have firmly held ideas about problems and their solutions. It involves listening and acknowledging the views of others. If left unchecked conflict can ruin a project. In extreme cases, an individual with a strongly held view could sabotage the project, cost large amounts of time and this has impacts on the project budget as well as the work environment.

**Negotiation** is about achieving balanced or compromised outcomes, usually by listening to different views and finding some sort of middle ground that all parties can agree on a solution.

**Interview techniques** involve careful planning and preparation and the use of strategies by the interviewer to obtain quality information from the interviewee. This may include notifying the interviewee in advance, having a clearly defined purpose for the interview, using open-ended questions and active listening, checking on body language and completion of the interview report including any follow up action from the interview.
Team Building
Team building can be achieved through a sequence of planned activities designed to gather information on the functioning of the group (project team) and to initiate changes designed to improve teamwork and increase group effectiveness. Initial strategies could include: a meeting of team members to get to know each other, emphasis on working as a team and obtaining input from team members amount effective team dynamics, suggestions and past experiences.

Every Information System involves people - both as participants and as users.

Exercise 5
Describe the following social and ethical issues and how they relate to the design and use of a new information system.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing nature of work.</td>
<td></td>
</tr>
<tr>
<td>OH&amp;S, health and safety including ergonomics.</td>
<td></td>
</tr>
<tr>
<td>Security of data including access, passwords, control, firewalls and encryption.</td>
<td></td>
</tr>
<tr>
<td>Appropriate use of data</td>
<td></td>
</tr>
<tr>
<td>Accuracy of data and the need for backups and the impact of viruses</td>
<td></td>
</tr>
<tr>
<td>Privacy of the individual and proprietary information</td>
<td></td>
</tr>
<tr>
<td>Copyright</td>
<td></td>
</tr>
<tr>
<td>Computer Crime</td>
<td></td>
</tr>
</tbody>
</table>
Work Environment
When designing a new system it is not only important, it is now legally and socially responsible to consider health and safety issues.
Ergonomics is the relationship between people and their work environment, and often refers to the designing or arranging of workplaces, products and systems. In the past, incorrect use of computers has, for example, caused health problems including - back aches, eye strain, headaches, fatigue, occupational overuse syndrome (OOS), etc. and as a result, a range of standards have been developed including -
  • furniture - needs to be adjustable (both desk and chair) with padded chair and feet to be flat on the floor.
  • information technology - the monitor should be an arm’s length away from the user, and slightly lower than the eyes of the user, with forearms level, with the user relaxed and comfortable.
  • environmental factors – the lighting should be uniform and not reflecting from the screen, temperature around 20-23 degrees, humidity around 50%, and noise levels less than 55 decibels.

Nature of Work
What people now do in the workplace is often quite different from their previous activities – even to taking rest breaks or doing exercises to help prevent OOS. Stress of all kinds needs to be avoided including worries about performance and job security. New systems have an impact on work in such ways as -
  • use of skills - retraining, multi-skilling or even deskilling may occur
  • meaningful work - workers may not understand the importance of the type of work they do
  • nature of the workplace - part-time and contract labour is increasing and most workers will change jobs continually throughout their working lives
  • social relationships - generally alter with new systems, often to less social interaction with others

Systems and Ethics
Ethics may be defined as a set of beliefs about what is right and wrong. Some of the issues people are concerned about include - environmental damage, equity and access, invasion of privacy, computer crime, freedom of information and copyright.

Exercise 6
1. Create an occupational health and safety checklist for evaluating the health safety of an IT work environment.
2. Evaluate the computer room you have IPT in for OH&S.

To be completed by - ..............................................
Understanding the problem

Students learn to:
• apply the steps in understanding the problem
• identify, communicate with and involve participants of the current system
• create a prototype from applications packages that provide:
  screen generators
  report generators
• use a prototype to clarify participants’ understanding of the problem

Understanding the problem is the first stage in the system development cycle. The exact nature of the problem must be determined and whether it can be solved by an information system. Understanding the problem often involves a preliminary investigation and completing a requirements report.

Preliminary Investigation

A preliminary investigation, or requirements definition, determines whether a quick fix of the existing system will solve the problem or a new system is necessary. Each of the information processes is examined, and any deficiencies in the existing system are recorded.

The preliminary investigation should take into account the needs and concerns of all the participants. Participants’ views are gathered using different data collection methods, such as interviews and surveys.

The requirements report is a statement about the needs for a new system. It outlines the aims and objectives of the new system and how it will help the organisation. Based on the data collected from the participants. Provides an overview of the new system in terms of data/information, information processes and IT. Used to develop potential solutions to the problem.

Exercise 7

Create a problem definitions and requirements report for the Midtown Art Gallery (see pages 4-5), containing details including - the type of data/information, information processes required to be performed, how urgent the situation is, any constraints applying to the situation, etc.

To be completed by - .........................................................

Prototyping

What is a Prototype?

A prototype is a working model of an information system, which includes possible versions of the user interface, input/output, database and processes.
Prototyping does not replace any phase in the traditional system development cycle, but is working model built in order to better understand the requirements of the new system and help clarify the participants’ understanding of the problem/solution. It is easier for the participant to see and understand the system when he or she has some working version of it. The end user probably does not relate well to traditional system analysis and documentation tools such as flow charts, hierarchy charts, data flow diagrams, and entity-relationship diagrams.

**Prototyping tools:**
The rapid development and testing of working models, in most cases is carried out using CASE tools, application generators, report generators, screen generators and fourth-generation languages (4GL’s). The CASE tool is used to create a series of diagrams and definitions, which is used to automatically generate a data dictionary. The application generator converts the logical model into a 4GL program. The screen generator is used interactively to produce a custom designed user interface and the report generator is used to design formatted reports. The data dictionary from the case tool organises and documents all data elements and interacts with the application, screen, and report generators to produce a system prototype.

**Data Dictionary:** a comprehensive description of each field in a database. This commonly includes - field name, field width as number of characters, data type, description of the purpose of each field.

**Exercise 8**
Create a data dictionary of Artworks for the Midtown Art Gallery

To be completed by - ..............................................................

**Exercise 9**
1. Create a prototype for the new information system (Midtown Art Gallery). Create your prototype using an application such as FileMaker Pro that provides - Screen generators - Report generators

2. Create 3 records

To be completed by - ..............................................................
The Prototyping Process
Prototyping can be used for both large and small applications. Typically, large systems still require using the traditional systems development approach, but parts of such systems can frequently be prototyped. Prototyping combines steps of the traditional systems development cycle, and allows the rapid development and testing of a working model. The model is then repeatedly refined until it is acceptable to the participants.

Limitations of prototypes
A prototype is not a fully functioning system but a working model and as such usually lacks security requirements, exception and error handling and other required functions of a fully working system. Developers can discard the prototype having served its purpose, discuss clarifying the needs of the system, or further develop the prototype into a fully working information system.

Exercise 10
1. Discuss the advantages and disadvantages prototyping.
2. Why is prototyping potentially valuable as aid in designing the end-user interface? Justify your answer and give an example.

To be completed by - ........................................................

Developing The Prototype
A prototype should be a working model of an information system. The prototype will be used to help understand and define the requirements of the system. The task list (list of things the information system has to perform) and prototype will help in defining the problem and determining how the information system might be used to solve the problems in a real situation. The prototype can be used to test possible information system features and should contain data entry screens, a small simple database containing queries and formulas that provide fundamental results.

Note: The prototype is built to help participants define what the proposed information system should do, and can either be developed into a complete system or discarded when the system requirements are determined.

There are three main advantages in using a prototype:
• The requirements of the system more accurately reflect the needs of the participants.
• Participants have the opportunity to be involved earlier and more directly in the development of the new system.
• The new system is easier to create from a prototype.
However, using a prototype has some disadvantages:

- The greater involvement of the participants could impact on their work with the old system.
- The repetitive process of the prototype can be frustrating if the succeeding versions do not provide a better solution.

Sometimes management do not fund the prototype development through to completion, which can produce software that is difficult to maintain, unreliable or inadequate.

**Task List**

In order to solve the Art Gallery problem you will need to identify each of the major tasks/functions that the midtown art gallery information system is to perform. You will also need to recognise the data/structures that are used in the system. Creating a task list involves identifying the major tasks and ordering them into the sequence that they must be performed in. It is important to identify prerequisite work tasks and order them accordingly.

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**Exercise 11**

Complete the task list for the Midtown Art Gallery:

1. Customer service agents need to be able to enter the name of the artwork and quickly determine the information about it.
2. Customers want to be able to view information about the artists.

To be completed by - .........................................................

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Organising the data into categories of subjects makes it easier to the map each subject into tables and queries. When using relational database such as MS Access or FileMaker Pro a process known as normalisation is used to design an efficient data store and minimise data redundancy and maintain data accuracy.

**Data categories:**

**ArtWork:**

Artwork Name, Artist LastName, ArtistsFirst Name, Type, Period, Age(Yr), Value, Cost and PurchaseDate
Artist:
Artist LastName, ArtistsFirst Name, Age, Nationality, Speciality, and Years of Experience.

Note - we require a relational database to be able to perform the functions needed.

Schematic diagrams
Schematic diagrams are graphical tools that help define the schema of the data within the information system, and will be used to develop the eventual database.

A common type of schema diagram is the entity-relationship diagram. An entity-relationship diagram (ERD) is a graphical method of identifying the entities and the relationships between them.

Entities, Instances, Attributes, and Relationships
Entities: An entity is a 'thing' or ‘event’ about which data is to be stored. Example entities for a school database system could include students, teachers, classrooms, etc.

Note: ERD entities can often be identified as nouns, and represented using a rectangle that is labelled with the name of the entity in upper-case letters.

Instances: An occurrence of an entity is called an instance. A database table ultimately holds each instance of an entity as records, or rows in a table.

Attributes: Characteristics of entities are termed 'attributes' of an entity. Attributes of a STUDENT may be name, date of birth, address, phone number, year advisor etc.

Key Attribute: Each entity must have a unique identifier, called a key attribute. The key attribute must be unique for the life of the entity and must be original for each instance. Key attributes are shown in ERD by underlining the name of the appropriate attribute.

Note: When an identifier is made up of two or more attributes it is called a composite key.

Relationships: A relationship in an ERD describes the associations between entities and is shown by a diamond with a description of the relationship written in lower case letters in the diamond. The lines connecting the diamond to the related entities are identified as verbs.
Normalisation

Normalisation is essentially the process of dividing a single flat file database with lots of columns and redesigning it as several narrow tables with fewer columns but more rows (relational databases).

A properly normalised design allows you to use storage space efficiently, eliminate redundant data, reduce or eliminate inconsistent data, and ease the data maintenance burden.

**Forms of Normalisation** (Normalisation is divided into several rules called forms)

First Normal Form - No repeating groups.
Second Normal Form - No non-key attributes depend on a portion of the primary key.
Third Normal Form - No attributes depend on other non-key attributes.

Normalisation should be carried out in sequence, as each proceeding form requires that the previous form(s) be met first.

**DATA CONVERSION**

Midtown Art Gallery Data from Manual Card System

<table>
<thead>
<tr>
<th>Artist</th>
<th>Von Grozmann, Elsa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Artwork</td>
<td>Daisies in the mist</td>
</tr>
<tr>
<td>Type of Artwork</td>
<td>Watercolor Painting</td>
</tr>
<tr>
<td>Period</td>
<td>Classic</td>
</tr>
<tr>
<td>Age of the Artwork</td>
<td>5 years</td>
</tr>
<tr>
<td>Value of Artwork</td>
<td>$1,500</td>
</tr>
<tr>
<td>Cost of Artwork</td>
<td>$1,235</td>
</tr>
<tr>
<td>Purchase Date</td>
<td>5/6/1990</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Artist</th>
<th>Johnson, Gayle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Artwork</td>
<td>Monday's Wish</td>
</tr>
<tr>
<td>Type of Artwork</td>
<td>Sculpture</td>
</tr>
<tr>
<td>Period</td>
<td>Modern</td>
</tr>
<tr>
<td>Age of the Artwork</td>
<td>6 years</td>
</tr>
<tr>
<td>Value of Artwork</td>
<td>$9,453</td>
</tr>
<tr>
<td>Cost of Artwork</td>
<td>$7,456</td>
</tr>
<tr>
<td>Purchase Date</td>
<td>5/4/1990</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Artist</th>
<th>Fifetom, Lisa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Artwork</td>
<td>Potiphar's Nose</td>
</tr>
<tr>
<td>Type of Artwork</td>
<td>Sketch</td>
</tr>
<tr>
<td>Period</td>
<td>Abstract</td>
</tr>
<tr>
<td>Age of the Artwork</td>
<td>8 years</td>
</tr>
<tr>
<td>Value of Artwork</td>
<td>$589</td>
</tr>
<tr>
<td>Cost of Artwork</td>
<td>$445</td>
</tr>
<tr>
<td>Purchase Date</td>
<td>8/6/1990</td>
</tr>
</tbody>
</table>
Exercise 12

1. Convert the data from the manual card system by entering the data into your prototype for Artists.

2. Add the new Artworks listed below to the system.

<table>
<thead>
<tr>
<th>Artwork Name</th>
<th>Artist Last Name</th>
<th>Artist First Name</th>
<th>Type</th>
<th>Period</th>
<th>Age</th>
<th>Value</th>
<th>Cost</th>
<th>Purchase Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Late Fall Evening</td>
<td>Roshburg</td>
<td>James</td>
<td>Watercolor</td>
<td>Impressionist</td>
<td>60</td>
<td>$3,564</td>
<td>$2,546</td>
<td>5/4/85</td>
</tr>
<tr>
<td>Water for Tears</td>
<td>Adams</td>
<td>John</td>
<td>Sculpture</td>
<td>Abstract</td>
<td>72</td>
<td>$567</td>
<td>$978</td>
<td>6/15/98</td>
</tr>
<tr>
<td>A Danube Scene</td>
<td>Sitzlar</td>
<td>Heinrich</td>
<td>Pastel</td>
<td>Classic</td>
<td>92</td>
<td>$4,589</td>
<td></td>
<td>$2,458</td>
</tr>
<tr>
<td>Italiano</td>
<td>Alescoro</td>
<td>Vittorio</td>
<td>Oil-based</td>
<td>Renaissance</td>
<td>15</td>
<td>$5,187</td>
<td>$4,879</td>
<td>10/15/90</td>
</tr>
</tbody>
</table>

To be completed by - .................................................................

Making decisions

Students learn to:
• conduct a feasibility study to determine if a proposed solution is feasible
• report on the benefits, costs and risks of projects that are to proceed
• develop a project plan

The making decisions stage involves making decisions using the data gathered in the preliminary investigation. The first task is to develop one or more potential solutions to the problem. The scope of the problem places constraints on the new system. A constraint is a factor that affects the system and prevents it from achieving the desired objectives. If the potential solutions seem appropriate, a feasibility study is carried out.

• Economic feasibility – compares the costs of developing the new system with the expected benefits.
• Technical feasibility – determines the IT requirements of the new system and the technical demands that will be placed on the new system.
• Schedule feasibility – determines whether time is available to implement the new system.
• Organisational feasibility – determines whether the new system will fit into the organisation and meet the current goals and objectives. Determines whether the new system will have enough support from participants to be successfully implemented and whether participants can operate the system.
Exercise 13

1. Describe what a constraint is
2. Identify and describe possible constraints that could be encountered with the development of the Midtown Art Gallery.

To be completed by - ..................................................

Feasibility study

A feasibility study is a short report that analyses potential solutions in terms of the known constraints and makes a recommendation. It briefly examines the available options, estimates costs and identifies any constraints to be considered. It should identify the nature of any problems, indicating the size or magnitude of the problem and whether it appears to be solvable. It is an extension of the preliminary investigation and is divided into different sections.

Section | Content
--- | ---
Title page | Project name, report title, authors, date
Contents | A list of report sections and page numbers
Problem definition | Exact nature of the problem
Requirements report | Aims and objectives of the new system
Summary of investigation of new system | Overview of the existing system; benefits, cost and constraints of the new system

Alternative solutions | Expanded details of each proposed new system
Recommendations | Recommended course of action; justify the decision
Project plan | Schedule if the recommendation is to proceed
Appendix | Supplementary material such as surveys

The initial sections of the feasibility study -
(i) state the nature of the problem, list the aims and objectives of the new system and give an overview of the existing system.
(ii) identify problems or requirements that are not satisfied by the existing system and outline the constraints on the development of a new system.
(iii) restate aims and objectives of the new system more precisely that the requirements report.

The middle section of the feasibility study analyses the data collected in the preliminary investigation. Descriptions are written in terms of how well they meet the aims and objectives of the new system.

The result of the feasibility study is the recommendation. There are three recommendation options (no change, develop a new system, or investigate other options), and it often examines the effect of adopting each of these recommendations.

Exercise 14

1. Discuss alternative solutions for the Midtown Art Gallery and make a recommendation.
2. Argue and justify the criteria and reasoning behind your recommendation.

To be completed by - ..............................................
Analysis report
Requires more data to be collected. It is necessary to understand the flow of data through the system and how the data is processed within the system. When the detailed analysis is completed, an analysis report is written. The analysis report contains design specifications for the next stage. These give general hardware configuration and design for input and output. The analysis report is the basis for a more detailed project plan.

Designing solutions
Students learn to:
• develop a solution to a problem from a prototype
• use a guided process in an application to create all or part of a solution
• use system design tools to:
  – better understand the system
  – assist in explaining the operation of the new system
  – document the new system

Designing a solution is the transformation of the specifications into appropriate hardware, software and information processes. It involves purchasing hardware, writing or purchasing software, and specifying information processes to make the system operational.

Systems analyst and programmers often use a top-down approach to designing a solution. This divides a large, complicated problem into a series of smaller, easier to solve problems.

Design tools
Design tools assist in the development of a new system and help to describe the information processes and rules within the system. Design tools include context diagrams, data flow diagrams, system flowcharts, decision trees, decision tables and data dictionaries.

Context diagrams
A context diagram is a graphical method of representing a system that uses only a single process together with inputs and outputs. See page

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="circle.png" alt="Circle" /></td>
<td>Single process: a circle used to represent the entire system</td>
</tr>
<tr>
<td><img src="arrow.png" alt="Arrow" /></td>
<td>Data flow: an arrow is used to represent the flow of data between the process and the external entity</td>
</tr>
<tr>
<td><img src="rectangle.png" alt="Rectangle" /></td>
<td>External entity: a square or rectangle represents any person or organisation that sends data to or receive data from the system</td>
</tr>
</tbody>
</table>
Example -

```
Example -

[Diagram showing relationships between Borrowers, Library staff, Booksellers, and Accounts dept.]
```

**Exercise 15**
In the space below draw and label a context diagram for the Midtown Art Gallery

[Blank space for drawing]

**Data flow diagrams**

A data flow diagram is a graphical method of representing a system that uses a number of processes together with inputs, outputs and storage.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Circle]</td>
<td>Process: a circle is used to represent the processes or actions that transform inputs to outputs</td>
</tr>
<tr>
<td>![Arrow]</td>
<td>Data flow: an arrow is used to represent the flow of data between the process, external entity and data store</td>
</tr>
<tr>
<td>![Box]</td>
<td>Data store: location where data is stored</td>
</tr>
<tr>
<td>![Box]</td>
<td>External entity: person or organisation that sends data to or receives data from the system</td>
</tr>
</tbody>
</table>
Exercise 16

In the space below draw and label a data flow diagram for the Midtown Art Gallery.
**Decision trees and decision tables**

A *decision tree* is a diagrammatic way of representing all possible combinations of decisions and their resulting actions. Represents the decisions made within a system as the branches of a tree.

A *decision table* is a table that represents all possible conditions and actions. Indicates the alternatives for different conditions and actions based on the rules. Divided vertically into conditions and actions, and horizontally into rules.

Note - Each decision has its own row and needs a column for every possible answer.

The way the decision tree actually works is -

<table>
<thead>
<tr>
<th>Condition</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision point</td>
<td>Decision branch</td>
</tr>
<tr>
<td>Decision point</td>
<td>Decision branch</td>
</tr>
<tr>
<td>Decision point</td>
<td>Decision branch</td>
</tr>
<tr>
<td>Decision point</td>
<td>Decision branch</td>
</tr>
</tbody>
</table>

**Exercise 17**

Complete the Decision table exercise below - by entering the remaining ticks or crosses - **based on** the decision tree above

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good friend</td>
<td>Y N N Y N N</td>
</tr>
<tr>
<td>Average friend</td>
<td>N Y N N Y N</td>
</tr>
<tr>
<td>Stranger</td>
<td>N N Y N N Y</td>
</tr>
<tr>
<td>Owe them</td>
<td>N N N Y Y Y</td>
</tr>
<tr>
<td><strong>Actions</strong></td>
<td><strong>Y- condition is true</strong>&lt;br&gt;<strong>N - condition is false</strong>&lt;br&gt;<strong>✓ - action matches given rules</strong></td>
</tr>
<tr>
<td>Accept invite</td>
<td>✓ X X</td>
</tr>
<tr>
<td>Reject invite</td>
<td></td>
</tr>
</tbody>
</table>

To be completed by - ......................................................
**System flowcharts**

A system flowchart is a graphical method of representing both the flow of data and the logic of a system. Documents are essential details of the system. Also shows the hardware used to process data such as storage mediums. Use standard flowcharting symbols plus special symbols for peripheral devices.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Input/Output" /></td>
<td>Input/Output</td>
<td><img src="image" alt="Manual operation" /></td>
<td>Manual operation</td>
</tr>
<tr>
<td><img src="image" alt="Paper documentation" /></td>
<td>Paper documentation</td>
<td><img src="image" alt="Magnetic tape" /></td>
<td>Magnetic tape</td>
</tr>
<tr>
<td><img src="image" alt="Online display" /></td>
<td>Online display</td>
<td><img src="image" alt="Direct access storage device" /></td>
<td>Direct access storage device</td>
</tr>
<tr>
<td><img src="image" alt="Online input" /></td>
<td>Online input</td>
<td><img src="image" alt="Flowline" /></td>
<td>Flowline</td>
</tr>
<tr>
<td><img src="image" alt="Punched card" /></td>
<td>Punched card</td>
<td><img src="image" alt="Telecommunications link" /></td>
<td>Telecommunications link</td>
</tr>
<tr>
<td><img src="image" alt="Process" /></td>
<td>Process</td>
<td><img src="image" alt="Predefined process" /></td>
<td>Predefined process</td>
</tr>
<tr>
<td><img src="image" alt="Terminal" /></td>
<td>Terminal</td>
<td><img src="image" alt="Decision" /></td>
<td>Decision</td>
</tr>
</tbody>
</table>

**Exercise 18**

Develop a flow chart for the query to find information on a particular artwork. See p25 text for example.
**System Implementation**

Implementing involves all the organising, scheduling and delivery of the new system to the participants. It should be decided in advance which conversion method will best suit the situation and what type of training will be required by the participants to operate the new system. This type of change can disrupt operations and place a lot of stress on all concerned if not planned and executed professionally.

Development of an **Implementation Plan** helps to ensure that the implementation proceeds smoothly. Whether the transition is from a manual to a computer based system or an upgrade of the existing system the implementation plan should include -

- Identification of staff, resources and time frame needed for the implementation
- Identify the most suitable conversion method and give a brief justification for your choice.
- Ensure that documentation including procedures and operating instructions are available for training and use by the participants of the new system
- When the hardware, software and communications equipment will be installed and by whom
- Test data
- Real data conversion from the old system
- Training schedule for participants and strategies to help orientate users
- Time and resource allocation for testing and acceptance testing prior to the system going into production.

Data conversion from a computerised information system can be automated however conversion from a manual paper-based system would require a large amount of data entry depending on how many of the existing records need to be placed into the new system.

**Exercise 19**

Develop an implementation plan that details:
- participant training
- the method for conversion
- how the system will be tested
- conversion to the new system

Analyse the various conversion methods and justify the use of each for a given situation.

Discuss issues that may arise when converting from the old system to the new.

Compare and contrast the conversion from a manual paper based system to a computer based information system as opposed to the upgrade of an existing computer based system.

To be completed by - ..............................................................
Information System Conversion Methods

Direct Conversion
With direct conversion the new system is certified and brought into production and the old system ceases to operate. As the old system is no longer in use any serious problems with the new system will cause major disruptions to the organisation.

Parallel Conversion
Parallel conversion requires that both the old and the new system operate concurrently for a period of time. Duplication of not only the system, but workers, data and other resources is expensive but it ensures that the new system is working correctly before the old system ceases functioning.

Phased Conversion
Phased conversion relies on the existing system working in conjunction with the new system until each portion of the system is replaced.

Pilot Conversion
Pilot conversion is used to trial a new system in one or more departments within an organisation. If the system is successful it can then be implemented throughout the whole organisation. However if there are problems with the new system the disruption is minimal.

Exercise 20
Complete the Conversion Method Advantages and Disadvantages Table.

<table>
<thead>
<tr>
<th>Parallel conversion</th>
<th>Direct conversion</th>
<th>Phased conversion</th>
<th>Pilot conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>Advantages</td>
<td>Advantages</td>
<td>Advantages</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Disadvantages</td>
<td>Disadvantages</td>
<td>Disadvantages</td>
</tr>
</tbody>
</table>
Testing, evaluating and maintaining

Extensive testing and evaluation is carried out on any new information system to see that it meets the aims and objectives as specified in the requirements report for the new system.

Testing

Test data must be prepared which will test the logic and validity of the new system. The purpose of testing is to ensure that correct results are derived from the system under all known conditions (as extensive as time and funding permits). Testing can be expensive and time consuming and any errors will require the modification or redesign to parts of the system in order to correct the error.

Testing Information Systems can be broken down into the following types of activities -

Unit testing: testing each program or module within a system separately and determining under what conditions the program or module will fail.

System testing: testing the information system as a whole. This type of testing tries to determine if all the modules or parts of the system will function together as planned. Criteria for system testing may include: the testing of performance, storage capacity, load handling (stress testing), error recovery and restart as well as operation of any manual procedures.

Acceptance testing: when sufficient tests have been carried out and the system is deemed ready to go into production an acceptance test signals the certification that the system is ready to be used in a production setting.

Exercise 21

Information systems may operate either as a batch or real-time system. Discuss the differences between the two types of systems and give an example of where each type would be used.

It is essential that all aspects of testing be carefully thought out and that the tests be as comprehensive and systematic as possible. To help achieve these desired outcomes a test plan defining what unit testing, system testing and acceptance testing needs to be carried out. A test plan is developed and set out in a similar form to that illustrated -

Test plan

<table>
<thead>
<tr>
<th>Area or condition being tested</th>
<th>Preliminary criteria or special requirements</th>
<th>Expected Results</th>
<th>Expected output at stage or result</th>
</tr>
</thead>
</table>

To be completed by - ........................................
Exercise 22
Discuss possible strategies and/or alternatives for modifying parts of the new system when a problem is identified during the testing stage.

To be completed by - ..............................................

Evaluating
Evaluation determines whether the Information System is working as expected or if modifications or even an upgrade are required. The new system is compared to the old system and assessment as to what extent the objectives and aims of the project have been met.

Exercise 23
Reviewing the effect of the new information system on participants, users and other systems and people within the environment, should be considered when evaluating the new or upgraded system. In a hundred words or less describe the possible impact of the new system on the above mentioned areas.

To be completed by - ..............................................

Maintaining
After the new system has been installed and the conversion is complete, including testing and evaluation, the system is said to be in production. From this point on, changes to hardware, software, documentation or procedures is termed maintenance of an existing system.

Exercise 24
Define the term maintenance and give details of what it involves. An example should use a specific scenario for context.

To be completed by - ..............................................