Project management focuses on a project. Projects have a definite beginning and an end. Good project management meets established goals, cost, schedule, and quality objectives. Project management involves the coordination of a number of phases to successfully achieve identified goals. These phases are the 5 stages of the System Development Cycle.
It must also identify **factors required by the system**. These include:

- people - users and participants
- information technology - hardware and software
- data and information

Users - end-users of the information system

Participants - the people that carry out the information processes within the information system.

**Communication skills** are very important when working on a project. All members of the project team are required to have effective communication skills. These include:

- active listening
- conflict resolution
- negotiation skills
- team work
- interview techniques

**system development cycle**

The System Development Cycle is a traditional approach taken to systems design. The SDC is really a project management tool or a way of sequencing the tasks that need to be carried out to develop a new information system.

The SDC studied in the IPT syllabus, has 5 stages:

1. U
2. M
3. D
4. I
5. T
understanding the problem

You have been engaged by Jewel Enterprises to design their new accounting and human resources system.

You decide to first talk to someone like the Finance Manager or Accountant. They would be able to -

• describe the primary functions currently performed by the system
• tell you the details about requirements for monthly management reporting, year end processing, statutory reporting, and so on
• give you some of the detail you require, but not all of it; however, they would be able to point you to the right people to speak to for further information on particular functional areas.

It could also be beneficial to talk to end users other than the ones the managers suggest, to make sure you get a balanced account. These other people might be:

• a Credit Control Manager who can tell you about the debtors ledger and what types of reports are used in this area
• an Accounts Payable Supervisor who could tell you about the creditors sub-system and how creditors invoices are processed
• an Accounts Payable clerk who would then give you the next level of detail about how the invoices are batched and entered into the system, how the cheques are printed, what information they need to reconcile the creditor's accounts, etc.

If you were looking at a Human Resources system, you would probably start with the Human Resources Manager to get the 'big picture'. You would find out:

• whether the personnel are paid by cash, cheque or direct bank deposits
• how they do salary reviews.

Next you would talk to the end-users. The people who process the payrolls to get the details such as:

• do they enter timesheets?
• how do they print the payslips?
• how do they print the cheques or produce the tape to send to the bank?
• how do they process overtime, and so on?

Other end-users include, other clerical people who would be able to tell you how they:

• process a new employee
• terminate someone who is leaving
• process a person's leave, and so on.

You decide to create a questionnaire to collect data from various people involved in the system. For example, you need to gather information about the existing system and how the goods are received from suppliers and then paid for - two of the questions you decide to ask are outlined below -
When you investigate the exact data requirements for the accounting system, you find out the following –

- They want to be able to pay their suppliers on a monthly basis, that's, print cheques to pay all outstanding invoices for each creditor.
- Occasionally they need to pay just one particular invoice on its own.
- They may also have to pay bills which are one off, so they do not have this supplier set up in the system (and they do not want to set them up because they will never be used again).

You now need to design the system to allow for all these situations. For instance, if the invoices are stored in a file, you will have to access them in different ways for the different types of purposes.

<table>
<thead>
<tr>
<th>Information</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>To pay all invoices for all suppliers</td>
<td>The file must be sorted in supplier number order so that all the invoices for a particular supplier are grouped together.</td>
</tr>
<tr>
<td>To pay one particular invoice</td>
<td>We need to find that particular invoice easily</td>
</tr>
</tbody>
</table>

Environmental factors

Environmental factors must be taken into account. The number of suppliers the company is dealing with and the number of invoices that are expected to be processed, will influence the design of the system. The types of reports and storage requirements would also need to be investigated.

Prototyping

If you have ever been to a motor show or an air show you will have heard the term prototype. You will have seen prototype cars on display, some of them might have been drivable and some of them might not.

In the development of information systems, the process of prototyping is a very similar concept. When you build a prototype of a system you would be building dummy screens, to show what they would look like. You would have part of the menu system working, to show navigation and to produce a sample report. The system does not actually work - it just looks like it does. The new system is easier to create from a prototype.
Microsoft Access

The main switchboard or menu has been created as a prototype to physically show the client what it could look like, the navigation, features and functionality.

So far the prototype includes -

- Products
- Suppliers
- Orders
- Categories
- Print Sales Reports
- Display Database Window

Prototyping is based on an engineering approach whereby small scale models are built to help end-users define their requirements and preferred input-output interfaces.

making decisions

This stage involves making decisions using the data gathered in the preliminary investigations.

A Feasibility Study needs to be conducted. A Feasibility Study is a short report that analyses potential solutions in terms of the known constraints and makes a recommendation. The Feasibility Study reports on the benefits, costs and risks of the new system, and whether it is feasible to proceed.

T - determines the information technology (hardware/software) requirements of the new system and the technical demands that will be placed on the new system.

O - determines whether the new system will fit into the organisational guidelines and meet the current goals and objectives. Also investigates whether there are participants who will be able to operate the new system and training is considered.

E - compares the costs of developing the new system with the expected benefits. Cost Benefit Analysis is usually conducted, comparing costs in relation to the old and new systems.

S - determines whether time is available to implement the new system. A Gantt chart is constructed to outline the tasks and available timeframe.
A maintenance plan is devised and involves the day-to-day, weekly and monthly maintenance procedures.

It is important for the process of evaluation to be ongoing, to enable effective decision-making about future developments.
A Project Plan is a summary of a project that specifies:

- who eg. The project team - roles and responsibilities
- what eg. Journal and diary entries
- when eg. Gantt chart
- how eg. Funding management plan, Communication management plan, Maintenance Plan

**designing solutions**

Designing a solution is the transformation of the specifications into appropriate hardware, software and information processes.

C __________________________
O __________________________
A __________________________
S __________________________ and R _________________
P __________________________
T __________________________ and R _________________
D __________________________

The solutions are based on the further development of prototypes already created. Participant development, involves people within the system developing the solution. Guided applications can be used to create all or part of the solution. This stage involves purchasing hardware, writing or purchasing software, and specifying information processes to make the system operational.

The design tools used in the Designing Solutions stage of the System Development Cycle include -

- Context diagrams
- Decision tables
- Data flow diagram
- Data dictionaries
- System flowcharts
- Database schema
- Decision trees
- Screen design
- Storyboards

These tools are used to better understand the information system; assist in explaining the operation of the system and to document the development of the new system.
The purpose of the context diagram is to identify and document all the data that flows into and out of the system. The context diagram shows the single bubble (process), all the data flowing into and out of it, and the external entities which the data comes from or goes to.

Data flow diagrams (DFD) represent the information system as a number of processes that together form the single process of a context diagram. The source of data, its flow between processes and its destination along with data generated by the system is represented.

Remember a DFD, consists of four basic components, external entities, data flows, data stores and processes. The example shown below outlines the data flow involved in invoicing.
System flowchart

System flowcharts are a diagrammatic way of representing both the flow of data and logic through an information system.

Decision trees

A decision tree is a diagrammatic way of representing all possible combinations of decisions and their resulting actions.

It represents the decisions made within a system as the branches of a tree. Each branch ends with a particular action. They are a graphical approach and are used when the module is depicting a complex selection structure.

Decision tables

Decision tables are used to specify the logic of an individual processing module within an information system. They are a tabular approach and are used when the module is depicting a complex selection structure.
Data dictionaries

Data dictionaries contain a comprehensive description of each field in the database.

This commonly includes:

- Field Name
- Data Type
- Field Size
- Description

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Field Size</th>
<th>Description</th>
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<tbody>
<tr>
<td>SupplierID</td>
<td>Number</td>
<td>4</td>
<td>AutoNumber 0002</td>
</tr>
<tr>
<td>SupplierName</td>
<td>Text</td>
<td>20</td>
<td>Mousetrap</td>
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<tr>
<td>Current</td>
<td>Boolean</td>
<td>1</td>
<td>Yes = 1, No = 0</td>
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<td>Address1</td>
<td>Text</td>
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<tr>
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</tr>
</tbody>
</table>

Database Schema

Or also known as E-R (Entity Relationship) diagram or Schematic diagram. It is a model or graphical representation of the groups of data (entities) and the relationships that exist between these entities (such as one to one, one to many, many to many).

Screen Design

Screen design for input and output of data are created. These are created using good principles of design, eg. ease of navigation, and use of consistent style.
Storyboard
A storyboard is a graphical model of a web site. They vary in structure and include - linear; hierarchical; and non-linear. They can also be a combination of the three. These will be further discussed in the Multimedia Option Topic.

Documentation
Documentation is an essential part of any system, as it communicates information to the developers, users and others on how the system operates and how to use it.

Implementation
The implementation stage delivers the new system to the participants.

Implementation Plan
When you are implementing a new system, there are two possibilities. You may be implementing a computer-based system to replace a manual one or you may be replacing an existing computer-based system. While the system is being converted testing also starts to occur, and a testing schedule is considered.

Conversion
The method of conversion is the way in which the information processes performed by the old system will be transferred to a new system.

**Direct** - involves the immediate change to the new system on a chosen date.

**Parallel** - involves the old and new systems both working together at the same time.

**Phased** - involves the gradual implementation of the new system.

**Pilot** - involves trialling the new system in a small portion of the organisation. The old system is still available if the new system fails or experiences problems.

Pilot conversion is usually started by a keen group of participants who appreciate the benefits of the new system.

Direct Conversion
On that date, the old system ends and the new system starts. All data from the old system is transferred to the new system, and the participants stop using the old system and begin using the new system. Direct conversion is not commonly used even though there are minimal transition costs. One reason that direct conversion is not commonly used is that it does not allow the project team to check whether the new system will operate correctly and whether participants understand the system. Another reason is that, if the new system fails or problems occur, the old system is not available as a backup.
Parallel Conversion

Participants can compare both systems and obtain a good understanding of the differences between the systems. If there are any problems with the new system, it can be solved before the old system is discontinued.

However, parallel conversion results in additional workloads for participants, as they must operate both systems until the new system is accepted. It may also result in confusion about which system has the correct data.

Phased Conversion

Certain operations of the new system are implemented while the remaining operations are completed by the old system. When one operation of the new system is successful, another operation is implemented until the new system is fully operational. Each operation is individually tested.

If there is a problem with a certain operation, it is possible to switch back to the old system. Unfortunately, phased conversion is often confusing because some participants are on the old system and some are on the new system.

Pilot Conversion

Involves trialing the new system in a small portion of the organisation. The old system is still available if the new system fails or experiences problems. If pilot conversion works, it is usually easier to motivate the other participants of the organisation to change to the new system.

Information processes are continually tested during the implementation of the system over a period of time. Minor changes to procedures are immediately implemented.

Which type of conversion would be the most appropriate and why?
Participant Training

Participants need to be instructed about and assisted with the major features and functions of the system. A training schedule can be organised and communicated to participants using a Gantt chart.

**testing, evaluating and maintaining**

**Testing** is a way of verify the quality of the project. Testing a solution ensures that it works. Testing is carried out throughout the implementation and testing stages of the system development cycle.

Without rigorous testing, the system cannot be guaranteed to work as expected. Tests must be designed to examine the system operation under all possible events.

- **Unit testing** - testing each module using a top-down approach.
- **System testing** - eg. testing batch and real-time processing.
- **User acceptance testing** - test data is prepared by the users to test all possibilities in the processing. Programmer interpretations are checked against user interpretations.
- **Stress testing** - estimate the peak load on the new system, eg. 10 000 transactions in a normal day and 50 000 transactions at peak time - ie. end of the month.

**Evaluation** determines whether the system is working as expected or whether changes are required. The new system is compared to the old, and evaluated whether the objectives for the project have been met.

**Maintenance** is the modification of the system by making minor improvements.

**Operation Manual** - An operation manual details procedures participants follow when using a new system. It is user friendly and takes the user through the system step-by-step. Screen dumps of the user interface help to ease the logic of the instructions.

**social & ethical design**

**Health and safety** - eg. ergonomics - furniture, information technology, environmental factors.

**Changing nature of work** - This includes - deskillng, multi-skilling and in some cases redundancy. Will anyone lose their job or will new jobs be created?
Ethics is a set of beliefs we hold about what is right and wrong. There are a number of issues involving the use of information systems that many people are concerned about. These include -

- **Environmental impact**
- **Equity and access** - equity concerns equal rights for all. It means that all people should have equal access to the benefits of information technology - this includes gender equity.
- **Invasion of privacy** - computer technology allows personal information to be distributed faster and further than previously before.
- **Freedom of information** - individuals have the right to access information
- **Control (rights and privileges)** - the level of direct involvement that people have in decision making, regarding themselves.
- **Computer crime** - broadly defined as any illegal or immoral activity that could not work without the use of a computer.
- **Copyright laws** protect the rights of an author against cases of piracy.

**useful websites**

http://www.boardofstudies.nsw.edu.au  
NSW Board of Studies

IPT sites

New HSC

http://www.hscandbeyond.mq.edu.au/  
Macquarie Uni

HSC technology support - case studies

Power House Museum

**references**


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Jacaranda: Milton.