Types of Information Systems

- There is a range of information systems to serve the varied needs of users:
  - Transaction processing systems
  - Electronic commerce
  - Process control systems
  - Management support systems: Management information systems, Decision support systems, Executive information systems
  - Knowledge-based systems: Expert systems, Neural networks,
  - Multimedia systems
  - Office automation systems
  - Geographical information systems

Transaction Processing Systems (TPS)
- capture, process and store business events
  - transaction - any business related event
    - eg. payment to employees, sales to customers
  - deal with basic business operations and functions
    - eg. payroll systems, billing systems, ordering systems
  - high volume of data
  - objectives
    - efficient data capture, movement and processing
    - integration with other information systems
    - providing information to the business
  - developer needs to understand basic business processes and business information needs

Electronic Commerce
- business conducted electronically through computer-to-computer exchange of standard business transactions
- possible because of international communication networks (eg. internet)
- requires high level of inter-organisational co-operation and standardisation of data formats

Process Control Systems
- similar in nature to TPS, but require the system to have in-built capability to receive information from its environment and respond immediately to given stimuli without operator intervention (real time)
- range from the very simple (thermostat for air conditioner) to the very complex (missile systems)
- requires the developer to understand the way the system works and the nature of the specialised technology required - appropriate technical expertise is necessary

Management Support Systems
- general term to cover a variety of types of system which aim to support management decision making
- based on aggregate transactions, not individual ones
- provide basis for management action
E.g. management information systems, decision support systems, executive information systems
Management Information Systems
- draws on diverse yet predictable data resources to aggregate and summarise data into a meaningful form to help managers
- provide routine scheduled reports (weekly, monthly, etc.) of the state of business operations
  - could be detailed, summary, exception, trend or on demand reports
- generally provide support for business environments which are structured, stable and predictable
- developer needs to:
  - be aware of management information needs
  - identify routine structured problems for which an MIS can help
  - be able to draw information from different TPS

Decision Support Systems (DSS)
- evolved from the inadequacies of MIS to support semi-structured or unstructured problem environments
- a system tailored to meet the needs of an individual manager
- usually provides a basic database of relevant information and data modelling tools to enable a manager to do their own forecasting and analysis, identify problems, find and evaluate alternative solutions, and select or compare alternatives
- developer needs to work with the manager interactively to set up a system with which the manager feels comfortable

Executive Information Systems (EIS)
- designed to support small groups of senior managers with no computer training
- enables manager to examine data at a very broad level (MIS style), but be able to ‘drill down’ interactively to get more detailed information if required (uses databases inside and outside the business)
- developer needs an intimate knowledge of senior manager information needs, plus technical knowledge to bring together and structure the data appropriately

Knowledge-Based Systems (KBS) and Expert Systems
- KBS systems attempt to replicate/simulate human knowledge
- this introduces the concept of artificial intelligence (AI) .. can a machine ever be ‘intelligent’?
- Expert systems aim to simulate the reasoning used by an expert human being, so the system can replace or replicate the expert’s skill
  - a knowledge base, a rule set, and a user interface
  - user sets problem and puts in data; expert system uses the rule set and the knowledge base to determine answer
  - most working instances are in areas where there is a relatively narrow knowledge base and easily defined rules
  - developer needs to be able to work with the expert to extract and codify their knowledge

Neural Networks
- tries to simulate the workings of the human brain by using parallel processors to replicate brain functions
- rather than supplying the machine with knowledge and rules as was the case with expert systems, neural nets are given many different examples of what they are ‘learning’ to do .. the system then ‘learns’ from this experience and tries to apply it
- developers need knowledge of statistical theory and neural net technology

Multimedia Systems
- systems which use a mixture of media - text, graphics, sound, video, animation to convey information
- use CD-ROM and Web as main delivery vehicles
- principle uses at present are games, infotainment, education, advertising, corporate promotion; electronic commerce may become a big application area
- developers a detailed understanding of media - graphics, film, sound, animation, etc - and experience in combining them to achieve optimum effect
Office Automation Systems
- A set of related technologies dealing with the 'standard' activities carried out in offices to enable more efficient and effective communication between office workers - word processing, document management, diary management, communications and e-mail, project management, etc.
- Includes both hardware and software systems...now being increasingly bundled into one package (Lotus Notes, MS-Office, etc.)
- Developer requires a very detailed understanding of office procedures, the sociology of work, etc.

Geographical Information Systems
- Systems which store and analyse information for which spatial location is a key attribute
- GIS are used across a wide range of applications related to the environment, population distribution, etc.
- GIS combine a database which stores the characteristics of objects with a map showing their location. Users can link queries across from one to the other - e.g. 'list from the database all information about objects within 25 km of this point', 'show on the map all objects from the database which have these characteristics', etc.
- Developers must understand geography, cartography, and the linking of database & graphics technology.

Types of Information Systems
- A large and ever-expanding range of specialised software is available for all these types of systems.
- Each type of system requires a particular set of technical skills on the part of the system developer.
- Different types of system tend to have different types of key users involved in their development - executives, managers, knowledge workers, clerical workers, etc.
- Different system development approaches are needed for these different types of systems.
- If you become involved in any area you will need to learn a whole new set of skills, reference literature, software, etc.

Project Management During Systems Development
- Project management is the process of planning, directing, and controlling the development of an acceptable system at a minimum cost within a specified time frame. Whitten et al. (2001)
- Project management is necessary because of:
  - The number of people involved
  - The number of tasks to be done
  - The extent of the interaction between the tasks and people
  - The complexity of the interactions between the tasks and people.

What is project management?
- "Project Management is the process of planning, directing, and controlling the development of an acceptable system at a minimum cost within a specified time frame." Whitten et al. (2001)
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Project Management
- To achieve a project that comes in on time, within budget, is of defined benefit to the organisation AND working to the user’s satisfaction.
- We need:
  - Some plans
  - Some objectives
  - Some consensus
  - Skilled people
  - Time and money.
  - Seems simple enough, yet it’s complex to implement and effect.
Causes of failed projects

- Poor management of users' expectations
  - Scope may change (uncontrolled) ... schedule and budget stay the same
- Cost overruns & schedule delays
  - Early estimates with little information ... set in stone, poor estimating skills
- Inadequate systems analysis and design
- Use of traditional SDLC

Project management activities

- Defining tasks and the dependencies between them
- Allocating people and resources to tasks
- Monitoring progress of project against plan
- Taking remedial action when things don’t go according to plan

Basic process of project management

- Select systems development methodology
- Plan the project tasks
- Estimate the resources and time required to complete individual phases of the project
- Staff the project team
- Organise and schedule the project effort (tasks/time/people/technical resources) and therefore cost
- Control the project development (directing the team, controlling progress, replan, restaff, ...)

Project Management Tools and Techniques

- Deliverables - to check what has been done
- Milestones - to check where we have got to (and how far to go)
- PERT Charts - to show the connections between tasks (Whitten p.130)
- Gantt Charts - to show progress on tasks (milestones) (Whitten p.131)

Project Management Tools: Deliverables

- Specific things which are produced during the development process and delivered to the client... e.g. a report, a project plan, a set of system models, detailed design documentation, a test plan, code...
- Every task in the SDLC should have a deliverable
- No task is complete until the deliverable is finished and handed over
- Deliverables should be agreed to by the client in advance to help eliminate problems over what is expected from the developer
  - “I didn’t realise that you wanted us to produce ............”

Project Management Tools: Milestones

- Events that mark the completion of important stages of the SDLC... e.g. completing a phase or a task within a phase
- Tell us how far we have come and how far we have to go
- Help to keep track of progress and monitor project scheduling... e.g. “We thought we would reach this milestone by now, but we still have two weeks of work before we will get there”
Planning the project

- The project plan is the map for the project
  - it establishes intermediate tasks en route to the project’s objectives
- To derive a plan use:
  - your company's methodology
  - your company’s plans and records of past projects
  - your experience
  - your team’s experience
  - published references
  - communication with other project managers

Estimating: what and how

- Time for individual work tasks to be completed
- Time for all work tasks to be completed
- Resource requirements for each subtask in terms of personnel and equipment
- Costs for staff and equipment
- INFORMED GUESSING
  - based on some impression of task difficulty (popular... not very accurate)
- ANALYSIS & SYNTHESIS
  - tasks broken in sub-tasks, then guessed, then accumulated
- HISTORICAL ANALYSIS
  - use previous estimates/actuals for similar tasks
- PARAMETRIC SYSTEMS
  - e.g. lines of code, function point analysis

Staffing

- The project manager must know how to place people in teams
- Match each worker's expertise to the tasks that need to be done
- Ensure that the team is adequately trained
- Minimise the number of idle workers (doing no work is demoralising)
- Assign each worker only one task at a time

Deliverables

- A task in the Project Plan may be:
  "Investigate User Needs"
  - It is impossible to say if this task is complete or incomplete
  - "Investigate User Needs":
    - Speak to all (or a particular number of) users
    - Build and document a model of the users’ requirements
    - Distribute the model to all users, asking for omissions, changes, agreement
    - Publish completed model and obtain official user agreement that it is correct

Binary deliverables

- The project and each phase must have a binary deliverable:
  - It is either correct or incorrect
  - Each deliverable must:
    - be defined by certain objectives
    - be attainable
    - have a set of completion facts

Project Control

Critical to project control are:

- A well defined set of system requirements
- A project plan which sets out anticipated rates of progress and resource use
- Reporting from project team at a detailed and an overall level
- Review of project team performance against the plan
Tools and techniques

- PERT Chart (Program Evaluation and Review Technique)
  - A graphical depiction of project tasks and their interdependence

- Gantt Chart
  - A simple bar chart which shows project tasks and the time required to complete the tasks

Gantt charts

- A Gantt chart is a planning and reporting device easily understood by both technical and non-technical people
- The steps to develop a Gantt chart are:
  - Identify the tasks and sub-tasks and allocate responsibilities among the project team
  - Estimate completion times for each sub-task
  - Identify milestones/deliverables for the tasks
  - Plot activities on the chart:
    - tasks and sub-tasks are listed vertically
    - time-scale is indicated at the top or bottom of the chart
    - a bar(s) showing the estimated time for each task and sub-task for each team member is drawn in the appropriate position

PERT Chart

- A PERT (Program Evaluation Review Technique) chart is a network diagram used to schedule and co-ordinate various activities and events of a project
- It shows serial or parallel arrangement of tasks:
  - critical or slack tasks (critical path)
  - the critical path: the minimum time required to complete a project

References
