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First Authored:
Alemayehu Molla and Richard Heeks, IDPM, University of Manchester, October 2003

Adapted for MIS Class in University of Ghana by
Dr Richard Boateng, ICITD, Southern University and University of Ghana Business School, 2009

Email: Richard@pearlrichards.org
MANAGEMENT AND ORGANISATIONS SUPPORT INFORMATION SYSTEMS

1. OVERVIEW
There are several categories of information systems. In most organisations a masala of these applications are deployed. In simple terms and for the purposes of the discussion to follow, we can classify organisational information systems in the following ways.

Operational Information systems
- Office automation systems
- Transaction processing systems (also sometimes known as basic data gathering systems)

Management support systems
- Management information systems
- Decision support systems
- Executive information systems

Organisational support systems
- Network based systems
- Enterprise-wide information systems

In this handout, we will explore the operational information and management support systems. Using the different layers of organisation introduced in the previous session, these systems could be located within organisations as described in figure 1.

Figure 1: Simple View of IS locations
Exercise 1: Identifying different types of information systems
(Developed from O’Brien, 2002)

A manufacturing company has networked its computers to those of its customers and suppliers to capture data about sales orders and purchases. Such data are processed immediately, and inventory and other databases are updated. Videoconferencing and electronic mail services are also provided. Data generated from the manufacturing plant are captured by sensors and processed by a computer that also suggests answers to a complex production problem posed by an engineer. Managerial end users receive reports on a periodic, exception, and demand basis, and use computers to interactively assess the possible results of alternative decisions. Finally, top management can access text summaries and graphics displays that identify key elements of organization performance and compare them to industry and competitor performance.

The company has started forming business alliances and using IS to build a global telecommunications network with other companies throughout the world to offer their customers’ worldwide products and services. The company is in the midst of making fundamental changes to their computer-based systems to increase the efficiency of their business operations and their managers' ability to react quickly to changing business conditions.

Required
There are many different types of information systems in the above minicase, identify and describe as many as you can.
2. OFFICE AUTOMATION SYSTEMS

2.1. A systems View of an Office

An office is an organizational unit that processes the information on which the functioning of an organization depends. Office system is a subsystem of its containing system – the organization. An office systems contains

- Layout:
- Services
- Infrastructure
- Activities
- Operators

How the above components of an office system are brought together to serve and support the organisation constitutes the office configuration. The configuration of an office system is largely determined by the organization system that contains it and is mainly affected by (1) the nature of the organization, (2) size of the organization, (3) its requirement and (4) types of office technology employed. Taking the extent of office technology utilization, one can then have a continuum of offices ranging from Traditional, Beginner, IT supported, Networked office, to Virtual offices.

2.2. Office Automation

Office automation refers to the use of information technology to support routine office activities and functions. This work includes, but not limited to

- Document management: capturing, processing, producing, communicating, storing and sharing
- Collaborative work
- Management of project activities: time, money, idea, and other resources
- Personal organization,
- Other administrative tasks, organizing meetings, office record handling

Office Automation systems (OAS) could therefore be defined as information systems intended to increase the productivity of office workers. As in most automation applications such systems would enable to do things faster, cheaper and better, i.e., in efficiency and effectiveness gains.

Further, OAS could be used organisationally to (1) coordinate and manage work of office workers within an organizational unit (2) link the work being performed across all levels and functions and (3) link the organization to its extended enterprises, that is customers, suppliers and other partners.

2.3. Types of office Automation systems

Personal OAS

- Word processing
- Spreadsheet
- Database management
- Data Presentation
- Desktop Publishing
- Personal Schedulers
- Communication
Group OAS

Groupware applications: these applications assist teams of people within and/or across an organisation in working together and help in achieving the three Cs – Communication, Collaboration and Coordination. Some groupware applications are summarised in the following table.

**Table 1: Groupware Functions**

<table>
<thead>
<tr>
<th>Groupware function</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging</td>
<td>e-mail, electronic forms processing, group mail, electronic bulletin boards</td>
</tr>
<tr>
<td>Document management and information sharing</td>
<td>Document image processing, Electronic document management systems (EDMS): These are systems that allow the capturing, routing, storing and manipulation of documents electronically</td>
</tr>
<tr>
<td>Collaborative authoring</td>
<td>Systems that allow team development of designs Computer Aided Design (CAD) and documents. Their capabilities include shared access to documents, centralised spell-checking dictionary, commenting facility, file locking to ensure that two users do not try to alter the same original document at the same time, version control</td>
</tr>
<tr>
<td>Conferencing</td>
<td>Text conferencing, video conferencing, teleconferencing, data conferencing. Such systems facilitate meeting among physically distant people.</td>
</tr>
<tr>
<td>Time Management</td>
<td>Group scheduling system: The value of electronic diaries is considerably increased if they are made available over a network. An individual's schedule can then be accessed by other members of the work group. These other members can therefore easily find out where a staff member is now, and is going to be at some future point. They can also, perhaps subject to confirmation from the owner, write in appointments</td>
</tr>
<tr>
<td>Decision making</td>
<td>Group decision support systems provide data-gathering, structuring ideas and information, analysis and reporting functions to help a group of people make a decision in an ill-structured situation</td>
</tr>
<tr>
<td>Work management</td>
<td>Workflow systems: systems that enable to assign and manage work processes, tasks and information electronically among people</td>
</tr>
</tbody>
</table>

Groupware applications support collaboration and communication of groups in either synchronous or asynchronous basis. While synchronous systems support same time collaboration and communication, asynchronous modes support these across different times.
<table>
<thead>
<tr>
<th>Location</th>
<th></th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same</td>
<td></td>
<td>Synchronous, examples are meeting and group decision support systems, conferencing</td>
</tr>
<tr>
<td>Different</td>
<td></td>
<td>Synchronous: teleconferencing, Internet chatting, group decision support systems, conferencing</td>
</tr>
</tbody>
</table>

**Exercise 2: A paperless office**
Futurist Alvin Toffler wrote in 1970 “making paper copies of anything is a primitive use of machines and violates their very spirit”. According to the predictions of that time, most people by now should be working in offices so computerized that paper is virtually obsolete. It was also predicted that as offices turned to electronic files, the use of printed-paper would decline dramatically.

1. Reflect back to an office (offices) that you are familiarized with, if the office was using office automation systems, do you think that the use of OAS increased or decreased printed papers? Why?

2. What are the primary factors that facilitate or inhibit the trend towards a paperless office?
**Exercise 3 : Automating an Office Mini Case**  
(Developed from Sculli and Ho, 2001)

A company is engaged in the production of industrial products. The prime function of the company is to distribute the products in the far east region, Korea, China and Hong Kong. It also provides pre-sale and after sale services. The company is based in Hong Kong and has about 50 staff.

The office layout consisted of rooms for executives, cubicles for senior technical and administrative staff and an open working area with desks for other minor staff. The computer infrastructure in the general office consisted of a mainframe, for running integrated application software for distribution management and accounting. There was also a smaller computer for sending, receiving and routing telex messages. New investments in computer systems are planned that include the installation of PC’s, a local area network and the purchase of related software to automate the office.

**Required**  
Management is uncertain about the new office configuration and has called upon you as a consultant to investigate and identify the key issues that they should be concerned with. What will be the primary concerns of managers, users? Why?
3. TRANSACTION PROCESSING SYSTEMS

TPS are also sometimes known as basic data gathering systems (BDS).

3.1. What is TPS?

Systems that capture, store and process data that are generated in the course of the day-to-day activities of organizations. Such systems help to address routine questions. The data can be categorized based on the two dimensions of frequency and externality.

**Frequency.** Frequent data relates to the day-to-day, repetitive operations of the organisation, such as issuing payments. Non-frequent data relates to either one-off or infrequent operations of the organisation, such as hiring personnel.

**Externality.** External data relates to operations involving individuals or institutions outside the organisation's boundaries, such as the organisation's clients, suppliers. Internal data relates to operations involving individuals or institutions inside the organisation's boundaries, such as employees.

The above classification enables us to determine the type of IT we need

3.2. Features of TPS

3.2.1 Architecture of TPS

Figure 2: Basic TPS Model
Exercise 4: Investing on Transaction Processing Systems
(Developed from Jessup and Valacich, 2003:202)

The Bank in this case provides services such as client trust management, corporate money management, custody services and so on. One of the most common processes in the organisation is generating a cash transaction on behalf of its clients. For the most part, these transactions involve paying bills for a client and money transfer. On average an administrative staff processes about 200 such transactions on a given day, in response to client requests. For a long time, the company relied on paper-based systems for these transactions. Requests were usually initiated by filling all the details of the transaction on the form or by sending a fax (if the request is coming from branch offices). Next the form was carried by hand to the staff members who were in charge of approving the transaction. Once it was approved, another staff member carried it to the floor where the operations department was housed which was responsible for the actual processing of the transaction.

This paper-based system requires a large number of staff members, the transaction often took a long time leading to delays in fulfilling customer requests and oftentimes there were errors. In addition, it was often difficult to locate an individual who would approve the transaction and oftentimes to find a staff member to move the form from one office to another. In addition staff members who were authorized to approve transactions had to be interrupted during their regular work hours to process such transactions. On average, the cash transaction processes at the Bank took about 86 person hours per week to be completed. Realizing this, the company’s primary concern was to find an appropriate way to automate its transaction processing, improve its customer service, and reduce the number of errors. As a result, the company decided on investing in an information system that consists of form design, workflow process management and an environment that allows for easy streamlining of workflows. New forms were designed for initiating and approving cash flow requests and the workflow processes were redefined.

The whole process was made Web-enabled. A staff member at any location can use a web browser to download an electronic form, which consists of few fields to complete. Once the form is submitted the underlying business logic of the information system routes the form for approval in baskets based on the type and the size of the request to any staff member who is authorized to give approval. Authorized staff can approve the approval requests in batch. Once the approval is given, the system automatically routes the form to the operations department.

Required
1. Of the different types of organisational information systems covered in previous sessions, which ones do you identify in the above case?
2. What were the problems the company face? What management, organisation and technology factors were responsible for those problems?
3. What advantages did the new transaction processing system provide?
4. Which of the several advantages that the system provided was the most important and why?
3.2.2 Transaction processing approaches
There has been a trend for transaction processing systems to move through two stages as technology and perceived organisational needs change:
- Batch systems: such systems collect the data to be processed over a certain period of time and then do the processing at some specified date or time.
- Real time systems on the other hand process the data as soon as the transaction occurs

Comparing the two approaches

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Batch</th>
<th>Real Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed of delivery of information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to deal with failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Validation requirement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disruption to user at the time of data processing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.3. Generic examples of TPS
- *Accounts Payable*. This keeps a record of money owed by the organisation.
- *Accounts Receivable*. This keeps a record of money owed to the organisation.
- *Personnel*. This keeps a record of all staff employed.
- *Customers*. This keeps a record of all the customers of an organisation
- *Payroll*. This calculates and records staff salaries and wages.
- *Inventory*. This tracks the movement of items in and out of a store.
- *General Ledger*. This keeps a central record of all financial transactions, drawn from accounts, payroll, inventory, etc.

Figure 3: Linkages Between Transaction Processing Systems
3.3. Importance of TPS
Because a TPS is used to capture, store and create information, it may look mundane to the casual viewer. However

- TPS is a mission critical system (example airline reservation system)
- Point of contact to customers and suppliers
- Data from the TPS is used to monitor organizational performance
- Relatively high cost if there is a system failure

3.4. Comparing TPS with Other Information Systems
The specific capabilities of a basic data-gathering system, listed above, are what differentiate it from other information systems. However, there are other features, which are also typical of BDS/TPS that would tend to set them apart from information systems described elsewhere in this module, such as:

- Large hardware power requirement to cope with a high volume of data input, processing, storage and output.

- High reliability requirement to keep these fundamental systems operational (use fault-tolerant systems).

- High recoverability requirement to rebuild data files, ensure no transactions have been lost and become operational again after a system failure.

- Regular, structured format for data use. Routine, structured, pre-specified, regular and repetitive formats for data entry, processing and output.

- High levels of data detail within data inputs and outputs.

- Limited processing complexity. This is "number crunching".

- Use by operational/clerical levels of staff.
4. MANAGEMENT INFORMATION SYSTEMS
Definition: “information systems that integrate data to provide formalized reports that summarize the information to assist with managerial monitoring and controlling of organisational activities and resources”

4.1 Management Control Systems
In order to understand MIS properly, one needs to understand the monitoring and controlling system that MIS support. This includes the conversion mechanism, the monitoring mechanism, the evaluation mechanism, and the feedback mechanism. Figure 4 below captures a simple and rational view of the monitoring and controlling system.

Activities of management control involve

Monitoring: observing and keeping track of the progress, quality, cost, time and other relevant parameters of inputs, processes and outputs

Evaluating: comparing the data collected through monitoring to standards, benchmarks, historical data, plans, targets

Feedback: communicating the results of evaluation to those responsible for the activities and tasks. Such feedback could be positive or negative

Action: decide up on feedbacks and then ensure implementations of corrective or preventive actions.

Figure 4: The monitoring and control system model
Rationally, the monitoring and controlling system provides the mechanisms by which the organisation a) knows if it is achieving its objectives, and b) achieves its objectives in the face of problems. In order for this to happen, all the following must be present:

- inputs, processes or outputs that can be measured, i.e. with some kind of performance indicator
- a monitoring mechanism that does measure the conversion mechanism and that produces information that is sufficiently CARTA: complete, accurate, relevant, timely and appropriately presented
- a comparison mechanism
- benchmarks, targets against which to compare
- a control and implementation mechanism
- an overall feedback loop that does not take too long to be effective.

4.2. MIS Features

4.2.1 Architecture of MIS

Whereas transaction-processing systems automate routine and repetitive business transaction processing activities to reduce errors and increase efficiency, MIS help managers exercise effective controlling of organisational resources and activities. Rationally, MIS are designed to get the right information, at the right time and amount, to the right user, in the right format to allow managers to monitor and manage the organisation better. Figure 5 captures a basic architecture of an MIS model.

**Figure 5: Simple View of MIS**
Exercise 5: MIS and Managerial Control
A call centre that handles customer service telephone calls is monitored by an information system that collects data on the number of calls each representative received and the length of time each representative took to answer each call and then to respond to the question or request for service. Managers at the call centre can easily obtain statistics on virtually any part of the process. And data collection is built into the system, making it unintrusive. Obviously, the manager’s goal is to make sure all calls are answered quickly and that customers are satisfied. Information from the system can then be used in a variety of ways. For instance, a manager can use the information from the system to compare a worker’s output to that of his colleagues, to his own earlier output, to historical outputs reflecting similar work conditions at other times. He can evaluate the number and duration of calls service representatives answer on a given day.

Required
1. Rationally, what are the different roles that the MIS play in the control process described above?

2. If instead of the automatic way of collecting information described above, one have call centre representatives to complete documents detailing their progress, what would be the consequences of such practice?

3. What uses of the evaluation information in the above call centre could be threatening?

4. In what ways could the information be used to make it less threatening?
4.2.2 Features of MIS Reports

**Differentiation by content**
In terms of content, MIS reports could be *Detailed or Summarised*.

*Detailed reports* contain all relevant information on the report topic. For example, a detailed payroll report might give the following information for all staff: employee number, name, wage/salary rate, standard monthly earnings, standard tax payable, and each individual monthly payment for the year-to-date. This overlaps with the functionality of basic data-gathering systems.

*Summary report*: contains a summarisation of information on the report topic or some predefined key performance indicators. Such reports provide high-level summaries so that a manager can quickly see if all important activities are operating as planned. For example, a project manager can get a summary report indicating the cost, time and activity status of a given project. Current project cost and time could be compared with budgeted cost and time to monitor if the project is going as planned or if some action is necessary.

**Differentiation by schedule**
MIS reports, either in detailed or summarized content, could be produced either on schedule, on demand or on exceptional basis.

*Periodic reports* are produced at regular intervals: daily, weekly, monthly, quarterly, etc. For example, a report of organisational unit salary totals produced every month after staff have been paid.

*Exception report*: filters out information to highlight situations that are out of normal range according to some pre-set criteria. For example:

- reports of staff not achieving minimum performance goals
- just the names of those staff who have been absent more than five times during the past month
- details of only those loans which had received no repayment for more than eight weeks
- codes of only those budget heads which are more than 10% over-spent.

*On demand reports are* produced as and when required in response to an ad hoc request. For example, a payroll report on all staff in the top two salary grades in response to a politician's concern about increasing public-private sector pay differentials for top managers.

- those patients who have been occupying a hospital bed for more than two months, in response to a shortage of beds for incoming patients
- the past training of a staff member, in response to their request to go on a training course.
- List of products that are not selling as well as forecasts predicted so that reasons could be investigated and ways devised before the problem gets out of hand
Table 2: MIS report example

<table>
<thead>
<tr>
<th>XYZ Private Limited Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Expenditure Report</td>
</tr>
<tr>
<td>Year-to-date, end September 2003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenditure Head</th>
<th>Budget (UK£)</th>
<th>Actual (UK£)</th>
<th>Variance (UK£)</th>
<th>Variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>275,900</td>
<td>291,400</td>
<td>15,500</td>
<td>5.6%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>241,200</td>
<td>248,000</td>
<td>6,800</td>
<td>2.8%</td>
</tr>
<tr>
<td>Office Equipment</td>
<td>113,600</td>
<td>141,600</td>
<td>28,000</td>
<td>24.6%</td>
</tr>
<tr>
<td>Utilities</td>
<td>88,500</td>
<td>84,500</td>
<td>-4,000</td>
<td>-4.5%</td>
</tr>
<tr>
<td>Transport</td>
<td>69,300</td>
<td>69,300</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Consumables</td>
<td>54,900</td>
<td>63,800</td>
<td>8,900</td>
<td>16.2%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>127,100</td>
<td>131,100</td>
<td>4,000</td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>970,500</strong></td>
<td><strong>1,029,700</strong></td>
<td><strong>59,200</strong></td>
<td><strong>6.1%</strong></td>
</tr>
</tbody>
</table>

**Differentiation by functional areas**

Four main types of management information system are described below accounting, human resource, marketing and production and operation.

**Accounting MIS:** Accounting in general and payroll in particular is one of the main emphases of organisations, public or business. It has therefore been a starting point for MIS in many organisations. Accounting MIS provide managers with reports to monitor how much has been spent; to compare this with budget; and to control expenditure to bring it in as close as possible to budget. Typical reports include:
- statements of account: month-end, year-end, year-to-date, etc; these will generally have to be designed to fit with acceptable accounting practices
- warnings of budget over head - or under-spend against target; variance from planned budget can be shown either in absolute or in percentage terms
- statements of cash requirements in the month ahead based on payments still owed within accounts payable data.

**Human resources MIS:** HR MIS are used in the entire human resource lifecycle from recruitment to termination or retirement. Reports include
- recruitment and selection: for example, a detail report on all vacant posts in the organisation and a summary report on the ethnic origin and sex of all job applicants and recruits for use in equal opportunities monitoring
- staff performance: for example, an exception report on only those secretarial staff who are able to take shorthand dictation and type at over 50 words per minute
- training: for example, an ad hoc report on all those staff who have received training in gender awareness
- staff promotion: for example, a detail report on all performance assessments for a potentially-promotable member of staff
- staff departure: for example, a comparative report on turnover rates and reason for departure in the information systems and accounting departments
- pensions: for example, a summary report on recent annual pension fund growth rates
Marketing MIS are used to monitor and control marketing activities related to product, pricing, promotion, distribution and customer service. Examples of reports include

- sales reports, a summary of bi-annual sales reports
- sales representatives performance report: an ad hoc report to monitor the performance of sales representatives or a periodic report detailing sales volume of each of the agents
- Campaign management report, a detailed report of the advertising and promotion schemes used to market a given product
- A summary report detailing customer complaints

Production and Operations MIS help to monitor the production and operation resources of an organisation. Some of the reports of such system are related to

- inventory management
- cost and quality management
- resource utilization
- job performance reports

4.3. MIS in the Public Sector

Management information systems have been created to support the whole range of public administration and regulatory activities. Such systems are used to monitor both public resources and public services such as education, health, police, etc. Just a couple of examples are provided here.

Asset Register MIS: Based on data recorded about particular types of public assets, such as buildings, such systems could monitor building ownership and use, and produce reports on, for instance:
- all details of one individual building (building code, address, description, owner, floor space, utility connections, local tax liabilities, etc.)
- annual growth in the total number of small industrial units in major cities
- buildings within one city block for which no ownership records were lodged.

A taxation MIS: Based on data recorded about individual tax-paying entities (whether individuals or organisations), this could monitor the payment of taxation, and produce reports on, for instance:
- all details of an individual tax payer (payer code, name, address, employment, employer, tax code, record of assets, record of recent tax payments and liabilities, etc.)
- a summary of sales tax receipts broken down by sector
- the names and addresses of all those claiming both tax exemptions and social welfare payments.

Public service MIS: Based on data gathered from individual schools and from other educational institutions such as exam boards and school inspectorates, this could monitor the provision of education and produce reports on, for instance:
- a details of one individual school (school code, name, address, location, staff numbers, student enrolment by year, annual budgets, examination grades, etc.)
- a summary of the average staff:student ratio for each region of the country
- the name and location of all schools without on-site playing fields.
4.4. Potential Benefits of MIS
Read through the case study below and note down the benefits that the computerised MIS component of the personnel information system has brought. In answering, try to distinguish these from the TPS component benefits.

A Personnel Information System
Developed from Askew (1993)
The organization described in this case computerized its personnel information system, providing a core transaction processing system with an MIS interface that was accessible by all middle and senior management staff. The combined system:
• provides a central register of all current permanent staff and those who have left since April 1st 1985;
• records information on staff's academic qualifications, pay, skills, job history, staff reports, seniority, age, grade, emergency contacts, sick leave record, disabilities, etc;
• provides staffing statistics and forecasts;
• maintains promotion board and training records;
• interfaces with financial and physical resource information systems.

Previously, individual groups within the organization kept their own manual personnel records, with copies being held centrally. All records are now held centrally on the computer, although some groups have been slow to relinquish their manual systems entirely. Ravi Besant, the organisation's MIS Manager understands the slow pace of change, "Of course, everyone likes to keep control over their own little patch, and there were fears - luckily for me, fears not justified in practice - that computer breakdowns would prevent access to data. But I think staff do now see the benefits of only having to enter data once, the lack of duplication, and the consistency that comes from having only a single copy of any person's records. With the network in place, any manager in the organization can immediately access any staff member's records whereas before they'd find themselves having to send for files from the central registry, which could take time or occasionally led to files being lost and having to be recreated."

Shana Braidlaw, in charge of the organization's product development team, agrees with Besant's analysis. "We did worry for a while about the impact of computerisation, but I'm now sold on the development. I can give a recent example of an internal complaint that arose about pay parity between men and women. Previously, it would have taken one of my clerical staff a day or more to pull out relevant information from the files. As it is, with the computer, it took me just a couple of minutes to find the pay and seniority details of all staff at the complainant's grade. I was then able to cut the data different ways to find out if there was a case to answer. Likewise, before meetings with my staff, I can pull up their details instantly and don't have to wait for files to arrive."

Braidlaw also feels she has a better handle on her team through the computer system. "I've had the system set up so it provides me with monthly reports on staff training, and exception reporting on levels of absenteeism and sick leave. It's not a substitute for 'management by walking about' but it is an additional string to my management bow in helping me understand where issues are likely to arise within the team. So I guess it makes me feel I'm being a more effective manager by picking up on things that might otherwise be left to fester."

Besant however have some regrets and would also approach the system differently today. "For what we did, at the time we did it, I don't have any regrets: we really didn't have any choices. But at that time, we had to go down the route of custom-build. Like anything built from scratch, that costs and takes time. Today there are much cheaper off-the-shelf packages that, with a bit of tinkering, could meet our needs just as effectively at a fraction of the cost."
4.5. Comparing MIS with Other Information Systems
How do the features of a management information system compare with other information systems? We can summarise a few general points about MIS:

- Monitoring and control is central to MIS, the focus is therefore mainly on information about what has happened (or is happening) rather than, as with planning, what will happen
- Processing are generally based on relatively simple aggregation and summary of data
- MIS normally feed into some human decision making and action based on reports.
- MIS are mainly targeted at operational and tactical management tasks
- Unless custom-written, MIS are typically based on a database system because of the superior query and reporting capabilities of DBMS.
- MIS have an internal rather than external orientation

However, people use the term MIS differently, and you need to check what they mean by it.
5. DECISION SUPPORT SYSTEMS
Decision-making is an essential component of organisational life. Decision makers receive and analyse information using many different media, including traditional print, group and interpersonal information exchanges and computer-based tools.

Decision support systems (DSS) is a generic concept that describes information systems that provide analytical modelling and information to support semi-structured and unstructured organisational decision making.

Common characteristics of DSS include
- Problem structuredness, used in semi-structured and unstructured decision context
- Intended to support and augment decision makers not replace them
- Supports most phases of decision-making process
- Uses underlying data and model
- Interactive: DSS is designed to be an interactive decision aid

5.1. Management Planning Systems
One role of decision support systems in organisations is to support managerial planning and modelling. We will therefore start our investigation of DSS with a deeper understanding of the managerial processes that they support. Figure 6 describes a generic rational model of a management planning system.

**Figure 6: Management Planning System**
The planning system has several elements

- objectives and value of outcomes,
- data,
- a model describing data relationships.
- possible actions to achieve the objective
- possible events that are outside management control but that might affect future actions
- analysis and evaluation of possible actions and events
- plans to be implemented

**Exercise 6**

You are a manager involved in wage negotiations with union representatives. You are to set up a decision support system to help with those negotiations. Specifically, the DSS is there to help you decide on the optimum wage increase for staff.

1. What might be your overall objective in deciding the level of wage increase?

2. What situation-specific data might you use in the DSS?

3. What would be the model/relationship for input and output variables?

4. What might be the different possible actions, i.e. the different decisions that you could take?

5. What possible other events could affect the outcome?

6. What kind of evaluation programme might you undertake?
Although planning is one activity where DSS could be used, DSS can be applied to aid decision makers across organisational functions in tackling a wide variety of organisational problems including routing, queuing, evaluating, predicting and so forth. The following table summarizes common DSS applications for specific organisational areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Common DSS Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>Cost analysis, breakeven analysis, depreciation methods, tax computation and analysis</td>
</tr>
<tr>
<td>Finance</td>
<td>Return on investment, buy or lease, budgeting, cash flow analysis</td>
</tr>
<tr>
<td>Marketing</td>
<td>Product demand forecast, advertising strategy analysis, pricing strategies, market share analysis, sales performance, sales growth</td>
</tr>
<tr>
<td>Human resources</td>
<td>Labour negotiations, labour market analysis, fringe benefit computations, personnel skills assessment, strategic human resource planning</td>
</tr>
<tr>
<td>Production</td>
<td>Product design, production scheduling, transportation analysis, product mix inventory, economic production quantity, job assignment</td>
</tr>
<tr>
<td>Materials Management</td>
<td>A DSS might be used to model different scenarios. For example, different ways in which stock-on-hand could be reduced to meet an overall requirement for a cut in capital tied up in inventory, economic order quantity,</td>
</tr>
</tbody>
</table>

5.2 DSS Features
5.2.1 Architecture of DSS
Like the architecture of other information systems, DSS consists of the CIPSODA components.

- Capture and inputs are data and models
- Storage manages the storage, retrieval and integration of both data and models
- Processing supports the merging of data with models, in this it supports the analysis and evaluation stage and therefore helps to provide a better understanding of the decision situation and decision options
- Outputs are graphs and textual reports
- Decision and action elements, DSS provide an environment for utilizing data, models and/or communications to solve problems and make decisions

The following figure represents a simple DSS architecture.
5.2.2. Types of DSS

The DSS architecture described in figure 7 emphasizes on data and models. However, there are several types of DSS. Understanding these categories help in integrating, evaluating and selecting appropriate mechanisms to support organisational decision makers.

DSS could be categorized based on the dominant technology component or driver of decision support, the targeted users, the specific purposes of the system and the deployment technology. Here we will discuss five generic types of DSS based on one major dimension, that of the dominant technology and three secondary dimensions. Based on the dominant technology component, DSS could be categorized as communications-driven, data-driven, document-driven, knowledge-driven, and model-driven. Some DSS are however hybrid systems driven by more than one major DSS component.

Each generic DSS could then be targeted to individuals or groups who are either internal or external to the organisation. In addition, the DSS can have broad or narrow purposes. DSS with a narrow purpose (such as budgeting or air ticket booking) are referred to as function or industry specific DSS while those that can support general purposes are called DSS generators. In terms of the deployment technology, DSS could be deployed over mainframes, PCs, client/server or Web-based architecture.

Data-driven DSS emphasize on access to and manipulation of large databases of structured data especially a time-serious of internal company data and sometimes-external data too. Examples include simple file systems accessed by query and
retrieval tools, and data warehouse systems that require more general and analytical tool.

Model-driven DSS include systems that allow access to accounting and finance, optimisation, statistical, mathematical and analytical models. Of course model driven DSS use data and parameters provided by decision makers in analysing a decision-making situation. But the emphasis is more on models and such systems are not as data intensive as data-driven systems.

Knowledge-driven DSS refer to DSS that not only help to analyse the decision situation but also recommend alternative rational decision actions. Such systems are also known as expert systems and decision subscribing systems. The expertise consists of knowledge about a particular domain, understanding of problems within that domain and skill at solving some of these problems.

Document-driven DSS help decision makers to access, retrieve and manipulate unstructured documents such as policies and procedures, product specifications, catalogues and Web pages. A search engine is a typical example of a document-driven DSS.

Communications-driven DSS include systems with features that support communication and collaboration tools together with decision models. Such systems are also known as group decision support systems (GDSS). The system is intended to facilitate the discussion of the problem, evaluation of alternatives, consensus building or alternative ranking by decision makers working together as a group.

The above different categories of DSS and the sub categories have several design, implementation and use implications. For example in data-driven DSS, designers should anticipate the user’s interest in applying the system in novel situations. The implementation of alternatives prescribed from knowledge-based systems assumes rational model of organisations, which may not be the case all the time. In model driven DSS, choosing appropriate models is a critical issue and understanding the models requires extensive users’ training. Table summarizes the different categories of DSS.

<table>
<thead>
<tr>
<th>Student Advising DSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>From (Jessup and Valacich, 2003)</td>
</tr>
<tr>
<td>Good student advising for course selection is one way to help retain students. Student advising is a time consuming activity for faculty involved in the process and is particularly important for newly starting students. Also it is particularly difficult to schedule advising sessions for part-time students. A university developed and implemented a Web based system to help students select modules. The system is linked to the university-wide database of student records so that it can consider a list of all completed courses as well as student interests when making recommendations. The DSS adviser makes course suggestions while considering degree requirements, prerequisites, availability, and student interests. The system knows when courses will be offered and can analyse the transcript of transfer students and reconcile them with existing degree requirements. The goal of the system is to mimic the experts of the faculty and professional advisors but in some ways it is better than the experts because it has a complete knowledge of the entire problem.</td>
</tr>
</tbody>
</table>

To think about:
1. If such a system is to be introduced here in Manchester, would you use it? Why?
2. Do you agree with the notion that the DSS system “has a complete knowledge of the entire problem”? Why?

A. Molla, R. Heeks and R. Boateng, 2009
Table 4 Categories of DSS

<table>
<thead>
<tr>
<th>Dominant DSS Component</th>
<th>Target Users: Internal  E External</th>
<th>Purpose: General  E Specific</th>
<th>Deployment Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>Internal teams, now expanding to partners</td>
<td>Conduct a meeting or Help users collaborate</td>
<td>Web or Client/Server</td>
</tr>
<tr>
<td>Communications -Driven DSS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database</td>
<td>Managers, staff, new suppliers</td>
<td>Query a Data Warehouse</td>
<td>Main Frame, Client/Server, Web</td>
</tr>
<tr>
<td>Data Driven DSS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document base</td>
<td>the user group is expanding</td>
<td>Search Web pages or Find documents</td>
<td>Web or Client/Server</td>
</tr>
<tr>
<td>Document Driven DSS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge base</td>
<td>Internal users, new customers</td>
<td>Management Advice or Choose products</td>
<td>Client/Server, Web, Stand-alone PC</td>
</tr>
<tr>
<td>Knowledge Driven DSS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Models</td>
<td>Managers and staff, new customers</td>
<td>Crew Scheduling or Decision Analysis</td>
<td>Stand-alone PC or Client/Server or Web</td>
</tr>
<tr>
<td>Model-Driven DSS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Source: Power, 2000)

5.3. DSS in the Public Sector

Decision support systems have been created to support the whole range of public planning activities and services. Just a few examples are provided here of DSS that are used in public sector management and services.

Budgeting

Budgeting is a major public sector application of decision support systems. DSS can aid in public sector budget formulation process. This covers from basic recording of draft budget submissions, calculating relevant aggregate figures; printing initial allocation ceilings based on an update of the previous year's figures to analysing different events and actions to produce a judicious budget allocation. DSS aid to evaluate various scenarios such as:

- Events that may affect either the overall budget environment or particular budget items could be analysed using “What ifs” analyses. Examples of such events include inflation and wage increases; foreign exchange fluctuation and interest variations, impacts of introducing bonus schemes.

- Actions that may affect the overall budget environment or individual budget items could also be analysed. Some of such actions one might consider in the budget process cover cutting one budget item, delaying payments to creditors, impact of varying percentage cut or increase on training.

- Evaluation of various goals-seeking scenarios. For example, if the IT budget is to be reduced by 10% overall, the impact of scenarios such as reducing maintenance budget only; postponing new systems development projects,
considering outsourcing, revoking some software licences, etc could be evaluated

**Macroeconomic Modelling**

Decision support systems have been created to support the whole range of public planning activities. Some potential areas include

- The Ministry of Finance/Treasury in many countries makes use of computerised models of the whole national economy. These are used to plan out different policies for interest rates, inflation targets, public sector borrowing, taxes, employment, etc. They may also use global/inter-country trade models to plan out policies on import tariffs, export promotion, trade regulation, and the like.

- Ministries of Industry and Agriculture may use sectoral decision support systems to model economic sectors and plan decisions about subsidies, support to particular product mixes, etc.

- Ministries of Labour or Education may use manpower planning decision support systems to evaluate different economic events and different training actions to help plan employment and education policy.

**Public Services**

Public service providers develop decision support systems in order to plan service provision. To take the single instance of the health sector, decision support systems are used to assist planning decisions such as:

- Planning where to build new health centres and hospitals; when to build them; and how many to build. Models here forecast health trends such as growth in demand and changes in regional distribution of illness and disease. Locational decision making may use a geographic information system, discussed later in the unit.

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**GIS-Based Floodplain Mapping in Wisconsin**

*(from McGarigle 1999)*

Winnebago County in Wisconsin lies on the western shore of Lake Winnebago and almost a third of the county lies on a floodplain. Buildings located in flood-prone areas are required to take out additional flood insurance. Decisions about which buildings fell inside or outside the floodplain boundary were based on outdated, manually plotted maps where even the drawn line ‘can represent as much as 50 to 100 feet, depending on how thick the ink was when it came out of the pen’.

The county decided to address this situation by investing in a GIS. This firstly provided a far more accurate map of the county, accurate down to two feet. The GIS was then used to project the floodplain for a "100-year flood", and this was then set as the revised floodplain boundary. This showed the old boundary to have been way out in some areas. Of 5,700 buildings originally marked as lying within areas in danger of flooding, the GIS showed 2,400 were wrongly categorised. Given average flood insurance costs of US$12,000 over the life of a 30-year mortgage, this will mean total savings to householders of some $28.8 million thanks to this re-zoning.

Another 1,300 homes were found to have been wrongly identified as outside the floodplain. Although the value of these properties is likely to fall, owners ‘will now have something they do not currently have: flood-insurance protection’. The county and federal emergency management officials have also benefited, with a clearer sense of where and how much assistance may need to be targeted in the event of a major flood.
• Deciding on the personnel policies that will produce the optimum mix of health auxiliaries, paramedics, nurses and doctors.

• Deciding which health treatments to refuse to undertake because of their high cost. Or, deciding how many of a particular type of health treatment will be scheduled in a given year, with the rest put on a waiting list for the next year.

5.4. Potential Benefits of DSS
Read through the following cases and identify the potential benefits of DSS. If your interest is in DSS application in business organisations read the first case and sift through the second. But if your interest is in the public sector read the second case and sift through the first.

DSS for an Energy Company
(Developed based on Laudon and Laudon, 2000)

There are many variables associated with running an energy company in the oil and gas business. Some of these variables include the ratio of gas and oil in a field, development and production cost, and fluctuating world supply and price. The number and complex relationship among these variables makes it difficult for managers to determine the cost-effectiveness of their business decisions.

Aiming to improve this, Pioneer Natural resources (PNR) in Texas decided to create a DSS that could provide more precise information for those decisions. First the company executives identified all of the management variables and diagrammed all of the business processes to create a model that could show the impact on the business when one or more of those variables changed. Then this model was converted to a DSS using Powersim simulation development tool that uses Excel spreadsheet and Access databases. The system was piloted tested using scenarios from the company’s gulf coast division and rolled out.

The first impact was to improve the analysis of data that has always been at the disposal of the managers but in a more comprehensive and useful way. For example by modelling different scenarios with the DSS, PNR managers can determine how much more to pay a service company to put a well into production earlier yet still earn a profit. The system allows a range of “what if” and “goal seek” processing by pulling the relevant data from the Access database and performing calculations based on user-defined variables.

The company uses the system to decide whether or not to respond to a sudden surge in the world oil price by increasing its production capacity. The tool provides management with more control by helping managers determine the specific actions necessary to arrive at a desired business result or model the result of each business decision under consideration. The company believes that each of its five divisions could potentially raise revenues by 25 to 40 percent using the DSS.
Every state in India is made up of several districts, each of which has a population of several hundred thousand people. Government planning at the district level has tended to be rather ad hoc, even politicised, and will frequently be based on informal information and informal criteria rather than any rational basis.

Aiming to improve on this, the state government in Gujarat introduced computerised decision support systems at the district level. The first impact was to improve the analysis of the data that had always been at the disposal of planners. Analysis of trends in land dispute claims, for example, showed that these increase dramatically at harvest time. Planners had been aware of this, but they were now able to plan more accurately the timing and numbers of staff to allocate to dispute resolution.

Planners are constantly having to make decisions about the location and allocation of resources between different towns and villages. If the state government decides to subsidise, say, new enterprises utilising wood products, where in the district should such enterprises best be located? If the federal government decides to distribute milch cattle, which villages should be prioritised?

Previously such decisions were either made on the basis of 'decibel planning' (i.e. which town/village committees shouted loudest) or they required weeks, even months, of data-gathering. Thanks to the DSS, a set of predetermined priorities and criteria can be selected and then entered into the DSS, which will produce an optimal set of priorities within a matter of seconds. Different priority/criteria sets can then be input, and different answers produced. These can then be discussed with politicians, committees, etc. However, the planner now has a more rational basis for discussion. Discussions about alternative possibilities can therefore become more objective and reasoned since everyone knows the basis on which selections are being made.

Finally, the DSS has been used to calculate cross-district averages. The planners now have answers to questions such as: What is average farm income in the district? What is average land productivity in the district? How much, on average, does it cost to set up a new primary school, health centre or drinking water supply? Not only does this provide them with a sounder basis on which to plan policy decisions, it also gives them a better understanding of their district and of the ways in which particular areas and projects in the district deviate from the norm.
5.5. Practical DSS Exercise – IT Investment Appraisal

The following is a simple IT project appraisal exercise to be developed using Ms Excel environment. After going through this practical exercise, you will have a better understanding of how DSS could be used to support decisions.

The Problem

The hypothetical company in this case, Legal power, is a medium sized professional legal services provider employing about 150 persons. Most of the employees have a PC on their desktop but rarely use them except to produce documents and read emails. With the existing practice it is not possible to exactly determine how long an employee has spent with a particular client and how much to charge a client is always subject to guesswork. Oftentimes, lawyers do not keep a detailed dairy of their activities and it is difficult to get the hours they spent on cases, which are the basis to bill clients. The company do not also have a client database and mostly depends on the record of individual lawyers. In addition, most of the lawyers prefer fax to communicate both locally and internationally leaving the company with massive bills.

Legal power is incurring huge operational costs in running the business and clients are complaining about the quality of service they are receiving. The company has recently lost some major clients. Its overall business volume and profit is declining over the last three years. The chairman of the company is considering investing on information systems to track the activities of lawyers and the time they spent with clients; improve communication and relationship with clients. With the system she hopes to reduce the operational cost, improve customer service and overall profitability.

The Solution

The Chairman contacted a local IS developer who after conducting a preliminary study provided her with the following technical solution

- Create a local area network with a capacity of 100 users scalable to maximum of 200
- Three Microsoft Systems Management Servers (SMS 2.0)
- Replace all the existing desktop hardware with new multimedia computers with Windows XP and Office XP
- Install a networked relational database
- Internet and Intranet for both internal and external nail system
- Connect the LAN to Lexis (a legal database) to get access to information
- Hire a new information systems manager, four systems personnel and 2 user support officers
- Contract out training of lawyers to an outside training provider

In addition, the developer produced the following cost and benefits estimates

- Initial investment cost (year 0), £741, 240 and total cost over 6 years of £2, 095, 040
- Estimated benefits after six years total £3, 836, 500
- Detailed cost and benefit figures are provided in the following table (this figures are fictitious)
### Cost and Benefit Estimates in £, 2003-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Hardware Costs</th>
<th>Software Costs</th>
<th>Services Costs</th>
<th>Personnel Costs</th>
<th>Total Costs</th>
<th>Total Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>£741,240.00</td>
<td>£227,760.00</td>
<td>£227,760.00</td>
<td>£227,760.00</td>
<td>£2,095,040.00</td>
<td>£3,836,500.00</td>
</tr>
</tbody>
</table>

**Required**

Should the manager invest on this project? Using Microsoft Excel, conduct a financial analysis to decide if the investment is worthwhile.
Activities
1. Open Microsoft excel
2. On the work sheet, enter the above cost and benefit estimates
3. Save your file as my investment
4. There are various financial analysis models to evaluate the above investment. In this exercise we will use the payback method, the rate of return on investment (ROI) and the net present value
5. Payback method measures the time required to pay back the initial investment of a project. It is the ratio of original investment to annual net cash in flow. To work out this period, you first need to calculate the net cash flow, which is the benefit of each year minus the cost of the year.
   - In cell B55 write Net cash flow. Then in D55 build a formula that deducts D44 from D53 (=D53-D44).
   - Copy this formula to E55, F55, G55, H55 and I55
   - Because cash flows are unequal we need to calculate the cumulative cash inflows to estimate the no of years it would take for the initial investment to pay itself. In cell B56 write Cumulative cash flows,
   - Then in cell D56, copy D55 or enter the following formula (=D55); in E56 enter a formula that adds E55 to D56 (=D56+E55). Copy this formula to F56, G56, H56 and I56. In K56 insert a formula that sums the net cash inflows.
   - Based on the above computation you can see that it would take approximately between 2.4 and 2.5 years to pay back the initial investment. The limitation of this method is that it doesn’t take into account the time value of money, the amount of cash flows after the pay back period, the disposal value of the investment (which in the case of computer systems is zero)
6. Return On Investment method. This method calculates the rate of return from an investment by adjusting cash inflows produced by the investment for depreciation. The method provides an estimate of the income earned by the project. ROI is computed as the ratio of benefit to total initial investment. Benefit is total benefit minus total cost minus depreciation divided by useful life. The return on investment should normally be more than the cost of capital (borrowing interest rate) or other investment returns to accept an investment
   - In cell B58 write Net benefit
   - In cell D58 enter the formula to calculate net benefit (total benefit-total cost-depreciation)/useful life. =(K53-K44-D44)/6
   - In cell B59 Write Return on investment. In D59 build a formula to calculate the ROI, i.e., net benefit divided by total initial investment (=D58/D44)
   - The ROI on this particular investment is about 22%. This figure has to be compared with the cost of borrowing capital and the return rate from other contending investments. One limitation of ROI however is it doesn’t take into consideration the time value of money
7. Net Present value method computes the value of the investment discounted in current dollar terms. This is because the value of the money you have today and
the value of the money you receive four or five years down the line are not equal. Therefore money received in the future needs to be adjusted (discounted) by a fixed rate (normally the prevailing interest rate or cost of capital).

- In cell B61 write Discount factor and in D61 put the value of the discount factor at 5%
- In cell B62 write Net Present Value.
- In D62 insert the function for computing Net present value (Insert menu, function, choose financial from function category; choose NPV from function type). The function would take a form such as ‘=NPV(Rate, Values)’ where "rate" is the discount rate (D61) and "values" is the block of cells containing the net cash flow figures, that is D55 to I55). In this case D62 would contain ‘=NPV(D61,D55:I55)’. This computation results in NPV of 978,490.

8. After building the DSS model, it is now possible to change the variables and perform a number of analyses. For example, a basic sensitivity analysis could be conducted to see the impact of the following variations on the payback period, net present value and ROI

- A 90% reduction on all estimates of lawyer efficiency
- No gain from the reduced clerical staff
- A 50% increase on all hardware costs
- Total cancellation of services
- Not maintaining in house IT Staff. But consider outsourcing with an initial flat fee of 300,000 per year for two years and 175000 per year then after

A Sensitivity goal seek analysis could also be performed, say if the manager would consider the investment only if

- It pays back the initial investment in not more than 2 years
- The return on investment is to be 25%
- A minimum net present value of a million pound

Similar evaluations could also be undertaken of

- Actions: such as upgrading the security of the system which requires an additional investment of 200,000 in firewall in years 3, 4, and 5
- Events, that is an anticipated increase in the cost of capital to 15%
- Events, eg, natural disaster in year 2

9. What are the disadvantages of using the system you just built?
### 5.6. Comparing DSS With MIS

**Exercise 7**

Fill in the following table, which provides a summary of the typical differences between an MIS and a DSS. One may see some overlapping, for example where an MIS has strong ad hoc query facilities, or a DSS is based on a simple model. However, in filling in the table, you should look more for differences than overlaps.

<table>
<thead>
<tr>
<th>Feature</th>
<th>MIS</th>
<th>DSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Management System supported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Level Targeted?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decisions Involved: How Structured,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity to Cope with Uncertainty?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is Produced for/by User in Standard Operation of System?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past Data is Used to Generate Information About: Past or Future?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How Simple or Complex is Analysis?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intended Outcome: Mainly Efficiency or Mainly Effectiveness?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is System Intended to Provide to Achieve Outcome?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical Scope: Organisations and/or Units and/or Individuals?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Developed Typically by Specialist or by User?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. EXECUTIVE INFORMATION SYSTEMS

Definition: "information systems that is highly interactive and that provide the information and other functions necessary for strategic decision making.". EIS help managers get the most accurate and immediate picture of the organisation and its environment.

6.1 Features of EIS

Read through the following reading and note down the features/components of executive information systems that are described.

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EIS at Motorola
Adapted from Nov. 15, 1998 issue of CIO Magazine

AT MOTOROLA INC.'S SEMICONDUCTOR Products Sector (SPS), putting timely information into the hands of managers used to be a problem, given the global scope of the company's operations. The sector had reams of detailed information stored in data warehouses. But the data wasn't doing anyone at the company much good because end users couldn't easily find what they were looking for. In addition, getting information from the system requires managers to know detailed SQL search commands.

Then in 1994 SPS implemented an executive information system (EIS) that let managers in the finance department quickly access data warehouse information from their desktops. Today SPS has moved the system over to an intranet that's available to other executives besides those in finance, and in the process it has reduced headaches involved in implementing and maintaining new applications.

Now accessing customer-centric data is as easy as point and click. Every transaction is captured, making it possible to drill down to the level of individual customers. In about five minutes, managers can find out what customers are buying, their order histories and the status of their current orders. Having the information so accessible enables managers to be a lot more proactive when problems arise. If for some reason a customer doesn't receive a shipment when promised, a manager will know that immediately and can find out why. SPS is even expanding on the anywhere/anytime computing model the Internet supports. About 700 managers equipped with Motorola pagers get the latest intranet-based business information sent to them on the road. If there are specific problems, they can drill down and drill across to locate the source of the problem and take immediate actions before things get out of hand.

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Following is a simple EIS model

**Figure Simple Executive Information System Architecture**

6.2 EIS in the Public Sector

The following case describes an example of the application of EIS in the public sector

**The City Office for Social Services' Executive Information System**

The City Office for Social Services had been coming under increasing pressure to improve performance and reduce budget deficits. When Mei-Xiang Zhao arrived as the new Office Head, she found her small management team had a lot of separate answers, but that she had no direct access to the 'big picture'. As a result, she set about requesting the creation of an executive information system.

Derek Schwarz, who has a part-time responsibility for the Office's computer systems, takes up the story. "We were fortunate - or maybe farsighted - in that all the main IS were based on similar hardware platforms and used the same basic database. Size also helped [the Office has just 17 staff and the City a population of less than 100,000]. So, while bringing all that data together - the finance, the HR, the social services - while that still give me my share of sleepless nights, it wasn't the impossibility that I've seen in some other agencies."

"We've also had good luck in other ways," reports Schwarz. "The finance system had a fairly comprehensive set of ad hoc reporting and modelling tools built for the Finance Officer and the system developer was still around in City Hall. We seconded him for a month and he was able to bolt those management tools on as the front end of the EIS. Ms Zhao's fairly computer-savvy so we didn't have to waste time with the idiot-proofing, two-item menus, and 'Press this button now' kind of stuff you have to put in for some of the senior managers or politicos."
The EIS has both drill down and drill across facilities. Zhao explains, "For instance, if we've got an overspend in the overall bottom line, I can drill down to the level of individual work groups to find out where the problem lies, and then drill down further to their individual budget lines to identify what I need to be focusing my team on. If it was a payroll line item, then I can drill across from finance to HR data to find out which staff are involved; maybe who's been doing overtime, so I can then chase up to discover why."

This has not been perfect, as Zhao notes, "The ability to access the data any which way and punch up any sort of graph means I did spend some late nights just playing around and 'finding out' a lot about the Office. Some of these things subsequently turned out to be incorrect. So I make sure these days that I always 'reality check' whatever the computer data is telling me."

The EIS has subsequently been integrated with the Office's office automation suite. Zhao can now cut and paste performance graphs and accounts tables into documents like the Office's annual report; or can fire off an email message requesting further information or action with the relevant system data attached.

Zhao has been impressed. And she's not the only one. "Every time my staff saw the system, the cry went up 'Hey, I want one of those too'. So now we're in the process of rolling out cut-down versions to the other management grades so they can get some of the benefits I've found."

6.3. Potential Benefits of EIS
The potential benefits of executive information systems derive from the features listed above, and are similar to those for other management support systems:

- faster decision making due to earlier identification of problems and faster delivery of information
- better decision making due mainly to a better understanding of the organisation and its environment, including:
  - more general background and contextual information for decisions, including unstructured decisions
  - more, and more formal, information about current organisational performance and future trends
  - less irrelevant information through filtering and drill down capabilities
  - the ability to model and evaluate strategic plan options.
- faster implementation of decisions due to electronic communication and word processing capabilities
- managers may also be more willing to devolve decision-making responsibilities if the EIS provides them with confidence that they are successfully monitoring performance.

6.3. Comparing EIS with Other Information Systems
Here below is a relative comparison of EIS with the two previous management and organisation support systems. This comparison is relative and shouldn’t be taken in absolute terms. For instance, customer relationship management applications deployed at operational level allow drill-down and across capabilities to provide service operators with detailed customer data.
## Feature Table

<table>
<thead>
<tr>
<th>Feature</th>
<th>MIS</th>
<th>DSS</th>
<th>EIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>What the system supports</td>
<td>Pont to existence of potential problems</td>
<td>Help in making decision about problems</td>
<td>Add data analysis and reporting flexibility over and above MIS and DSS</td>
</tr>
<tr>
<td>Organisational system supported</td>
<td>Functional area monitoring and controlling</td>
<td>Planning and modelling</td>
<td>Overall organisational performance and market forces activities</td>
</tr>
<tr>
<td>Management level</td>
<td>Operational and tactical</td>
<td>Tactical</td>
<td>Strategic</td>
</tr>
<tr>
<td>Problem structure</td>
<td>Structured</td>
<td>Semi-structured</td>
<td>Largely unstructured</td>
</tr>
<tr>
<td>Information (data) coverage (source)</td>
<td>Internal</td>
<td>Mostly internal and some external</td>
<td>Internal and external</td>
</tr>
<tr>
<td>Output</td>
<td>Standardised reports</td>
<td>Model and data analysis environment</td>
<td>Flexible and customisable working environment</td>
</tr>
<tr>
<td>Extent of data integration required</td>
<td>Medium</td>
<td>High for data-driven DSS</td>
<td>High</td>
</tr>
</tbody>
</table>

### 7. Management Support Systems Issues and Potential Disadvantages

So far we have focused on the positive contributions of operational and management support systems. However, the realisation of such benefits depend on success in developing, implementing, deploying and using these systems. There are several issues that affect this process. Following the onionskin model, these could be catalogued as:

- External environment
- Organisational environment
- Systems development environment
- Operation environment
- User environment
- Information and data environment

In addition, even if systems are implemented and utilized successfully, there are concerns about some disadvantages associated with information systems. Read through the reading below and note down any disadvantages associated with the management support system described in the reading.
Impact of Computerised Support for Admissions Decisions
(From Avgerou & Mulira 1996:238—239)

"For the Ministry of Education and the university staff of the Makerere University in Uganda, the admission system is a means for selecting suitable candidates in a systematic and fair way. In an environment where corruption is rife and competition high, combating corruption is a priority. As seen in the case of Makerere University, the computerized admission system appears fair to the majority of candidates.

However, the Makerere University admissions system is using a computer system to simulate complex social systems. The old admissions system, which used application forms, provided more information about the candidates and gave more scope to the student, career teachers and head teachers to influence the admissions process. … The current admissions system – which totally excludes judgment of general qualities of the candidates – has contributed to the questionable quality of university students. With the aim of eradicating tedious manual entries, the coding sheets for the computer-based admissions system were designed with only one entry provision for academic qualification. There is no entry for the candidate's general academic performance from the head teacher or career guidance teacher. Indeed, the university Vice Chancellor is concerend about the kind of students that are admitted to Makerere.

In an effort to enhance the education of women, especially in science and technical fields, Makerere has taken steps to increase the numbers of women admitted. In 1990, the university decided that 1.5 points should be added to the weights of female applicants per course. Although the percentage of women admitted has gone up, the number of eligible female candidates is still very low. The 1.5 points bonus for women applicants is in line with government broad policy but has raised the question of whether women are the only disadvantaged class. Are women more deserving than boys from peasant backgrounds whose only chance to overcome their station is through higher education? Since the bonus does not take into consideration the candidate's social circumstances, such a policy only affects a small percentage of girls on the margin. There is nothing outside [school exam] grades considered to throw some light on the candidate's capabilities or character, or her/his circumstances, misfortune or disabilities.

Thus, for the government and the university authorities, it is perhaps ironic that the same system that combats corruption perpetuates another evil – bureaucratic inertia. … The centralized, rigid and inflexible system used for university admissions is insufficient to guarantee ethical, human choice; and such rationalism impedes the development of compelling, philosophically sound objectives."

Reflection
Reflect back to an organisation with which you are familiar. Using an example of a computerized information system make notes on the following points

1. How do you describe the functionality of the system in OAS/TPS/MIS/DSS/EIS terms?

2. What benefits has management obtained as a result of the computerized information systems? Do you think that other members of your organisation agree with your description? Why?

3. What would you consider as the greatest problems (disadvantages) of the computerized information system? Why?
References


Web Resources

DSS resources
http://www.dssresources.com/index.html

Some DSS applications for personal use such as estimating life expectancy, planning for insurance, planning college loan or other payments, planning for retirement, etc http://moneycentral.msn.com/investor/calcs/n_expect/main.asp
http://www.moneycentral.com

Online Microsoft licensing configrator (needs registration)
http://www.greymatter.com/Licensing/lol/

Expert systems (including online demonstrations)
http://www.exsys.com

Practical cases on a variety of information systems
www.cio.com

Cases for the application of IT in the government sector
http://www.govtech.net/magazine