Chapter 12

THE ENGINEER, USER OF INFORMATION AND COMMUNICATION SYSTEMS

Introduction

- Information and communication technologies (ICTs) can be used to:
  - Corporate communication/diffusion (spreading) of information.
  - Marketing
  - Decision making
  - Business-to-business communication and e-commerce
  - streamline the business value chain.
  - Mass customisation
  - Telecommuting.
  - Virtual office.

Introduction (Cont.)

Using of computers, networks and various types of software in various engineering discipline:

Engineering disciple	Applications of information and communication systems
Aeronautical engineering	The design, wind tunnel testing and production of aircraft
Chemical engineering	The design (CAD) and control of plants; simulation of chemical reactions; design reactors, flow systems and distillation columns;
Civil engineering	stress analysis
Electrical (including electronic)engineering	Circuit design and analysis; power distribution and control; 3G network planning; optimisation software; measurement and automatic control; PLCs; Supervisory Control and Data Acquisition (SCADA).
Mining engineering	Mine design, mine optimisation, production scheduling
Product and process engineering	Computer-aided engineering and design extranets enable a company and its business partners to jointly design products and processes (O'Brien: 50)

Data, information and knowledge

- Examples of data:
  - Measurements, facts, figures, (computer instructions)codes and names
- Information is more useful for decision making. It is processed data.
- Criterial that information must meet:
  - Accurate
  - relevant to the decision to be taken
  - Concise, easily to understand and well presented
  - Provided in an appropriate medium
  - provided timely
  - cost-effective

Data, information and knowledge (Cont.)

- Information is the source which knowledge originates and insight originates from knowledge.
- Accountants, clerks, engineers, lawyers, computer programmers, system analysts, managers, physicians, librarians and auditors are all information or knowledge workers.
- Various activities/jobs that a knowledge (or information) worker may do.
  - Creates and collects information
  - Acquires information resources
  - Organises information
  - Stores the information received
  - Analyses information
  - Presents or uses information
  - Distributes information
  - Makes decisions based on information
  - Maintains information systems

Information needs and responsibilities

- Questions that can be used to identify the information needs of decision makers:
  - What types of decisions do you make regularly?
  - What information do you need to make these decisions?
  - What information do you get regularly?
  - What information would you like to get that you are not getting now?
  - What information would you want daily? weekly? monthly? yearly
  - What data analysis programs would you like to use?
  - How much information is needed?
  - How, when and by whom will the information be used?
  - In what form is information needed?
  - What information is necessary for planning and controlling operations at different organisational levels?
  - What information is needed to allocate resources?
  - What information is needed to evaluate performance?
  - What information is needed to improve products and services?
  - What information is needed to improve customer relations?

Information systems

- An information system is any organised combination of people, hardware, software, communication networks, and data resources that collects, transforms, and disseminates information in an organisation.
- The use of CAD (computer-aided design) reduces the time and money spent to produce and update design drawings. In some cases, the CAD is being used to control other computers and machines to manufacture basic components of equipment. Because the CAD software has the capability to perform design checks and make changes to designs as they are approved. Following can be achieved by using CAD:
  - A significant reduction in engineering errors
  - Less rework required because of design errors
  - Improved updating of designs over the former manual methods
  - More timely posting of changes to designs
- Various components of an information system:
  - Hardware
  - Models and software
  - Telecommunications and network resources
  - Databases
  - Database management systems

Uses, advantages and disadvantages of information system

- Advantages/benefits of information systems. (How can information systems be used to gain a competitive advantage?):
  - Information technology and systems assist decision makers in making complex decisions (MIS, computer assisted decision-making).
  - Information systems also help in efficiency (e.g. business process re-engineering)
  - They offer faster product/mine design
  - With information systems, a business has a competitive advantage – good tools and improved methods can provide a competitive advantage (e.g. e-commerce – B-B)
  - With information systems in place, a business can manage complexity with ease.
  - Information systems help in making faster product design and development
  - Simulation of new projects for optimization purposes (before implementation).

IT in design and product development

- Using IT in design and product development can benefit from:
  - Improve in product quality and reliable
  - Lower component and production costs
  - Operational efficiencies
  - Jut-in-time supply

IT in production and manufacturing

- Manufacturers use information systems to coordinate and control a variety of operations.
- Company uses IT to manufacture the product in bulk with less effort.
- Counting of product being manufactured can be computerised measured.

ICT in engineering management

- ICT in project management – project management software is widely used to assist project managers with the development of project schedule and with project administration.
- Three phases of management decision-making.
  - Intelligence
  - Analysis and design
  - Selection or choice.
- Purpose of a management information system (MIS).
  - An MIS supports the process of making unstructured or semi-structured decisions by performing some of the phases of the decision-making process and providing supporting information for other phases
- The decision support system (DSS) purpose is to provide the manager with the necessary information to make intelligent decisions. A DSS is a specialized MIS that supports a manager's skills at all stages of decision-making e.g.:
  - Identifying the problem
  - Choosing the relevant data
  - Selecting the approach to be used in making the decision
  - Evaluating alternative courses of action
- Expert systems as form of artificial intelligence, can assist decision makers.

E-Business

- E-business is defined as the use of internet technologies to internetwork and empower business processes, electronic commerce, and enterprise communication and collaboration within company and with its customers, suppliers, and other business stakeholders.
- E-commerce is the buying, selling, marketing and servicing of products and services across a variety of networks.
- "Bricks and clicks" is a hybrid business model in which companies use both traditional and e-business.
- The WWW-project was started 1989 by Tim Berners-Lee at CERN as a means to share research and ideas with employees and researchers around the world.
- ICT help businesses to use resources effectively:
  - Keep control of stock
  - Increase production
  - Marketing
  - Keep records
  - Communications
  - Save costs

Conclusion

- ICT especially helps companies/industries in many ways such as:
  - Marketing (spreading word of industry)
  - Research
  - Setting up meetings
  - Communication
  - Designing

References

- Ref: Management for Engineers, Technologists and Scientists, 3rd edition, by Wilhelm P. Nel