

13. Using Information Systems

Many factors can affect the ability of an information system to fulfil its goal of supporting business processes. Before an information system is developed, its purpose must be aligned with the goals of the business, a cost benefit study should be completed, and user requirements must be carefully analysed to ensure that it will provide the appropriate functionality. During the system development process, organisational standards need to be adhered to in respect of the various deliverables of the SDLC and the overall IT architecture of the organisation. But over and above these planning and acquisition issues, the final measure of success for an information system depends on how it is *used* – are employees happy to incorporate it into their data processing activities; does it deliver the information that they need; is the integrity of information guaranteed; can human or technical problems be identified and corrected? No matter how carefully a system has been developed, there are still potential problems associated with its use in the real world, which need to be included in an IS management strategy.

13.1 Change Management

One of the main reasons that information systems fail, is that users resist change. Many individuals believe that their skills and experience will be of less value in an automated environment, which threatens their job or status. Users may refuse to adapt to new methods of working, or while using the new system may attempt to undermine its efficiency. Acceptance of the system can be significantly improved through the implementation of a change management strategy.

During the *systems analysis* phase, users should be involved in the identification of problems that occur in existing systems, and given the opportunity to express their own information requirements. If they are made aware of shortcomings in the old system and of how these will be alleviated when the new system has been implemented, then they are more likely to accept the change. Where decisions need to be made between alternatives, users should be part of the decision-making process rather than being presented with a unilateral solution.

The *design* phase of the SDLC involves the “make or buy” decision. The evaluation of commercial packages should be done by a team that includes users as well as managers and technicians, so that any operational concerns can be raised and clarified. If a system is to be developed in-house (or outsourced), then the users should be consulted about the layout of screens for data capture, and the format of reports. Finally, if the new system will result in changes to existing work procedures, the impact should be discussed and any problems or training needs identified.

User training falls within the *systems implementation* stage of the SDLC, and should involve more than just teaching users how to operate the new system. They must also understand what the purpose of the system is, what benefits it is expected to generate for the business, what problems could result if it is incorrectly used, and the importance of their role in its successful implementation.

13.2 Ergonomics

Ergonomics refers to design principles that support safety and efficiency in the workplace. Uncomfortably aligned computer monitors and keyboards, or the incorrect height of chairs and desks, may result in neck or back pain; eye strain can be caused by screen glare or poor display resolution; and repetitive strain injuries (RSI) such as carpal tunnel syndrome, may affect the wrists and hands of data entry personnel. Correct attention to ergonomics will not only reduce health risks, but also improves employee morale and productivity.

Examples of how ergonomic principles can be incorporated in an IS environment include:

- The use of keyboards with built in wrist rests or specially contoured design to reduce RSI.
- Chairs with variable seat height and back support.
- Correct adjustment of the angle of computer monitors.
- In addition to adjusting the brightness and contrast of the computer monitor, an additional transparent screen can be used to reduce glare.



An infrequent but potentially life-threatening new health hazard that has recently been identified by medical practitioners is “e-thrombosis”, which may result from sitting immobile for long periods. This is similar to the condition sometimes experienced by travellers on long flights, in which a blood clot forms in the leg veins, and may subsequently break off and travel to the lungs or other vital organs.

13.3 Ethics

The increased use of information systems in business has given rise to new opportunities for behaviour that could negatively affect the organisation, its employees and its customers. The study of *ethics* examines the moral quality of a decision or course of action, and is based on what is *right* rather than what is *legal*. Four major areas of ethics that are affected by information technology are privacy, property, accuracy and access, and many businesses have a *code of ethics* determining the expected standard of conduct for their employees.

13.3.1 Privacy

Most companies store information about their customers and staff in corporate databases – not only details like names and addresses, but also transaction histories, payment records, etc. One ethical issue regards the *privacy* of that information. By law it may not be passed on to a third party without the consent of the subject of the information. However, within the organisation itself accumulated information may be used, for example through data mining or neural networks, to decide on credit limits or to target customers for promotions, even though the information was not originally supplied with that use in mind. A member of staff who applies for a more senior post, may find that her previous record of sick leave influences the outcome of her application. If you were ill on the day of your final IS exam, you would apply

to write a deferred examination: would you think it fair to have your performance in other courses taken into account when deciding whether the deferred exam for IS should be granted? Another cause for concern is the viewing of personal data by employees when this is not actually required for business purposes: if an attractive member of the opposite sex joins your organisation, is it ethical for you to check his/her age and marital status? What about HIV status? And in many countries, governments are now debating the balance between the right to personal privacy of information and the need for national security.

13.3.2 Property

Computer software and data have been the subject of a number of ethical issues related to *property*. Software piracy (the copying of copyrighted software) is illegal, but what about the copying of software that has not been copyrighted? If you are confident that you can get away with copying your friend's tutorial preparation, do you think that it is acceptable to do so? Copying of other people's ideas without acknowledgement is *plagiarism*, which is generally regarded as unethical even if society does not always consider it to be illegal. Employees who leave an organisation may take with them confidential knowledge about the firm and its business plans, which they gained while they were working for the organisation but which could be useful to a competitor. Even within the organisation itself, employees may be reluctant to volunteer their knowledge for inclusion in an expert system, since this may reduce their own importance. The Internet has facilitated the unauthorised copying of intellectual property across national boundaries, such as the swapping of music files between individuals, which is practically impossible to control without the cooperation of the individuals involved.

13.3.3 Accuracy

Accuracy of information at the transactional level can to some extent be controlled through validation checks within the database and software design. Individuals are entitled by law to check and correct personal information that is stored in corporate databases. Nevertheless, since the users of information systems are human and fallible, the use of technology alone will not prevent the production of inaccurate information, either intentionally or by accident. Again, the growth of the Internet has made the dissemination of incorrect information extremely difficult to control, and raises ethical issues about the responsibility for its consequences. An unresolved problem concerns the retouching, or digital alteration of photographs, where the key issue appears to be whether the intended information content of the image has been changed.

13.3.4 Access

Access to information can be protected through the use of technology, such as passwords, electronic and biometric controls. Databases can allow or restrict access for different types of users. But what about equal access to information for those who do not have computers, or who are unable to use them because of physical disabilities? Many people feel that it is unethical for society to condone the lack of access to information for specific groups. On the other hand, employees who have access to organisational computing resources are often guilty of abusing the privilege by using company time and equipment for personal pursuits such as emailing and web surfing.

13.4 Data Processing Controls

An important function in computer auditing is the review and analysis of information systems security. One element of this is physical access control; another is software-based data processing controls that are intended to prevent data errors from occurring, to identify any errors that have occurred, and to assist with recovery from errors. Validation checks may be built into the database structure, or coded as part of a software application, to enforce business rules such as credit limits or minimum and maximum charges. Network and database access may be selectively restricted, and network monitoring software keeps track of which users log on to the system, what files they access, and what changes they make. *Audit trails* provide a transaction history showing where each entry originated and who was responsible, and serve an important function not only in identifying the source of problems but also in determining where staff training is needed. Sequential numbering of transactions and of audit reports ensures that every business activity is recorded. Where financial totals are transferred from subsidiary journals to the general ledger, the corresponding general ledger audit report should cross reference the audit report that reflects the individual transactions, and control totals in both ledgers must be reconciled. *Exception reports* should be produced in the case of transactions or totals exceeding previously specified limits.

Further data processing security for complex transactions can be provided by database management systems. A single transaction may result in updates to a number of different files, e.g. a sale will affect both the accounts receivable and inventory files. In this case, all the required updates must be made successfully before the transaction is *committed* to the database; if an error occurs at any stage after the start of processing, then all the updates will be *rolled back* (i.e. undone), to prevent the possibility of inconsistent entries.

Additional *management controls* should be implemented to reduce data processing risk. Employees should be thoroughly trained in the software and procedures that they are expected to use. Regular backups should be made and stored in secure off-site locations. Separation of duties among employees reduces the risk of deliberate fraud, and awareness of ethical standards should be a part of company policy.

13.5 Disaster Recovery

Natural disasters, sabotage, theft, viruses – any of these can result in damage to, or even destruction of, an organisation's information systems. Reliance on corporate databases and powerful servers increases the vulnerability of the system. A disaster recovery plan is needed to document how the business would be able to recover from either the total loss of computing capabilities, or else the interruption of critical services.

Regular *backup* of data and programs is the first essential for recovery from mishap. Backups should be kept off-site and in a fireproof container or safe, and should be tested at intervals to ensure that the restore procedures function successfully.

A *hot site* provides an alternative computing facility that can be used in the event of a major disaster, such as occurred at the World Trade Centre in New York in September 2001. Backup copies of application programs and corporate data can be run on equipment at the hot site with minimal interruption to business. Because the duplication of computer hardware is

expensive, this facility may be shared between a number of firms operating in different geographical locations. (In fact, the internal systems used to manage the twin towers of the World Trade Centre, each had their disaster recovery facilities located in the opposite tower, since the likelihood of both towers being destroyed simultaneously was believed to be remote.)

Some disasters can be minimised through avoidance and early warning systems. An *uninterrupted power supply (UPS)* will prevent data corruption resulting from power spikes, and in the event of a total power failure, can run the system for a limited period before shutting it down in an orderly fashion and without data loss. Temperature control systems, smoke detectors and water sprinklers or gas fire suppression systems should be installed to reduce fire risk, while physical controls such as door locks and alarm systems will protect against unauthorised intruders. Expert systems can be used to monitor the network for faults and to protect against communications threats such as viruses and hackers.

13.6 How IS Affects You

Every department of an organisation uses information technology in some way, and even if you are not an IS major, IS is likely to be an important element of your future career in commerce.

- In *finance* and *accounting*, information systems are used to forecast revenues, plan business activities, manage financial resources and audit the performance of the organisation.
- In *sales* and *marketing*, information systems are used to determine the potential market for new products, to plan advertising campaigns and predict sales revenues, to determine product prices and manage customer relations.
- Many of the processes in an organisation's value chain can be enhanced through the use of computer-based information systems, from procurement to manufacturing to after-sales service. The *operations* manager who has a sound knowledge of information technology will be able to apply it effectively in order to maintain competitive advantage in the market.
- *Human resource* management is no longer focused solely on employee record keeping. The internet has become a powerful employment tool; company intranets empower staff to manage their benefits, leave and training requirements. IT now has an important role to play in the hiring and retention of staff.
- Of course, if you intend becoming an *IS specialist*, then the development and management of information systems will be central to your future career, and this is only the beginning of your studies in the field of IS. Even if you focus on a particular aspect of IS, such as database or network administration, you will need a solid foundation of basic principles that will enable you to integrate your area of responsibility with the goals of the business and the IT architecture that supports them.

Whatever your future career, we trust that your introduction to information systems will have opened your eyes to the wide variety of ways in which IS can be used to support the activities

of any business.

13.7 South African Perspective

The Computer Society of South Africa (CSSA) has adopted the following code of conduct for its members:

“A professional member of the Computer Society of South Africa:

1. Will behave at all times with integrity. He or she will not knowingly lay claim to a level of competence that he or she does not possess and he or she will at all times exercise competence at least to the level he or she claims.
2. Will act with complete discretion when entrusted with confidential information.
3. Will act with impartiality when purporting to give independent advice and must disclose any relevant interest.
4. Will accept full responsibility for any work which he or she undertakes and will construct and deliver what he or she purports to deliver.
5. Will not seek personal advantage to the detriment of the Society.
6. Will not discriminate on the basis of race, sex, creed or colour.”

13.8 Beyond the Basics

When an organisation invests in new technology, four different stages are experienced in its assimilation. If these are understood and supported by management, the introduction and spread of the technology can be facilitated.

Phase 1: Technology identification and investment. A team of technological specialists and business users is needed to explore and *evaluate* new technologies. When the decision is made to acquire a new technology, the initial investment should include staff training and management of the implementation.

Phase 2: Technological learning. Staff must be supported in their efforts to use the new technology, and encouraged to *experiment* in order to gain experience and knowledge of its capabilities. Use of the system should not be restricted only to existing business tasks.

Phase 3. Technological learning. Technical staff and experienced users together define possible applications of the new technology and determine the most cost-effective ways in which it can be *incorporated* within business processes.

Phase 4. Widespread technology transfer. Once the new technology has a base of experienced users and clear plans have been developed for its future use, it can be *transferred* throughout the organisation. At this stage, tighter management control instead of the previous policy of experimentation is needed to achieve the expected return on investment.

13.9 Exercises

13.9.1 Ethics

Would you consider the following scenarios to be ethical or unethical? Explain why you think this.

- A company requires employees to wear name badges that track their whereabouts while they at work.
- The network manager reads an employees e-mail.
- An employee forwards an e-mail to a third party without obtaining permission from the sender of the message.
- An employee uses his computer at work to send personal e-mail to a friend.
- A student uses the university computer labs to send personal e-mail to a friend.
- A student copies text from the Web and incorporates it in an essay without acknowledging the source.
- A student is required to create a Web page for an assignment, so she finds an existing page that she likes and then modifies its contents.

CASE STUDY: CREAM ADVERTISING

Refer back to the Cream Advertising case study that was introduced at the end of Chapter 10.

Jade Smith has come to the conclusion that rather than trying to add new functions to her existing information systems, which are in any case somewhat outdated, new systems should be introduced at all levels of the organisation. This would include applications to provide transaction processing support, management reports, trend analysis and forecasting, and access to information about their market and competitors. Groupware would be an important factor in supporting team work and client communications.

Jade is also concerned about the growing number of rival advertising companies who have included the internet in their business strategies. She is reluctant to spend money on something that will not necessarily increase business income, but she is aware that her clients feel that Cream is falling behind the times. In her view, the only way that the added expense of e-commerce would be justified, is if they are able to expand their business to cater for a global market and attract new overseas clients.

- (a) Explain why it is important to plan for the integration of the different systems, rather than simply acquiring individual software packages and the appropriate hardware from different vendors?
- (b) It will probably be necessary to develop software interfaces between the various systems to ensure that data can be transferred between them. Would you advise Jade to employ a technical programmer for this purpose, or should the job be outsourced?
- (c) How can Jade best manage the introduction of the new systems to ensure that staff will use them as efficiently as possible? What ongoing support arrangements should be put in place?
- (d) The new systems will give all staff access to the internet, as well as to corporate data and applications. What ethical problems might arise and how can they be pre-empted?
- (e) In expanding to a web-based global marketplace, are there any cultural or social issues that Jade should be alerted to?

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