

Chapter Five

ALTERNATIVE APPROACHES

The available alternative approaches to the IS development, implementation, equipment management and staffing management issues will be considered in respect of the concerns highlighted in the previous chapter. In addition, these alternatives will also be viewed from the financial, human resource and technological aspects.

5.1 IS Development

5.1.1 Applications Development

There are five approaches to the development of applications. These include the systems life cycle, prototyping, application software packages, end-user development and outsourcing.

5.1.1.1 Systems Life Cycle

This is the oldest method for developing applications. It consists of six stages and these are *project definition, systems study, design, programming, installation and post-implementation*. Each stage must proceed sequentially. Each must also have formally defined outputs or deliverables and approval before the next stage may commence (Laudon & Laudon, 1996, pp. 439-442).

This method is mostly used for large projects that need formal specifications and tight management control over each stage. Examples of such applications include airport traffic control systems and refinery operations.

However, this is a very rigid and costly approach. KDU management's preference for maintaining a small two-member software development team indicates that the systems life cycle approach would not be applicable in this

context. Furthermore, this approach is also not suitable for unstructured, decision-oriented applications where requirements are not clearly defined and may change over the development time frame. It is also not appropriate for small desktop systems that are the norm in most businesses today. Since KDU's systems are run on a Local Area Network (LAN) with PC nodes, it is unlikely that this method will be suitable for KDU.

5.1.1.2 Prototyping

Prototyping consists of rapidly building an experimental system inexpensively for the users to interact with and to evaluate. The prototype is then refined and enhanced until the users are satisfied that it captures all of their requirements and can be used as a template to create the final system (Laudon & Laudon, 1996, pp. 443-446).

This is especially useful for simple applications where requirements are vague and unstructured as well as for front-end user interface designs for large systems. In such instances, user involvement is highly encouraged in the development and iteration of the design until the specifications are captured accurately.

However, such rapid creation can result in systems that have not been completely tested or documented and may also suffer from technical inadequacy. Essentially, prototyping is not suitable for large systems design that requires batch processing or complex logic processing.

KDU's user interfaces have been partially developed using this method. However, while the front-ends looked acceptable, the back-end considerations have sometimes been overlooked, thus leading to a re-design of the original front-end. The time taken to re-work the system have been costly and time-consuming for the in-house programmers.

5.1.1.3 Application Software Packages

Such packages eliminate the need for writing software programs when developing an information system. They reduce the amount of design, testing, installation and maintenance work required to build a system.

These packages are helpful if a firm does not have the IS staff and financial resources to custom build a system. They are best suited for applications with requirements common to many organisations and which carry a limited number of functions (Laudon & Laudon, 1996, pp. 447-454).

However, such packages may need extensive modifications to meet an organisation's unique requirements. This would substantially raise the development costs. Moreover, the feasibility of adopting this method may suffer if the implementation necessitates extensive customisation and changes in the organisation's procedures.

In 1995, KDU had made an enquiry regarding such a system. It had resulted in a quotation of approximately RM300,000.00. As a result, KDU did not seriously consider this approach as the cost of doing so was prohibitive.

5.1.1.4 End-User Development

This involves the development of IS by users, either alone or with minimal assistance from IS specialists. Such systems can be created rapidly and informally using 4th GL tools such as Oracle, Informix and Sybase.

The benefits of this approach are the improved requirements determination, reduced application backlog and increased end-user participation in and the control of the systems development process. The most appropriate types of applications that would benefit from this approach would be those with relatively simple processing logic and small files (Laudon & Laudon, 1996, pp. 455-460).

However, end-user development may propagate IS and data resources that may not conform to existing quality standards. This may be due to the fact that users are not conversant in proper development procedures and may not be very disciplined in their approach to the development process.

KDU's systems are not large but they are complex, and as such, this approach is not appropriate for the college.

5.1.1.5 Outsourcing

Outsourcing, in its most generic form, shifts an organisation's service, traditionally conducted in-house, to an external vendor that specialises in providing that activity in areas such as transportation, logistics, warehousing, payroll, computer data processing and manufacturing (Hall, 1997, pp. 17-19). In doing so, the organisation becomes more focused on its core competencies while leaving support functions or the whole department to the vendor. The vendor, on the other hand, would focus all its resources on issues concerning the outsourced service. It can then spread its costs over a large client base, thus achieving economies of scale and boosting the quality of its offerings through continued specialisation. Therefore, both the outsourcing organisation and the outsourcer would focus their resources on their respective core competencies, effecting cost reductions, enhancing product and/or service quality and passing on these benefits to their respective customers (Hitt et al, 1997, pp. 94-96).

However, a study by Weill and Broadbent (1998) showed that while companies that outsource their IT portfolio had lower costs, they were also slower to market their new products and had less revenue growth than their competitors. This was due to the fact that outsourcing added another layer of bureaucracy to the vendor-customer communications. As a result, the users in the customer organisation regularly complained of an overall slowness of response to their requests, although their IT operating costs were reduced.

Furthermore, outsourcing was more popular with organisations that competed on low cost rather than customer service or product innovation. The study

concluded that those organisations that required a fast turnaround time and considered information to be a core competency, should outsource IT less or none at all. Moreover, outsourcing this may actually dilute the deep business knowledge that had been accumulated over the years.

In fact, partially developing systems in collaboration with an IT vendor, called cosourcing, may actually be more beneficial to an organisation as valuable expertise would then be partially kept in-house, while outsourcing that which the organisation does not currently possess in-house. In respect of KDU's needs, there could be a joint collaboration between some of the School of Computing students and the in-house development team, with the latter designing the MIS and the former coding the programs.

The third alternative would be to keep core competencies totally in-house so as to maintain control over the areas that may provide competitive advantages to the firm. Here again, KDU must consider whether the content development of the college homepage provides a competitive advantage to the business. If it does, then there is every reason to maintain in-house development control over the homepage content.

Thus far, the benefits of straightforward outsourcing are mixed and these really depend on the strategy and the desired focus of the organisation's business. It is not so easy to state whether outsourcing is necessarily good or bad.

5.1.2 Hardware Acquisition

5.1.2.1 Purchasing

With technology constantly evolving, computer life cycles are becoming increasingly short. By purchasing hardware/software outright, businesses will risk ending up with equipment long after it has outlived its usefulness. However, the businesses will ultimately own the equipment. These equipment are then considered assets of the firm that need to be depreciated accordingly

so as to offset tax liabilities to reflect the on-going decline in the value of their assets. The purchase of such equipment may increase the equity base of a firm as well as provide opportunities to effect higher tax write-offs. However, firms still need to forecast depreciation schedules, interest rate charges, tax payments, department budgets, required upgrades, equipment life cycles and residual values of equipment when it is sold (Smith, 1998, p.1).

5.1.2.2 Leasing

Leasing is a practice that originated in the 1960s as a means for corporations to acquire costly mainframe computers (Smith, 1998, p.2). This arrangement was first introduced by International Business Machines (IBM) to cater to its customers' computing needs while locking them into its computing platform.

On the other hand, leasing shifts the financial burden of acquiring equipment to the leasing company. Such an arrangement provides the use of the equipment over a set period of time for a specified series of payments. Generally, these payments are settled on a monthly basis, although it is possible to structure them to accommodate the varying cash flows that are associated with seasonal businesses. At the conclusion of the lease term, the firm has the option to either renew the lease or surrender the items to the lessor, who in turn, may choose to refurbish for resale or to salvage the parts (Greene, Martin V., 1998, p. 3).

5.2 IS Implementation

5.2.1 College Homepage

The issue to be determined is whether to maintain the college homepage as a marketing tool or to exploit further in other innovative ways.

5.2.1.1 Marketing Tool

The traditional marketing approach is to reach out to potential customers by

actively advertising its products and services. However, a homepage is a passive tool. It requires potential customers to seek out offerings by companies. Nonetheless, firms update their homepage offerings as often as possible so as to maintain a high level of interest among their potential customers, and commercial interest among sellers and buyers alike, is mounting.

However, few laws governing such commercial ventures on the Internet exist. As homepages are updated regularly, there is no proof that certain offers are authentic and not mistakenly stated at a lower price then corrected to a higher price after a customer has committed to buying the product at the previous lower price. There is practically no recourse for the customer except to pay up or dismiss the transaction as a mistake. Until greater clarity exists on the Internet, electronic business will continue to be dogged by a certain level of unreliability.

To date, the KDU homepage has already attracted more than 5000 hits since its launch in 1996, and while this may not be very high, this number is still encouraging. The management has toyed with the idea of effecting electronic payments with its online registration. However, there is still sufficient cause for concern regarding the security of such transactions. It remains to be seen whether the college can make sufficient contact among potential local and international students to justify further investments in its homepage.

5.2.1.2 Distance Learning through Content Management

Content, in its broadest definition, encompasses

- music and audio-visual services
- multimedia services combining digitised text, data, audio and still visuals

All are easily available on the Internet or may be distributed through a physical medium such as CD-ROM.

The key to successful content delivery is not only dependent upon network speed. Effective content is measured by the degree of interactivity that greets the user (Beale, J., 1998, p. 7). Content may also face censorship as user groups may find certain information offensive. In particular, the Malaysia position on content management does "take into account threats to our economic activities, national security, morals and culture" (IATFEC, 7th October 1997, Appendix 2).

Specifically, discussion of content management will focus on the delivery of educational materials over the Internet for distance learning purposes. This may be as straightforward as downloading a text file in Microsoft format, or in Adobe Portable Document Format (PDF) (Lange, L., *IEEE*, 1998, p. 41). It may be as sophisticated as an interactive exercise or quiz that is completed by the student and then sent to the teacher, who marks it and then returns the results to the student. Detailed explanations would accompany the wrong responses so that the student would be able to learn from his/her mistakes. A search facility would also be provided to enable the student to search for exercises and past year examination questions that pertain to a particular topic.

In this respect, the effective management of content provides an innovative approach in delivering educational materials in a geographically dispersed environment. Therefore, the college should seriously consider this as a potential avenue for future growth.

5.2.2 Mailing Lists

5.2.2.1 The Traditional Way

The compilation of mailing lists is a major activity among companies. The more traditional method of obtaining such lists is to approach credit card companies, magazines and societies, and promote their products and services through their regular monthly correspondence (The author's experience). As a result, many consumers have been the unwitting recipients

of such promotional flyers or "junk" mail.

5.2.2.2 The Internet Way

However, as businesses recognise the opportunity of reaching a wider audience through the Internet, they have been quick to exploit it by broadcasting messages to large groups of people. Practically everyone with an email address has been the recipient of these electronic "junk" mail. Since email is so cheap, this becomes a convenient, albeit annoying, method of reaching the masses. From the perspective of the recipients, this annoyance very quickly translates to an invasion of their privacy (The author's experience).

5.2.2.3 Privacy Rights

Generally, privacy implies the protection of privacy and personal data. This issue arises as firms compete for consumers in increasingly innovative ways. One of the more popular ways is to employ database marketing methods in which personal details are analysed in terms of gender, age group, profession and education qualification. The motive is to identify new patterns of consumer behaviour and to exploit the opportunities arising thereof (OECD, *Privacy Guidelines*, 1997, p. 9).

To be specific, the privacy issue arises from the manner in which such information is obtained. A good example is when a consumer is accessing a particular homepage, e.g., Netscape, and s/he would like to take advantage of the free software download facility. However, the consumer will first need to provide a few details about him/herself - this is when most, if not all, consumers do not think twice about revealing some of the most private details about themselves. This becomes a real problem should the owner of the information (in this example, Netscape) decide to sell it to the highest bidder. As a result, Internet email users have been bombarded by the electronic equivalent of conventional junk mail.

5.2.3 Responsibility

Responsibility means that one has to accept the potential costs, duties and obligations for the decisions one makes. In respect of email, this would refer to the actions of the users in using or abusing the email facilities provided by their respective organisations.

5.2.3.1 Types of Email

By definition, email may be used as a replacement of written correspondence, or it may be used as a medium of discussion. Furthermore, it may be classified as (Defence Signals Directorate, 1998, p. 126)

- **Formal email** – email that is required to be kept as a record of a firm's business activities
- **Informal email** – email that is conversational and not required as a record of a firm's business activities

While these may appear to be distinct, however, the actual usage may not be so straightforward. This is because users tend to use the email facility for personal correspondence as well as for official business. Such tendencies would lead to certain abuses of the email facility such as spreading of rumours and gossiping.

5.2.3.2 Individual Rights

A contentious issue is the monitoring of staff email by employers. While the email facility belongs to the firm, staff assume that they have the right to use it without fear of the management reading their correspondence. This may not necessarily be true as certain firms do carry out employee monitoring practices that include accessing staff email and disposition of staff email when the staff is on temporary but extended leave (www.privacyrights.org, 1997, p. 6). In this respect, the rights of the individual to privacy is built upon the idea

of protection against intrusion (OECD, *Privacy Guidelines*, 1997, p. 5), specifically in the context of email and Internet access.

5.2.4 Access Control and Accountability

5.2.4.1 Access Control

In respect of access control, this concerns the data security of the contents of email, where access to email is limited to authorised recipients. Such access control constitutes network security and it is normally effected by log-in identities followed by individual passwords. A common procedure is to remind users not to divulge their passwords.

In general, MIS are challenged by both data and network security issues that include (www.privacyrights.org, 1997, p. 2)

- Audit trails to reflect modifications / deletions / additions carried out on existing information
- Segregation of duties, e.g., staff who invoice cannot be allowed to collect payments
- Sensitive data being located in secured areas accessible only to specific and qualified personnel
- Entry with unique password

5.2.4.2 Convenience of Use

However, the over-riding concern regarding secure passwords must also be balanced with the users' need for convenience. Generally users prefer a single sign-on capability in which they need only log into the network once to access all their applications, rather than having to log into each application separately.

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5.3 IS Equipment Management

5.3.1 Computer Virus

This is a rogue software program that is difficult to detect and spreads rapidly through computer systems, destroying data and disrupting operations (Laudon & Laudon, 1996, p. 692). As a consequence, networked computers are especially vulnerable to such attacks.

5.3.1.1 Safety Cards

The only alternative to purchasing anti-virus software is to purchase add-on cards that are installed into each computer as part of the overall hardware. These are called safety cards. They act as a mirror to the existing software residing on the hard disk. In this manner, the hard disk is write-protected as users will not be able to save any files on it. Neither will any virus be able to attach itself to the hard disk. The unit price is RM290.00 and each card may be configured individually according to the required types of applications. The main drawback to this approach is that much effort is required to install and configure the individual cards for each computer.

5.3.1.2 Anti-virus Software

In comparison, the anti-virus software may be installed in the server and then the individual computers may be installed from the server. Once installed, the anti-virus will be constantly monitoring the files that are introduced into the system. An alert will sound should it detect unusual file characteristics and it will prompt the user accordingly.

5.3.2 Software Licensing

As businesses migrate to faster computers and more resource-hungry applications, many are faced with escalating costs that may actually not be justified. The problem exists because managing computing resources for

hundreds or thousands of users can be a logistical nightmare. Compounding this is the complexity of less tangible issues that may include tracking license terms, usage and lifecycle costs (Shoup, L., 1996, p. 1).

5.3.2.1 Periodic Renewals

Tracking the costs of maintaining computing resources is not merely keeping track of fixed assets. There is the issue of the ownership of hardware and software (Shoup, L., 1996, p. 2). For instance, certain software is licensed from the vendor for say, up to a year, and not owned by the firm. Examples include anti-virus software that provide quarterly updates for a two-year subscription and annual renewals for special license keys that enable the software to function properly. In addition, software licensed for education or teaching purposes is prohibited from being utilised for business administration. An example is the Oracle Relational Database Management System (Letter of Agreement, Oracle, 1995).

Furthermore, annual renewals of ongoing maintenance and service contracts are not accompanied by any physical deliverables, with the exception of occasional visits by the respective service personnel. Sometimes, however, even these visits may become routine and insufficient attention may be given to the job at hand.

5.3.2.2 One-off Purchases

Another point to consider is the purchase of software licenses to cover an equal number of networked workstations e.g. 100 licences for 100 networked computers. However, not all the machines may be using the software 100% of the time. This shows that a number of the licenses are actually not utilised. Unnecessary expenses are incurred as the unutilised software licenses do effectively contribute to a loss in productivity (Shoup, L., 1996, p. 4).

5.3.3 Hardware Upgrades

5.3.3.1 Component Upgrades

Upgrading the memory of computers has always been seen as the most economical method to extend the life of a computer, although other components, like hard disks and microprocessors, have been upgraded as well. The main concern in upgrading hardware components is that the labour charges have not been included in the costing (Gartner Group, 1998, pp.1-4). This is because internal IT staff are expected to effect these upgrades. With general charges for installing and servicing computers at approximately RM80.00 per hour, it could take up to one hour per PC to install memory and a hard disk. The cost of evaluating a machine to determine the number of components to upgrade may also take half a day. For a total of 150 machines, this would quickly become a costly exercise.

5.3.3.2 New Purchases

In comparison, purchasing new computers is a relatively straightforward task – new machines will always be configured in a typical manner. In addition, new PCs should be able to run the standard software applications. Furthermore, setting up new machines is not complex as the required software being used by the organisation may be installed easily and quickly from the server.

5.3.4 Contingency Planning

It is always necessary to be prepared at all times as disasters can strike anytime. Fire, floods and virus attacks can spell the end of hours of meticulously prepared reports and thousands of customer records and financial transactions. This would almost certainly kill a healthy business, what more, one that is struggling in the current economic climate.

5.3.4.1 Backups

The common practice adopted by IT departments is to carry out back-ups on a daily basis. One may use a set of five tapes, one for each working day. One may also carry out a three-generation regime that recycles a set of three tapes every three days. Generally, data that have been backed up onto tapes should be kept off-site since there is little point in keeping the tapes in the same location as the original data (MIS Australia, March 1998, www.misweb.com.au).

5.3.4.2 Quick Replacements

It is also advisable to maintain close relations with a trusted supplier so as to effect a quick replacement of damaged hardware. Furthermore, although it may be a costly measure to take, it is a good idea to set up an alternate site. Alternatively, the firm can consider sharing disaster recovery data centres with organisations in the same industry. Regardless of the cost, the true test of a good disaster recovery plan is the speed with which a firm can resurrect its business after a disaster has struck (MIS Australia, March 1998, www.misweb.com.au).

5.4 IS Staffing Management

IT staff recruitment and retention issues are nothing new. However, with the current economic downturn, the challenge of achieving more with less places an even greater strain on the existing IT staff issues. In a survey conducted by MIS Asia in March 1998, staffing issues topped the list of concerns of Asia's IT Directors (MIS Asia, October 1998, p. 69) as their most significant challenge in 1998. The IT professionals, however, rated "a stable, well established organisation" as the highest quality they seek in choosing an employer.

5.4.1 Recruitment and Retention

Traditionally, IT staff tend to be more loyal to their profession and career development than to their current employer, and are prone to move on to further their career. The most common HR management tools such as remuneration and training cannot ensure higher staff retention. These must be offered together with working conditions and personnel support (MIS Asia, June 1998, p. 57).

The more tangible aspects of staff recruitment and retention may consist of

- flexible working arrangements
- desirable geographic locations
- training and education that create career opportunities

5.4.2 Motivation

IT staff motivation is difficult to define. It may incorporate

- a belief in something or someone
- the desire for the employer to recognise their worth and to show that appreciation
- a sense of belonging

It is the combination of the tangible and the intangible that constitute success in recruiting and retaining skilled IT staff (MIS Asia, June 1998, p. 60).

5.5 The Next Step

In comparing the current business activities (previous chapter) with the alternative approaches available, it is possible to effect certain improvements to the betterment of the college. As the issues discussed so far are disparate *in nature*, it is therefore necessary to put in place a set of recommended policies that considers these issues in a holistic manner.

Consideration for each issue cannot be examined in isolation. On the contrary, each forms part of the organisation's attitude towards the effective management of technology and due consideration must be given to each issue while looking at the impact it may have on other issues. For instance, one cannot discuss user responsibility without discussing individual rights. The management of equipment cannot be effective without leasing, as leasing is both an initiator in IS development (an MIS cannot be developed without a computer) and a good equipment management tool (it is a good hedge against obsolescence). Therefore, there will be an inevitable overlapping of issues in the resulting recommendations.