SWP 16/91

USING AN IS STRATEGIC MODEL TO GIVE A STRATEGY FOR TEACHING IS

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INTRODUCTION

Recent work has classified the information systems of an organisation according to their impact on the future profitability of the business and the level of the dependence of the business on IS. An examination of each classification shows that the nature of the system demands differing development software, styles, personnel and management. This allows the skills needed for a development to be predicted which has implications for courses offered to both business and information systems specialists. Moreover, the personalities required for the successful development of a particular type of IS, indicate particular learning styles and hence suggest teaching methods.

One of the important lessons to be learnt by educators and personnel managers alike, is that the traditional learning curve and career path is not necessarily consistent with the development requirements of IS. This reinforces the need for a flexible approach to learning programmes which are tailored to the requirements of the IS and continue through the professional's career development.

CLASSIFICATION OF INFORMATION SYSTEMS

In 1984, McFarlan [1] analysed the position of IS within companies and showed how this could be used to determine the expenditure and management structure for IS. He produced a grid positioning companies according to the strategic impact of existing systems and of the application development portfolio. This work has been extended, by for example Ward et al [2] to be a classification for information systems within an organisation. One of the advantages claimed for this approach is that it concentrates on the role the IS plays in the business. Each system is plotted according to its value to the organisation. This is measured according to the organisation's dependence on the system today and the impact the system will have on the future of the business. Most applications fall into one of the four quadrants shown in figure 1.

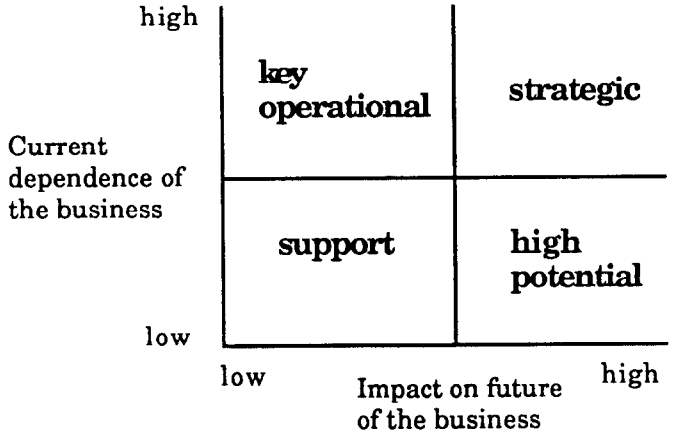

Figure 1: Classification of Information Systems

Looking first at the organisation's current dependence on systems; word processing or cost accounting are normally important to an organisation but there will not be immediate problems if the systems fail. For this reason these are classified as support systems. Contrast this with key operational systems such as an airline reservations or shopfloor control on which the business depends all day and every day. When considering the future impact of systems on the business, areas such as computer integrated manufacture or point of sale are strategic because these are the systems which will become key operational systems in the longer term. Other examples of the use of new technologies such as expert fault diagnostics fall more firmly into the realm of R&D and so are classed as high potential until their true worth becomes clearer. However, these are only general examples, one of the important differences between this and McFarlan's work is that the classification depends upon the particular organisation. Within many organisations, the payroll, for example, would be regarded as a support system but it has been classified as strategic where the ability to control staff payments on a day to day basis was critical to the future of the organisation.

IMPLICATIONS OF CLASSIFICATION FOR IS DEVELOPMENT

By examining the nature of systems in each quadrant, useful generalisations can be made about the development software and style that are most appropriate for each type of system [2]. Moreover there are implications for the type of development staff that are required: their level of technical or business knowledge and their personality. What emerges is that only key operational systems require traditional development conducted largely by technically experienced staff.

Development software

Since the business is highly dependent on key operational systems these are unlikely to be off-the-peg packages. It is more likely that the system will either be based on a industry specific package (such as point-of-sale) which has been tailored to meet the requirements of the business or will be bespoke software. This is partly due to the nature of the system; it is likely that it will be industry specific and that integration of data will be of paramount importance. Moreover, due to the dependence of the business on the system, funding will be available for the necessary tailoring. In contrast, support systems are likely to be based on standard packages (such as word processing) which neither require the same degree of tailoring nor does their role in the business justify it.

Systems which have a high impact on the future of the business are very unlikely to be pure package systems; if a package was available, the system should already be key operational or support (for a thriving business!). Moreover , systems are unlikely to remain static in this half of the matrix but will change frequently either in response to changes in technology or in the business environment. Bespoke systems are indicated but due to the need to respond to change, fourth generation development tools are more likely to be used. The development of bespoke systems can be justified financially for strategic systems but not for high potential systems. These are more likely to be prototypes emerging from an R&D type environment which are quickly identified as belonging to one of the other quadrants and are developed accordingly (or are discarded).

Development style

Both the software used for key operational systems and the high dependence of the business on such systems indicate that software engineering principles should be applied. The high degree of tailoring and the complexity of these large integrated systems require a structured approach to development with the careful specification of requirements before development. The dependence of the business on the system for its day-to-day operation mean that change and configuration control is crucial and the installation of new releases of the system will have to be carefully managed. However, the business can not afford for such systems to become out-of-date and a continual measured programme of enhancement is likely. On the other hand, support systems

are likely to be standard packages which satisfy well-understood functionality where changes (for example in legislation) will be handled by the package supplier. Within the business, the relevant packages will have to be selected and installed but the users should be encouraged to adapt the package rather than demand expensive tailoring. Consequently, the identification of requirements should be easier and be kept at a high level and the approach to development must recognise this. Although changes to support systems need to be made with care, it is usually much easier to recover from problems because the use of the systems is not time critical.

Prototyping will be used for all systems which have a high impact on the future of the business. This is because neither the requirements nor technology will be well understood. For strategic systems, there is a need for great care: the business is highly dependent on such systems so failure must be avoided. This is often seen to be in conflict with the need to change systems rapidly and the use of prototyping to determine requirements. This conflict can be addressed by the use of very small project teams developing systems using a structured approach to prototyping. This is frequently possible because the systems are small, using data from a number of sources but not attempting integration in the same way as key operational systems. It is important that strategic systems are subject to the same level of configuration control as key operational systems even though this may be regarded as an anathema to the development style. The prototyping of high potential systems can afford to much more relaxed (and needs to be as it is important that these prototype systems are cheap).

Technical and business knowledge of development staff

Both key operational and support systems will normally be developed and installed by technical staff although the support systems will require a lower level of technical ability. There will naturally be an involvement of users in the development of systems but in the case of support systems a high level understanding of the business will not be needed. The development of key operational systems will require a significant involvement of well-informed users but the requirements of individual groups of users may need to be over-ridden by the technologists in order that integration of systems can be successful.

Strategic systems require considerable technical and business skills for their development. The use of new technology and the ability to develop reliable sysems within a prototyping environment will stretch the technical staff, but in these systems, the knowledge of the business staff is equally important. They will need to understand what the system does and as far as possible how it does it in order to fully exploit its capabilities. Moreover, it is likely that some strategic systems will require considerable changes to working practices. The skills needed for high potential systems is slightly different. Whereas, strategic systems will be developed by technical staff because of the need for reliability, high potential systems may be developed by business staff with technical R&D type support. This is because, it is critical that the high potential systems that are developed are applicable to the business - the technology needs to be exploited to the benefit of the business not just for its own sake.

Personality of development staff

Ward et al [2] apply product portfolio management to the development of IS and identify the necessary management characteristics. These can be extended to apply to the technical staff undertaking the development of the IS as shown in figure 2.

key operational	**strategic**
controller - resistant to change - quality seeking - risk reducing	developer - organisational goal seeker - flexible - risk accomodating
support	**high potential**
caretaker - reactive - efficient - risk reducing	entrepreneur - personal achiever - innovative - risk taking

Figure 2: Personality attributes of IS development staff

IMPLICATIONS FOR TEACHING

This analysis of IS has clear implications on the kind of education we should be offering on programmes for both business and information systems students. The development software and style indicate the subjects which need to be covered in courses and the most appropriate teaching style to adopt. Perhaps not surprisingly, the implications are greater for technical courses. An understanding of the development path a system takes through the quadrants of the classification together with the personality attributes required can be used to shape career and educational development paths.

Courses

There are two key issues that need to be addressed in the education of information systems specialists. Firstly, the systems development style depends not only on the type of application (eg. real-time) but also on its role in the business. Students need to be taught when as well as how to apply software engineering practices. They also need to be able to use development styles appropriate to the application. Secondly, students need to be made aware that the business effects not only the requirements for an IS but also the development of that IS.

For business students, it is important to teach about the importance of quality and reliability in IS and how this may be achieved, but it is also important to point out when short cuts are desirable. The involvement of business staff in high potential systems means that it is important that business students are aware of the capabilities of new technology and that subsequently they keep up-to-date. Simplicity is the key word here and such sources as popular journalism should not be neglected.

Teaching style

Learning is generally regarded as being skills, attitudinal or knowledge based or in the terms of Burgoyne and Stuart [3]: cybernetic, experiential or information transfer/cognitive. With each type of learning, a number of teaching styles are recommended (eg. 'tell-show-do' for skills based). For each type of IS the main types of learning required for business and technical staff are shown in figure 3.

key operational	**strategic**
business - knowledge technical - knowledge, skills	business - attitudinal, knowledge technical - attitudinal, knowledge, skills
support	**high potential**
business - n/a technical - attitudinal	business - skills, knowledge technical - attitudinal, knowledge

Figure 3: Learning styles of IS development staff

This can be used both to guide the teaching style on particular courses and to indicate the kind of course required by a particular member of staff.

Organisational Issues

While this is not the route for all IS, a system typically begins life as high potential, is identified as being strategic, becomes absorbed into the key operational systems and may finally end up as support. In contrast, normal career paths for both business and technical staff will either be from key operational to strategic or from high potential to strategic. So, while we might expect staff to stay with an application throughout its life, this will be counter to their expected personal development. In addition, we have indicated that different personality types are required for the various eras of an IS.

A recognition of this dichotomy, will lead to a continual requirement for education as staff move from application to application or the system changes its nature. It is imperative that this education is timely if disasters are to be avoided; the development of flexible modular credit accumulation schemes is seen as particularly helpful in this area.

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21 January 1991