Information Systems Planning and Management in New Zealand Tertiary Education Institutions

John Greenwood

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John Greenwood
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Abstract

The strategic use of information systems for competitive advantage is a subject of current information systems research. This thesis examines the application of this view of the organisation on tertiary education institutions in New Zealand, and its impact on their information systems planning process. Recent changes in the legislation governing the tertiary education sector are reviewed, and their effects on New Zealand tertiary institutions are examined. A number of models of information systems development are summarised and used as a framework to position the current state of information systems in tertiary institutions. The results of a survey, which gathered information about the information systems planning in New Zealand's tertiary education institutions, are presented. Several models of information systems planning are examined and their applicability to the organisations involved in tertiary education is determined. A suggested development of information systems planning within tertiary institutions is presented.

Acknowledgements

I would like to thank all the individuals in the various institutions around the country who took the time and effort to assist me in this research.

My supervisor, Peter Blakey, deserves my special thanks. His unstinting efforts over the last few months in keeping me on the straight and narrow are greatly appreciated.

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Chapter 1

Information Systems Planning — the Education Context

Strategic information systems planning and the use of information systems for competitive advantage has been the subject of much attention in the research literature, and popular literature (for example Crocombe et al, 1991), over the past decade. While the focus has been on profit-making organisations in the private sector and lately on nations, very little has been done to examine the relevance of this work to public non-profit making organisations. This study is an examination of information systems planning and management of publicly funded tertiary education institutions in New Zealand in the context of this body of thought.

THE AIMS OF THE STUDY

There have been major changes to the education sector in New Zealand in recent times. Legislative changes have had a significant impact on tertiary education institutions and their planning activities. The changes will be summarised, and their effect on the planning process, especially the information systems planning process, of tertiary institutions will be examined.

The establishment of the current state of information systems development is the basis for planning. There have been attempts by various researchers to describe the process of information systems development from a variety of perspectives. This study will

examine several of the resultant models and attempt to place the current state of information systems in New Zealand tertiary education institutions within the framework of these models of information systems.

There appears to be a widely held view that tertiary institutions are like no other organisation. At the beginning of this research, a number of points were broadcast for comment in several newsgroups in the usenet news network. One of the points was: "...case studies could be taken from New Zealand universities (or perhaps tertiary educational institutions)." Of the several replies to this suggestion, none favoured using universities in the study, because, it was maintained, they did little or no strategic planning—certainly not in the information systems area. Fundamental to this thesis is the notion that tertiary institutions are, as providers of a service (education and training), comparable to other organisations in the wider business community. This view of publicly funded organisations underlies changes made in the public sector by successive New Zealand governments. As a consequence, models applied to describing private sector organisations could also be applied to the public sector. This thesis endeavours to establish the applicability of these models to tertiary education institutions. In this regard, special attention will be paid to the 'strategic' models of organisations as this view of organisations is currently the focus of much research in the information systems area.

One of the aims of this study is to determine to what extent tertiary education institutions in New Zealand engage in information systems planning, and to establish the framework of their information systems planning process. A questionnaire was devised and a survey undertaken to gather the information necessary to the appropriately position New Zealand tertiary institutions' use of information systems, and examine the detail of their information systems planning process.

There have been a number of information systems planning models proposed in the information systems literature. They can be distinguished on the basis of their

integration with the business planning process. A number of models of information systems planning will be examined in this study with the aim of suggesting an appropriate model for New Zealand tertiary education institutions to use in their information systems planning process.

A subsidiary aim of the study was to promote some awareness of strategic information systems planning within the tertiary education sector in New Zealand. One of the purposes of the questionnaire was to nudge information systems managers into thinking about their planning and to at least begin to think about strategic impacts of information systems within their organisation if they were not already doing so.

CHANGES TO THE EDUCATION SECTOR

There seems to be a generally held opinion that the tertiary education sector does little or no information systems planning, and that it is somehow different from other sectors of the economy and does not or need not operate in the same way as other industry groups. In New Zealand, it is understandable that views of this kind exist. The education system at all levels has been almost entirely publicly funded in the past, and there have not been the commercial pressures of fiscal efficiency and accountability that are present in the "real world.[1]" Educational institutions have been viewed as a part of the societal infrastructure and were not necessarily expected to exhibit the same behaviour as organisations in other sectors. Recently, there have been changes to the education sector which have affected the organisations operating within it.

There has been an effort by the successive Labour governments of 1984 and 1987 and the National government of 1990 (all of whose policies in this area moved in the same direction) to change the perceptions of and behaviour of publicly funded organisations. Initially, Government Departments were targeted for reorganisation as the Governments searched for cost efficiencies and a reduction in public spending. Out these moves came organisations such as ElectriCorp and Telecom—State Owned Enterprises that were meant to operate on a commercial footing.

During this period, the education sector was also subject to reforms. *Tomorrow's Schools* initiated reforms to education administration (Department of Education, 1988). The government commissioned a report on post-compulsory education and training in New Zealand, popularly known as the Hawke Report (Hawke, 1988) which led to the *Learning for Life* (Department of Education, 1989) initiatives. The resulting Acts of Parliament (the Education Act 1989, the Education Amendment Act 1989, and the Education Amendment Act 1990) saw the administration of schools devolve to Boards

[1]The "real world" has been defined as anywhere outside the education sector.

elected from the communities served by those schools. These Acts gave schools the increased financial responsibilities of authority over all operational expenditure except teacher salaries.

Recently, the Government began experimenting with bulk funding to schools to give the Boards the responsibility for all operating expenditure, including salaries. Although this move is viewed with suspicion by the teacher unions who see it as a cost-cutting exercise, the government's argument is that, in tandem with the Employment Contracts Act 1991, bulk funding gives schools more flexibility in deciding how to prioritise spending. For example, it would enable them to trade off salaries for increased investment in technology and other resources.

The tertiary education sector has not escaped the review process. During the general education reforms of the late 1980's, the University Grants Committee, which had administered university funding, ceased to exist (Education Act 1989). The funding of Universities, Polytechnics and Colleges of Education was to be administered through a newly formed Ministry of Education (Education Amendment Act 1989). A newly formed New Zealand Qualifications Authority (Education Amendment Act 1990) was to have broad authority over all qualifications granted in New Zealand, including those granted at tertiary level.

Whatever the motives of the different governments in implementing changes, they have had the effect of making tertiary education institutions more aware of their responsibility to be financially accountable to their major funding sources, initially government, and latterly, with a greater proportion of the costs being recovered through course fees, to their students. In addition, tertiary institutions are more closely scrutinised with regard to the sustainability and effective delivery of the educational qualifications they provide. There appears to be a move towards a more market-driven approach to the provision of educational qualifications, with the application of a free market supply and demand ideology to education. Whatever educators' philosophical

reactions might be to this commoditisation of education, the realities of government policy are pushing tertiary education in that direction.

All of these changes to the environment within which tertiary education institutions operate are bringing the management of their resources and the management of their organisations under closer scrutiny, both internally and externally. As a part of this process, the management of information systems is being examined within tertiary institutions, especially since investment in computing and communications resources involves significant and ongoing capital and operational expenditure. Undoubtedly, tertiary education institutions have been doing some information systems planning, but to what extent it has been strategic planning, rather than confined to operational and tactical planning, is the subject of this investigation.

CHARACTERISTICS OF TERTIARY INSTITUTIONS

Most people have an understanding of what a university is, what a polytechnic is, and what a college of education is. Their perceptions are important to those institutions, not least because the the Education Amendment Act 1990 requires that the community served by an institution be consulted when the institution is setting its general directions. Section 162 of the same Act specifies the characteristics of the various institutions operating in the tertiary education sector:

> (a) That universities have all of the following characteristics and other tertiary institutions have one or more of those characteristics:
>
> (i) They are primarily concerned with more advanced learning, the principal aim being to develop intellectual independence:
>
> (ii) Their research and teaching are closely interdependent and most of their teaching is done by people who are active in advancing knowledge:
>
> (iii) They meet international standards of research and teaching:
>
> (iv) They are a repository of knowledge and expertise:
>
> (v) They accept a role as critic and conscience of society: and
>
> (b) That—
>
> (i) A college of education is characterised by teaching and research required for the pre-school, compulsory and post-compulsory sectors of education, and for associated social and educational roles:
>
> (ii) A polytechnic is characterised by a wide diversity of continuing education, including vocational training, that contributes to the maintenance, advancement, and dissemination of knowledge and expertise and promotes community learning, and by research, particularly applied and technological research, that aids development:
>
> (iii) A university is characterised by a wide diversity of teaching and research, especially at a higher level, that maintains, advances, disseminates, and assists the application of, knowledge, develops intellectual independence, and promotes community learning.

The object (section 160) of the Education Amendment Act 1990 with regard to tertiary institutions is to "...give them as much independence and freedom to make academic, operational, and management decisions as is consistent with the nature of the services they provide, the efficient use of national resources, the national interest, and the demands of accountability."

The Education Amendment Act 1990 (section 161) states the intention of Parliament to preserve and enhance the academic freedom and the autonomy of tertiary institutions. In section 161 the term academic freedom is defined as:

(a) The freedom of academic staff and students, within the law, to question and test received wisdom, to put forward new ideas and to state controversial or unpopular opinions:
(b) The freedom of academic staff and students to engage in research:
(c) The freedom of the institution and its staff to regulate the subject-matter of courses taught at the institution:
(d) The freedom of the institution and its staff to teach and assess students in the manner they consider best promotes learning:
(e) The freedom of the institution through its chief executive to appoint its own staff.

The tertiary institutions are constrained by the Education Amendment Act 1990 (section 161) in exercising their academic freedom and autonomy in a manner consistent with:

(a) The need for the maintenance by institutions of the highest ethical standards and the need to permit public scrutiny to ensure the maintenance of those standards; and
(b) The need for accountability by institutions and the proper use by institutions of resources allocated to them.

The major effect of these changes (most significantly of the Education Amendment Act 1990) upon tertiary education institutions insofar as this thesis is concerned was to catapult them into a planning process. Under section 184 of the Act, it became mandatory for each institution to produce a written charter setting out the goals and

purposes appropriate for the type of institution. Additionally, in the preparation of their charters, the institutions were directed to consult with staff and students of the institution and with the communities served by the institutions. The specification of the characteristics of the different types of institution and the definition of academic freedom by the Education Amendment Act 1990 is helpful to this planning process. They are helpful in shaping some of the overall goals and objectives to be achieved by the institutions.

As had been done previously in the formation of State Owned Enterprises, the Government was attempting to create public organisations that operated on a more business-like basis. In the tertiary education sector, this was largely accomplished by legislation requiring institutions to be more financially accountable according to the provisions of the Public Finance Act 1989 (Education Amendment Act 1990, section 203). This required tertiary institutions to produce a variety of financial reporting statements, a financial performance analysis, and a statement of financial objectives. The financial planning horizon was set at three years.

The Education Amendment Act 1990 also defined the functions and duties of the Councils of institutions (sections 180, 181) and the duties of the chief executive officer (section 196).

The net result of this legislation was to impel New Zealand tertiary education institutions to a behaviour more like private sector business organisations than had been the case in the past. The requirement for a charter caused institutions, many of which had previously done little long range planning, to identify the nature of their organisation and its future directions, and to build a framework within which to achieve the goals and objectives of the organisation.

As part of this process at corporate level, many institutions extended the process throughout the organisation, to academic and administrative departments, so that the directions that individual departments saw as desirable could be assessed relative to the

corporate goals, and integrated into the corporate plan. Several institutions, according to the questionnaire responses, found themselves preparing some sort of information systems strategic plan for the first time. This was complicated, as was the overall planning exercise, by the lack of a planning process and planning procedures.

A further complication to the information systems planning process was the lack of a clear organisational structure for information systems within institutions. A few examples from the questionnaire responses will show the diversity of information systems management structure:

- three information systems functions responsible to different areas of the organisation: a design and programming function overseen by an MIS development manager reporting to the Divisional Manager Marketing and Development; a data reporting function with responsibility in each functional area and ultimate responsibility with the Division Manager Finance and Administration; and a systems administration and operations function the responsibility for which lay with the Divisional Manager services.
- a number of personnel responsible for various information systems functions: a programmer for software, an MIS manager for hardware, an MIS officer for data collection and processing, a filing clerk for hard copy, and a senior administrative officer for the system as a whole.
- functions split amongst the registry, a computing services centre, and academic departments.

With information systems functions responsibility split through different departments and individuals within the organisation, it is more difficult to provide a cohesive plan than if the information systems functions are responsible to a single department or individual. In many cases, because of the dispersal of information systems functions throughout the organisation, it is not always clear who has the planning responsibility.

The diversity of information systems management structure within tertiary education institutions can in part be attributed to the development of information systems within organisations. It may also be a result of the flattened management structures of the organisations generally, especially in the academic departments. Typically, as one respondent stated, it is "...a flattened structure with autonomy pushed down as far as possible." The principle of autonomy, especially of academic departments, has often resulted in resource allocation being prioritised by relative strength of personality of department heads rather than a cohesive organisational plan.

THE BUSINESS OF TERTIARY EDUCATION

The business that tertiary education institutions are engaged in is the provision of education and training. They are providing a service, and in that respect should not be considered different from any other organisation that is in the business of service provision. They must ensure a steady flow of customers and provide those customers with a satisfactory service.

Differences from commercial operations in the private sector lie in two areas. Firstly, tertiary education is generally considered to be a non-profit activity. This is true even for many private providers which are often set up with trust funds and depend upon endowments for a large proportion of their income. This may mean that there is less pressure on these organisations than there is on businesses which must consistently make a profit to survive. It doesn't mean, however, that tertiary institutions can ignore areas of their activities that are losing money.

The second difference lies in the nature of the owners of the business. Private sector companies are owned by one or more shareholders who are investing money with a view to a fiscal return. In New Zealand, as in most countries, the major shareholder in public education is the government on behalf of the community it represents. In general, society as a whole is not seeking a monetary return on their investment—its "profit" is the raising of the level of education of the workforce and population that will result in the country and its products being able to be more competitive with the rest of the world (Crocombe et al, 1991). The individuals that make up society see their "profit" as being a higher level of education and greater opportunities for themselves and their children.

The situation is clouded somewhat by the fact that the customers of tertiary institutions almost entirely are the children of the owners, or the owners themselves. This might

explain much of the resistance to increased "user-pays" in education in this country. New Zealanders are accustomed to paying for tertiary education through taxation, and the dramatic changes in funding for an individual's education find many unprepared and already facing difficulties in a period of economic recession. This is coupled with a proud tradition of open access to education in New Zealand. It is small wonder that the Registrar of one of the country's Polytechnics was recently reported as finding that students are wondering from where the financial support for their education will come, and are also questioning the advisability of spending several years furthering their education, with the prospects of a significant debt level at the end of that period, and a low level of employment opportunities in the current economic climate.

These challenges are some of those that face tertiary education institutions now. These will be examined further in the context of their planning process and in particular in the context of their uses and potential uses of information systems. It is considered fundamental to this thesis that information systems planning is inseparable from overall corporate planning.

The Use of Information Systems in Tertiary Education Institutions

The characteristics of tertiary institutions (discussed earlier) identify the major functions of the organisations to be teaching and research. To facilitate the provision of these services, there is an administrative function. The use of information systems is now fundamental of the achievement of all three functions.

In common with many organisations, information systems were first used to automate expensive and repetitive tasks, principally in the accounting area. Over time, the number of tasks converted to computerised information systems increased. Today most institutions have many registry functions (such as various accounting procedures, staff salaries, and student records) computerised. Tertiary institutions were part of the general trend toward end user computing. As the price of microcomputers came down,

individual departments were able to find money for their purchase through operating funds. The major use of this equipment was word processing and departmental record keeping.

Tertiary institutions have been using information systems in their teaching programmes for many years. Initially, it was computer science and information systems courses that required computer equipment. As the use of microcomputers and software productivity tools increased, the range of use of information systems in teaching programmes increased to encompass other teaching departments too. Typically today, tertiary institutions have one or more specialist teaching laboratories running a wide variety of software to facilitate the delivery of many courses of study.

The other main function of tertiary institutions, especially universities, is research. The early use of information systems in the research area was primarily by computer science and information systems departments, and also by departments and individuals involved in quantitative data analysis. Often the computer that provided the student teaching facility also was used for research purposes. As the performance of microcomputers increased, more and more research activities were able to be carried out using facilities within the departments. In today's more distributed information systems environment, a centralised file server and a powerful central computer are usually provided for research projects requiring more power than microcomputers can currently deliver. However, even the heavier computing requirements are starting to be met at a department level led by computer science and information systems departments who are finding that the costs of minicomputers is falling within their reach.

Chapter 2

Models of Information Systems and Their Application to the Tertiary Education Sector

MODELS OF INFORMATION SYSTEMS

In order to establish the current position of information systems in New Zealand tertiary education institutions and to suggest a planning framework for them, it is necessary to examine some general models of information systems development and some information systems planning tools.

There are a number of models of information systems which endeavour to provide a framework to facilitate the assessment of an organisation's use of information systems. The earliest of these is the *stages of growth* model initially proposed by Nolan and Gibson (1974) and refined by Nolan (1979). In 1979, Rockart put forward a methodology for defining the information needs of an organisation which he called *critical success factors*. McFarlan (1984) developed a *strategic grid* for categorising organisations according to their strategic use of information systems. Gibson and Hammer (1985) combined the stages of growth model, the critical success factors, and the strategic grid to produce the *benefit/beneficiary matrix*—a tool to categorise an organisation's use or need for information technology.

The Stages of Growth Model

The stages of growth model suggested that organisations go through several stages in their introduction and assimilation of information systems. The model was developed to describe what had happened to organisations during their development of their information systems resources, and organisations today investing in new technology may well accelerate their progress through the stages or even miss stages out completely.

Although the model has been criticised (e.g. Benbasat et al, 1984), it nonetheless can prove useful in determining the progress of an organisation in its use of information technology and its development of information systems. The early hypothesis by Nolan and Gibson (1974) had four stages, and the expanded model as proposed by Nolan (1979) included six stages of:

- initiation,
- contagion,
- control,
- integration,
- data administration, and
- maturity.

Initiation, the first stage, described the introduction of information systems in the organisation. The first applications were generally the computerisation of accounting activities and other labour intensive, repetitive operations that have a fixed set of procedures. This stage was characterised by a lack of management control, and by a general organisation-wide lack of knowledge about the potential and capabilities of information systems.

As information systems were developed, and their usefulness was established, there was increasing pressure for more applications. This may well have been exacerbated

by over-zealous marketing of information systems by information systems personnel, promising sophisticated systems well in excess of the ability of the technology of the time to deliver. This *contagion* stage saw huge growth in requests for applications systems, and in the acquisition of hardware. There was still little managerial control, with computing treated as an overhead expense, with the information systems department not being required to show a return on the investment in information technology.

The inability of information systems projects to be completed within budget and to meet deadlines ushered in the *control* stage. Information systems expenditure was more closely scrutinised and prioritised. Users began to be asked to justify their applications systems requests. Information systems managers began to be accountable to senior management for the organisation's investment in information systems.

The rapid improvement in technology including the introduction of the microcomputer and the development of software technologies such as database management systems and fourth generation languages brought about the integration of data and systems within the organisation, and made information systems much more accessible to the user. The *integration* stage is characterised by the growth of end-user computing with the user able to bypass the information systems department, with its applications backlog, and develop systems for their own use, often with no observable cost to the organisation. The cost of microcomputer hardware and software was within the reach of departmental budgets, and programming time was often provided by enthusiastic users, diverting their efforts from other tasks, rather than the information systems department. These technology changes and their consequences were reflected in the roles of the users and the information systems departments. This stage saw the decentralisation of information systems departments to become more of service providers to users. This often painful process saw the information systems departments of organisations lose their control over the information resource within the organisation.

The current stage of evolution for many organisations is the *data administration* stage. Information has been recognised as a corporate resource, and the primary concern is its appropriate management. Information must be stored and maintained so as to be accessible as a shared resource to the user community. The user has primary responsibility for the integrity and use of the information resource; the information systems department is concerned with the provision of the delivery platform and the technology infrastructure.

In the final stage, *maturity*, information systems are an integral part of the organisation, which is concerned with their exploitation for competitive advantage. The information systems manager is part of the senior management and has a strong influence over how the organisation does business and even over what business it does.

Critical Success Factors

In the late 1970's, the emergence of microcomputers combined with the development of spreadsheet software meant that the ability to access and manipulate information was more readily available to end-users. Building on this greater accessibility to information, Rockart (1979) and others (e.g. Bullen and Rockart, 1981) developed a method for defining executive information needs called critical success factors. Critical success factors are the limited areas of business activity in which performance is crucial to the success of the organisation. There are five major sources of critical success factors:

- the industry,
- competitive strategy and industry position,
- environmental factors,
- temporal factors, and
- managerial position.

The *industry* critical success factors are determined by the characteristics of the industry. These factors are common to any organisation in a particular industry. In the tertiary education sector, critical success factors might include maintaining a high quality of the qualifications offered, or ensuring the recruitment and retention of quality staff.

There are factors which distinguish a firm from its competitors within an industry grouping. These are the *competitive strategy and industry position* factors. They include such things as market niche, company size, geographic location, and understanding the industry leader's strategies and their impacts. Within the New Zealand tertiary education sector, critical success factors will include ensuring the regional student base of an institution, and provision of specialist qualifications.

Environmental factors are those areas over which a company has little or no control, but which nonetheless are critical to its performance. This category includes national and international economies, politics, regulatory controls, and energy sources. An obvious example in New Zealand is the recent education reforms, compliance with which is critical to the success of tertiary education institutions.

Temporal factors are those which normally would not generate a critical success factor but become important for a relatively brief period of time. These are areas of activity that might at a point in time be unacceptable and in need of attention, but normally would not be of concern. For example, if there was a sudden dramatic drop in a particular course of study at an institution, this would generate a critical success factor as it is an issue that must be of major concern. Once the situation had been resolved, either by increased student numbers, cessation of that particular course of study, or some other resolution, this area would no longer represent a critical success factor.

Because the critical success factor methodology can be applied at all levels of management within an organisation, each department in an organisation will often have

a generic set of critical success factors . These *managerial position* critical success factors are those that the manager of a department will use to set their priorities and plan their strategies. Heads of departments in tertiary institutions, for example, will be able to identify critical success factors relating to the performance of their department, which may be general to the organisation or specific to the department. Obviously, the provision of quality courses of study will be an ongoing organisational critical success factor that will also apply more specifically to each academic department. On the other hand, a department may consider the provision of a particular software tool to enhance their teaching programme as a critical success factor that applies specifically to that department.

The Strategic Grid

The strategic grid (Figure 2.1) developed by McFarlan (1984) is a tool for categorising organisations according to their management and use of information systems. Four main categories are identified:

- support,
- turnaround,
- factory, and
- strategic.

The main objective of organisations in the *support* category is the reduction in the cost of information systems. As the label support suggests, the major goal of the information systems department of organisations in this category is to support the organisation's objectives in the most cost-effective way. Well-established manufacturing firms are characteristic of organisations found in this category.

Organisations subject to internal or external pressures may move from the support category to the *turnaround* category. External pressures might include changes in the industry, and better information technology products and services. Internal pressures

might come from end-user groups within the organisation, or from newly enlightened management. This category is a transitional category that represents a temporary strategic position. Organisations will normally move from the turnaround category to either the factory or strategic categories.

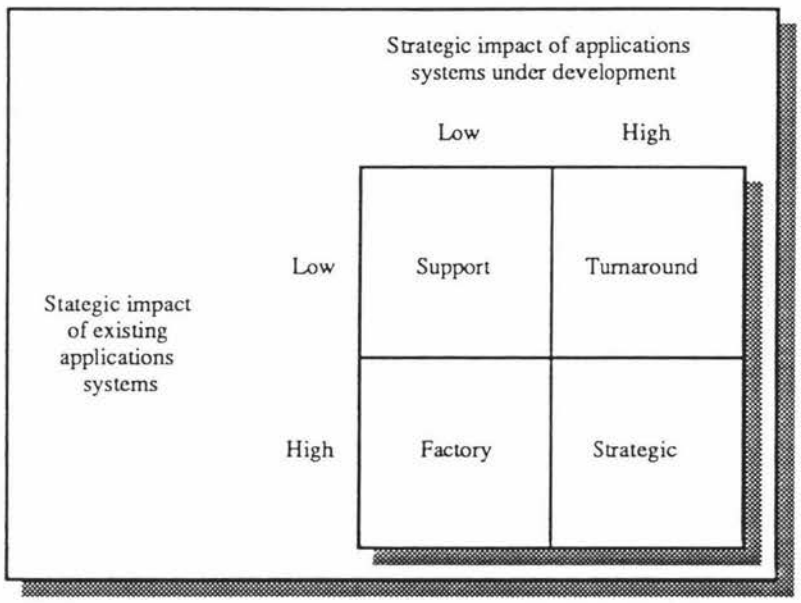


Figure 2.1: The strategic impact of applications systems (from McFarlan 1984).

The *factory* category includes organisations that have existing systems that were developed for their strategic impact. They are not developing new strategic applications. Like firms in the support category, the role of the information systems department is limited to current operational activities.

Organisations in the *strategic* category have integrated their information systems planning into their overall strategic planning. In their discussion of McFarlan's strategic grid, Wysocki & Young (1990) state that the information systems manager is the information expert on the management team, and is expected to "identify, recommend, and implement information and technology changes that will affect the strategic direction of the organisation" (page 26). Other ongoing concerns are the

protection of the organisation's current strategic position, and the maintenance and improvement of strategic products and services.

The strategic grid is a useful tool in assisting information systems planning. Firstly, the category into which an organisation falls is established. Organisations in the support and factory categories are considered to be in a static environment insofar as information systems is concerned. Their planning is reactive and directed into maintenance and modifications to existing systems. Those organisations that are categorised in the turnaround and strategic categories are organisations whose use of information systems is changing, or are organisations which consider the impact of information technology on their business during their planning process. Organisations in these categories are proactive in their planning, which is directed at new technologies and new applications .

The Benefit/Beneficiary Matrix

The benefit/beneficiary matrix (Figure 2.2) is an attempt by Gibson and Hammer (1985) to synthesise the stages hypothesis of Nolan, the critical success factors method of Rockart, and the strategic grid of McFarlan. It uses 'domains' to categorise an organisation's use of information systems. The benefits of information systems are either increased efficiency, improved effectiveness, or a transformation function. These benefits can apply either to an individual within the organisation, a department within the organisation, or to the organisation as a whole.

Domain 1 is usually associated with organisations in the initiation and contagion stages of the stages of growth model. The benefits of information systems development for organisations in those stages are typically to increase the efficiency and effectiveness of repetitive activities. The beneficiaries of the developments in this domain are departments within the organisation.

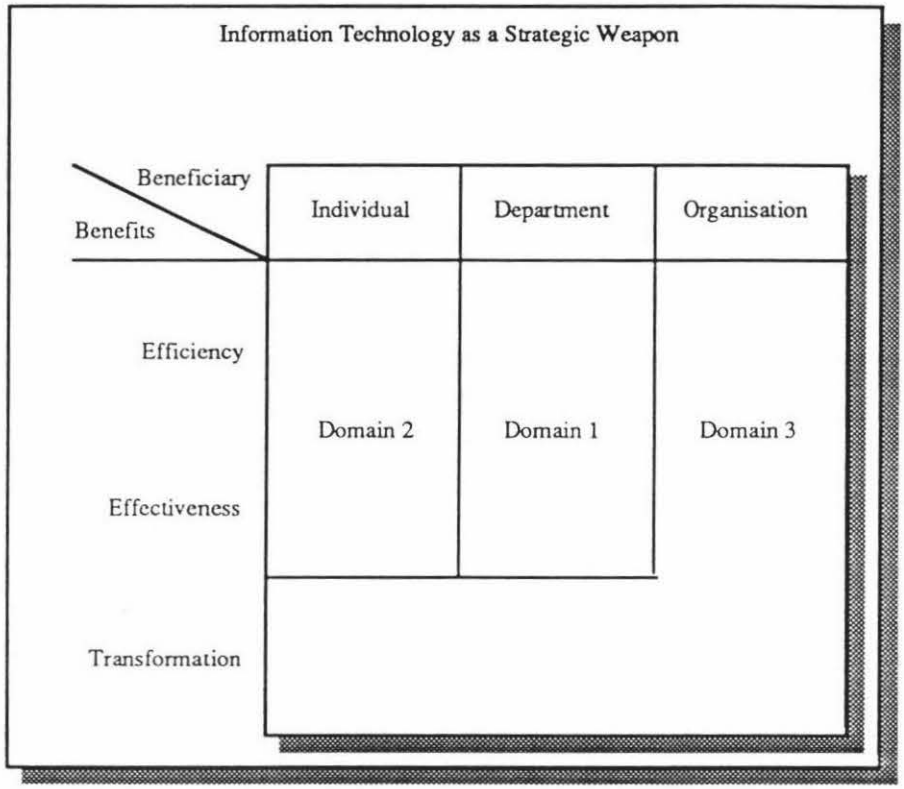


Figure 2.2: The benefit/beneficiary matrix (from Gibson, Cyrus F. and Michael Hammer (1985) "Now that the dust has settled, a clear view of the terrain," *Indications*, vol. 2, no. 5; as referred to in Wysocki and Young, 1990).

As organisations move through the control and integration stages of the stages of growth model, the increase in end-user computing means a new beneficiary—the individual user. Domain 2 has individuals empowered by increased access to information systems and applications tools to increase the efficiency with which the perform their jobs, and because they have greater access to information individuals are able to improve their job effectiveness.

Domain 3 recognises the use of information for strategic purposes. Information systems can be developed that expand and redefine the roles of individuals and departments within the organisation. The relationship between the firm and its

customers and suppliers can also change. Some competitive advantages will result for the organisation from these internal and external transformations.

Just as McFarlan's strategic grid could be used as a planning aid, similarly the benefit/beneficiary matrix can be used as a springboard for information systems planning. The organisation can be positioned as to its use of information systems and planning strategies developed relative to that position and the goals of the organisation.

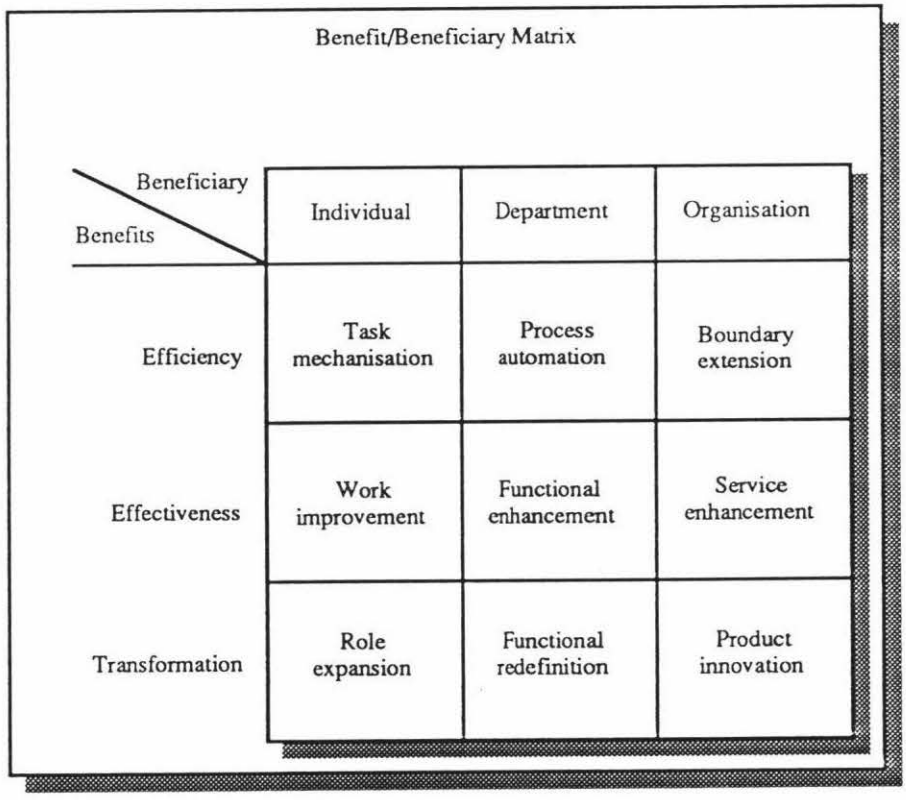


Figure 2.3: Type of application by matrix cell (from Gibson, Cyrus F. and Michael Hammer (1985) "Now that the dust has settled, a clear view of the terrain," *Indications*, vol. 2, no. 5; as referred to in Wysocki and Young, 1990).

When the matrix is re-examined as an application grid with nine cells (Figure 2.3), the nature of each benefit as applied to each beneficiary can be clearly seen. This more detailed matrix can be used as an operational tool for exploiting information systems. It makes it easier to position an organisation's current use of information systems by

providing categories into which applications can be placed. It identifies the kinds of issues that new applications developments would have to address to target a more strategic use of information systems. It also allows the information systems manager to clearly position a particular information systems development by the problem that is to be solved, and then focus on the appropriate technology and strategies to solve that problem.

When the application matrix is compared with the original benefit/beneficiary matrix, it is seen that the benefits to departments (which were Domain 1 of that matrix) achieved increased efficiency through process automation (usually accounting applications) and achieved increased effectiveness by functional enhancement.

The contribution of information systems to the efficiency and effectiveness of the individual (Domain 2 of the matrix) was achieved by task mechanisation and work improvement. For example, word-processors improved the speed and accuracy, and therefore efficiency, of clerical work; and managers, using spreadsheet and database software, were able to improve their effectiveness with better and more timely access to information.

The strategic use of information (Domain 3 of the matrix) is accomplished by transforming the individual, department, or organisation, and by increasing the efficiency and effectiveness of the organisation. The role of the individual can be expanded, a department's functions can be redefined, or the organisation can undergo a transformation through product innovation. Additionally, the efficiency of the organisation can be increased by boundary extension, or the effectiveness of the organisation can be improved by service enhancement.

The Models in the Tertiary Education Sector

Historically, tertiary education institutions seem to have been no different than many other organisations in their adoption and development of information systems. With regard to Nolan's stages of growth model, they have clearly passed through the initiation and contagion stages. Information systems were established in tertiary institutions especially in the accounting and administration functions. The potential of information systems for research was clear, and universities, particularly, invested in computers to aid with quantitative methods. Departments involved in the teaching of information systems required computing facilities to successfully accomplish their teaching, and spare capacity was filled (and exceeded) by other teaching departments which began to realise the potential of information systems as a teaching tool.

Tertiary institutions moved through the control stage of Nolan's model where centralised information systems expenditure became more closely monitored. In the integration stage, with the decreasing cost of microcomputers, departments were able to circumvent their dependence on a shared central resource. Equipment housed locally in departments was available for administrative and some research and teaching functions.

Most tertiary institutions are still in the integration stage, although there is some indication that a few, at least, are entering the data administration stage and recognising the need for an appropriately managed information base.

With reference to MacFarlan's strategic grid model, tertiary institutions are, on the whole, within the support category. Their major concern (perhaps understandably in the current policy and economic climates) is the provision of information systems in a cost effective manner.

There are a few instances of the use of information systems for strategic impact, which might place organisations in the turnaround or factory categories. For example, one

organisation provided a significant information systems investment to support a course of study and give its qualification a competitive advantage over similar qualifications. It is not clear that it is contemplating further uses of information systems for strategic advantage, so it might be placed in the factory category.

The integration of strategic information systems planning with overall strategic planning within the organisation does not appear to have taken place in tertiary institutions (as will be seen from the responses to the questionnaire). Clearly then, none could be categorised as strategic in McFarlan's strategic grid model.

Similar conclusions may be drawn when tertiary institutions are examined with reference to Gibson and Hammer's benefit/beneficiary matrix. There is established use of information systems to achieve increased efficiency and effectiveness of departments, especially in the administrative areas of the organisations, clearly placing them in Domain 1 of the model.

There has been increasing usage of information systems to enhance individual efficiency and effectiveness in administrative functions, in course preparation and delivery, and research activities. This use of information systems places the organisations in Domain 2 of the benefit/beneficiary matrix.

It is not so obvious that tertiary institutions have been using or have established a need for the use of information systems to transform the roles of the individuals within the organisation, the departments within the organisation, or the organisation itself. The other aspects in Domain 3 of the benefit/beneficiary matrix, increased organisational efficiency and effectiveness in its relationships with its buyers and suppliers, are not areas to which tertiary institutions have applied information systems.

Of the three models, the stages of growth, the strategic grid, and the benefit/beneficiary matrix, the last might well be the most useful in positioning an organisation. Nolan's stages of growth model traces an historical development of information systems and

might not be as relevant to organisations which have more recently begun computerising their information systems. MacFarlan's strategic grid gives a limited number of categories which are more oriented to the organisation's overall philosophy of information systems use. Gibson and Hammer's benefit/beneficiary matrix, on the other hand, focuses on functional processes in various aspects of the organisation and may be more accessible to information systems management, and is more obvious in its application.

ASSESSING STRATEGIC OPPORTUNITY

In an increasingly competitive environment, tertiary institutions could find themselves competing for students much more aggressively than before, and facing more significant consequences if they fail to compete successfully. In order to generate product or service enhancements that could have a competitive advantage, specific areas of strategic opportunity must be identified. There are some approaches, largely based upon the work of Porter (1985) and Porter and Millar (1985), which provide a framework for assessing strategic opportunity.

Value Chain Analysis

According to Porter & Millar (1985, page 150):

> The information revolution is affecting competition in three vital ways:
> - It changes industry structure and, in so doing, alters the rules of competition.
> - It creates competitive advantage by giving companies new ways to outperform their rivals.
> - It spawns whole new businesses, often from within a company's existing operations.

Value chain analysis provides a framework that allows organisations to examine their business in terms of strategic thinking. The value chain divides a company's business into the technologically and economically distinct activities called value activities. Value activities are those activities performed by an organisation to design, produce, market, deliver, and support its products. The value a company creates is measured by the amount it commands for its products or services. If this value exceeds the cost of performing the value activities, the business will be profitable. To gain a competitive edge, value activities must be performed at a lower cost, or performed in a way that leads to differentiation of the company's products and services and a higher value.

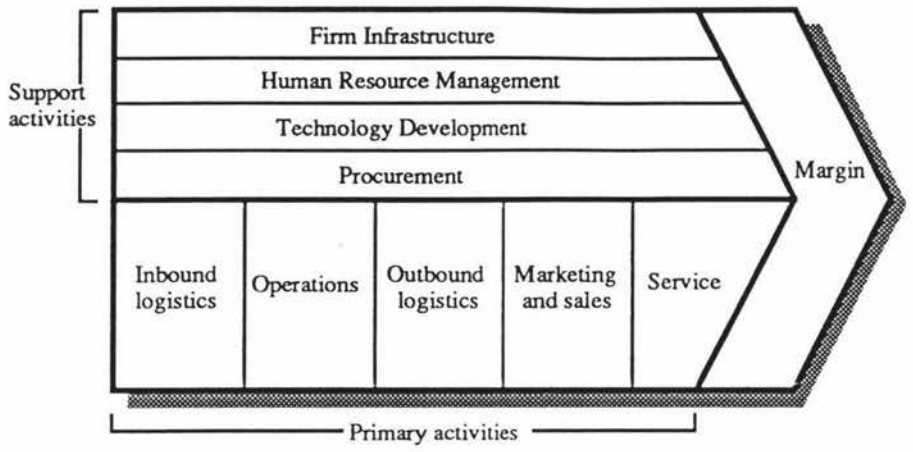


Figure 2.4: The value chain (Porter, 1985).

Porter (1985) identifies nine generic categories of support and primary activities into which value activities fall (Figure 2.4). Primary activities involve the creation and distribution of products or services, and include categories for:

- *inbound logistics*, which are the activities associated with the receiving, storing and disseminating of inputs to the product,
- *operations*, which are the activities associated with the transformation of the inputs into the final product,
- *outbound logistics*, which are the activities associated with the collecting, storing and distributing the product to the buyer,
- *marketing and sales*, which are those activities associated with providing means by which buyers can purchase the product, and the inducement to do so, and
- *service*, which is the activities associated with providing service to enhance or maintain the value of the product.

The relative importance of each of these primary activities to an organisation's competitive advantage will be dependent on the nature of the industry. For

organisations in the tertiary education sector, inbound and outbound logistics would seem less applicable than operations, marketing and sales, and service.

The support activities include the inputs and infrastructure necessary for the primary activities, and encompass the categories of:

- *firm infrastructure*, which consists of a number of activities including general management, planning, finance, accounting, legal, and quality management which support the organisation's entire value chain,
- *human resource management*, which includes the activities involved in recruiting, hiring, training, development, and compensation of personnel,
- *technology development*, which encompasses the efforts of the organisation to use technology to improve the products and the process, and
- *procurement*, which refers to the function of purchasing inputs used in the organisation's value chain, both consumables and assets.

As with primary activities, the importance of each of the support categories varies according to industry. Within the tertiary education sector, it is recognised that human resource management is of critical importance, and so too is technological development.

The primary activities are linked as a chain with each activity adding value to the product and incurring a cost for the value added. Examination of the value chain allows an organisation to identify ways to lower costs, differentiate products and services, or change its competitive scope.

The value chain for a company in a particular industry is part of a more comprehensive chain termed by Porter & Millar as the value system (Figure 2.5). The value system includes the value chains of a company's suppliers, may include the value chains of the distribution channels between itself and its buyer, and ultimately the buyers' value chains. A company may gain competitive advantage by focusing on the linkages in the value system.

Using the value chain, Porter and Millar suggest five steps that organisations may follow in order to identify strategic opportunities created by information technology.

Firstly, organisations need to assess the existing and potential information intensity of each link in their internal and external value chains to identify possible strategic opportunities. Higher or potentially higher information intensity in a link in the value chain or in the product will often signal potential for strategic opportunities. The assessment of information intensity may also uncover areas of business activities which need investment in information technology.

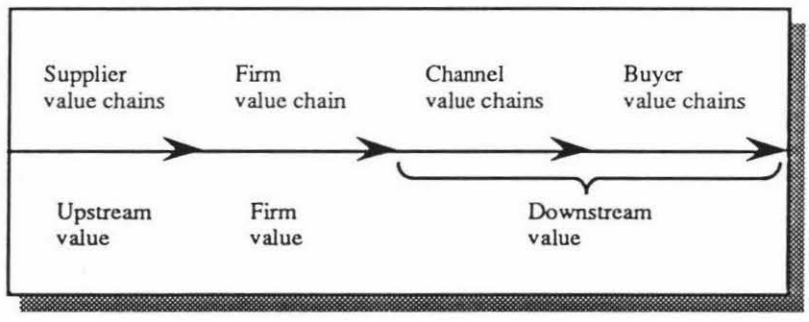


Figure 2.5: The value system (from Porter & Millar 1985).

Secondly, organisations must determine the role of information technology in the industry structure: how competitive pressures might arise from suppliers, competitors, and buyers, and how they might be affected by information technology. The organisation must be able to respond to pressures that materialise in order to retain or improve industry position.

Thirdly, organisations should identify ways in which information technology could create competitive advantage. Each link in the value chain should be considered to see how it might be affected by information technology. If high cost activities or critical areas of the business can be affected, then efforts can be focussed on applying information technology to them.

Fourthly, organisations should investigate how information technology might spawn new businesses. This involves identifying what information generated or potentially generated by the organisation could be sold. The existing internal information processing capacity could be assessed with the view to taking advantage of spare capacity in a new business venture. The organisation's products should be examined to ascertain if information technology makes it feasible to produce new, related items.

Finally, organisations must develop a plan for taking advantage of the opportunities available through the exploitation of information technology. This must be a business driven (not technology driven) activity. The plan should prioritise the strategic investments necessary to allow the organisation to capitalise on the strategic opportunities presented by information technology.

Competitive Forces Model

As well as creating information linkages or substitute products to establish competitive advantage, organisations should endeavour to establish product or service differentiation. The competitive forces model (Figure 2.6) (Porter, 1985) examines the five competitive forces that operate on an organisation within the Porter's value system. These are:

- the threat of new entrants,
- rivalry amongst existing firms,
- threat of substitute products,
- bargaining power of buyers, and
- the bargaining power of suppliers.

New entrants to an industry may cause reduced margins by lowering prices, or decreasing market share. Organisations may be protected from new competitors, organisations by technological and other barriers. These barriers may include:

economies of scale, proprietary product differentiation, switching costs, capital requirements, access to distribution, or government policy.

There are clear examples of these barriers in the tertiary education sector. In the deregulated environment that institutions are finding themselves, smaller institutions are finding it more difficult to succeed compared to larger institutions which are able to benefit from economies of scale. Potential new entrants need to have substantial capital backing to ensure the provision of resources such as accommodation, libraries, and computers. Conversely, one of the main barriers to new entrants in the degree market has been reduced under the new legislation. Previously, universities were the only institutions able to grant degrees and it required an Act of Parliament to create a university. Now other organisations may become able to teach degree courses, and the process of granting recognition is entrusted to the New Zealand Qualifications Authority.

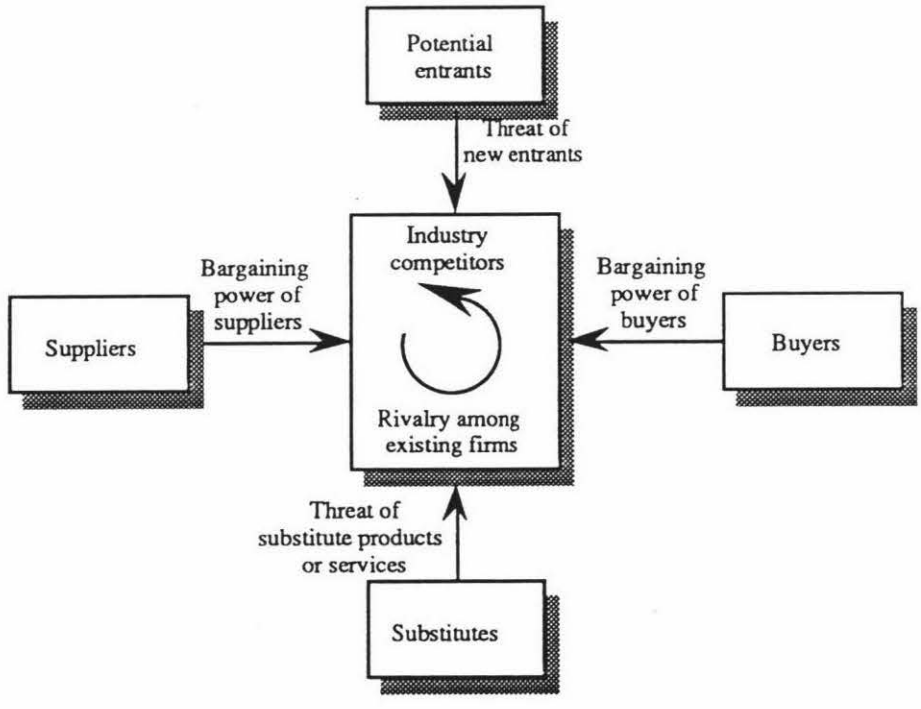


Figure 2.6: Forces driving industry competition (from Porter 1985)

Organisations within an industry will be seeking technological opportunities to improve their relative industry positions. This may result in lower prices, improved quality, or faster service, but may be at the cost of reduced margins and could have longer term effects on the industry. Generally speaking, competition is expensive, and organisations may seek competitive niches in order to reduce its effect. New Zealand tertiary educational institutions have managed enough growth in the past to make rivalry within the sector only a minor factor. With the possibility of a reduction in student numbers (upon which income is based) due to factors such as increased fees and reduced financial support from government and holiday employment, the prospect of increased competition amongst institutions is increased.

New technologies have brought about more opportunities in price and performance improvements through substitute products. Possibly the most vulnerable area is the replacement by computerised products of their human counterparts. In the case of tertiary education, there seems little likelihood in the near future to the replacement of human teachers with computer assisted learning or the like. The moves to greater use of technology in the distance education area are aimed at achieving a more effective use of the teacher resources available rather than replacing them.

Buyers can exert considerable influence on an industry by bargaining for service and quality improvements, by forcing price competition, and by forcing competition amongst the organisations within an industry. Buyers are in a strong position if they account for a large proportion of an organisation's sales, if they purchase standard products, if they face few switching costs, or if they are a threat to vertical integration in the industry. These might be countered by trying to increase the buyers' switching costs, selecting buyers who do not pose a threat, or providing differentiated products or services to large buyer groups. In the context of tertiary education, buyers (students) are theoretically in a strong position as they represent the major part of the institutions' funding, either directly through fees, or indirectly through government grants which are

tied to student enrolments. Furthermore, the majority of students are purchasing relatively standard products (Arts, Science, and Commerce degrees in universities, for example). Switching costs for buyers in this sector have been increased considerably recently, especially for those students who contemplate studying away from home.

Suppliers that have differentiated products or are not threatened by substitute products are in a powerful position relative to their competitors. If a particular industry is not a major part of a supplier's business, that industry can be subjected to pressures in the form of price increases or quality decreases to the supplier's products or services. The pressure from suppliers would not seem to be a major influence on organisations in tertiary education.

Porter suggests three strategies an organisation might follow to establish competitive advantage and minimise threats from competing forces. The first strategy is to be a low cost producer. Information systems can be used to identify and manage costs, to develop more cost-effective products and processes, to manage processes more cost-effectively, and to replace costly manual procedures with automated ones. Some of these have little relevance in tertiary education, where most of an organisation's operational costs are staffing, and there have been few significant developments in replacing staff with information systems in the teaching arena. Tertiary institutions pursuing the low cost strategy would likely need to look to streamlining other aspects of their operation.

A second strategy is to offer a uniquely differentiated product. Information systems can be used as a feature of the product or service, to develop differentiated product features, to develop differentiated service features, or to manage a differentiated product line more effectively. There may be more scope for tertiary institutions pursuing this strategy. Some organisations have used information systems as a feature of their qualification in order to gain a competitive advantage.

The third strategy is to develop systems to identify and service specialised markets. Information systems can facilitate the identification of these markets through analyses of corporate or industry sales and customer information. Information systems can also be used to customise the product to individual customer requirements, or be made an integral part of the product.

Porter identifies two fundamental risks associated with these strategies. An organisation may fail to attain or sustain competitive advantage. Other organisations pursuing the same strategy more effectively are threats. Threats also come from organisations pursuing one of the other strategies. Additionally, due to industry evolution, the advantage may be eroded, so an organisation must continually invest in improving its position.

STRATEGIC OPPORTUNITY IN TERTIARY EDUCATION

The Education Amendment Act 1990 has a number of provisions that mean that tertiary education institutions will operate more like an organisation in the business sector than previously. Section 166 of the Act establishes universities, polytechnics, and colleges of education as body corporates capable of holding property, suing and being sued, etc. In addition, section 192 gives institutions the rights, powers and privileges of a natural person, the power to issue debentures, to grant floating charges, to sell assets, and to borrow money, so long as these are exercised for the purpose of performing the functions characteristic of the institution, or are otherwise appropriate for that institution. The Councils of the institutions are empowered by section 193 to "...have all powers reasonably necessary to perform its functions efficiently and effectively." These include the power to prescribe student fees, an area it had previously had no control over and one that the Government is hoping will provide an effective differentiation of product between institutions. According to section 199, grants to institutions by the Government will be closely tied to student numbers. Institutions are required by section 220 to produce an annual report.

The competitive forces model can be applied to tertiary education institutions, especially now that the recent legislation has brought about fundamental changes in the tertiary sector. Changes in the funding levels to the tertiary sector by Government, and an increased user pays component has heightened the bargaining power of one of the buyers of the sector's services, the students. Although the full impact of this is yet to be fully felt, it seems likely that, as students are called upon to pay for an increased share of their tertiary education, they will become more critical of the service they receive. The major buyer of the services of the tertiary sector (the Government on behalf of society) has already signaled with the legislative changes that it is seeking more accountability for the money it spends.

The rivalry amongst existing organisations is likely to intensify with with the increased pressure from buyers. Already organisations are beginning to position themselves relative to their competitors, some by amalgamation (for example, the University of Waikato and Hamilton Teachers College), some by expansion into markets traditionally held by competitors (for example, the University of Otago's moves into extramural teaching, and Massey University's Albany campus).

In addition, the recent changes have opened the way for potential new entrants to the industry. The establishment of the New Zealand Qualifications Authority, which has the authority to approve courses of study at all levels, has made it possible for new and existing organisations to market an approved product to compete with existing courses of study. This includes the move by polytechnics to offer degree courses in various areas, something that previously used to be the sole prerogative of the universities, and opens the way for private provision of education at various levels.

The legislation also makes possible the threat of substitute products or services. For example, although education at university level in New Zealand has always been of a high standard internationally, it is now feared that there is the potential for the development of lower standard degrees and other academic qualifications. Any proliferation of institutions with more easily attainable qualifications would likely have the effect of attracting students away from the established institutions.

On an organisational level, it is clear that the concepts embodied in both value chain analysis and the competitive forces model apply as readily to the tertiary education sector as they do to other industry groups. It has already been suggested that tertiary institutions have gone through much the same processes in their information systems development as other organisations, including the growth of end user computing within the organisation. What has not been explored is the use of information technology as a component of the competitive strategy of tertiary institutions or, indeed, the appropriateness of the idea in the tertiary sector. Philosophically, given that tertiary

education institutions respond to the same forces that mould the behaviour of other organisations, and given that information systems strategic planning is inseparable from corporate strategic planning in any organisation, then clearly tertiary institutions should be examining potential ways of exploiting information technology for competitive advantage. Underlying much of the work in this area is the premise that organisations must examine information technology in the development of their corporate strategy, or they may find themselves relatively disadvantaged. There would seem to be no reason why the situation should be any different for the tertiary education sector.

As has been discussed, there are changes occurring that are forcing tertiary education institutions to more closely emulate the behaviour of organisations in other industry sectors than they might have previously. One of these changes is the commoditisation of education in New Zealand. In addition to increasing the profile of students as clients or customers of an institution by increasing the fees that are collected directly from them and by changes in funding that link funds received from government more directly to student numbers, much more has been made of the benefits of tertiary education to the individual student and less attention paid to the benefits to society of a generally better educated membership. This has the effect of making institutions much more aware of their own market, and potentially makes them more aggressive in increasing their share of the overall market. There is no doubt that, as organisations in other industries have done, tertiary institutions have an opportunity to more effectively utilise information systems to analyse the data they hold on their customers and consolidate and increase their market share.

Using information technology for competitive advantage in a tertiary education environment may not necessarily involve the development of sophisticated information systems, but more the provision of information systems infrastructure and resources to facilitate teaching and research. One issue almost certain to be a key critical success factor for any tertiary institution is the recruitment and retention of quality academic staff to carry out the productive functions of tertiary education—teaching and research.

Some institutions are already detailing, in advertisements, the information systems resources available to staff. For example, recent advertisements for staff in the Faculty of Science, National University of Singapore have stated:

> All academic staff have access to the following computer and telecommunications resources: an individual microcomputer (an IBM AT-compatible or Apple Macintosh); an IBM mainframe computer with 16 MIPS of computing power; an NEC SX supercomputer with 665 MFLOPS of computing power; departmental laser printers; a wide spectrum of mainframe and microcomputer software; on-line library catalogue; voice-mail; the international computer networks/BITNET and INTERNET, linking academic institutions and research centres all over the world. The campus-wide network, which is based on the high speed optical fibre based FDDI technology, enables the academic community to access the computing resources in the University from the convenience of the individual workstation.

As much space is devoted to detailing the information systems resources available to academic staff as is used outlining the salary scales and conditions of service; clearly an indication that the institution regards the provision of and nature of the information systems facilities as being an equally important inducement in the recruitment process.

From these examples of the potential strategic use of information systems, it is clear that tertiary education institutions could profitably consider using information systems for competitive advantage. The use of models like the value chain and the competitive forces model can help an organisation focus on the specific threat from its competition and develop an strategic use of information systems (if appropriate) to counter that threat.

Chapter 3

Information Systems Planning Models and Their Application to the Tertiary Education Sector

STRATEGIC INFORMATION SYSTEMS PLANNING

Planning that takes place within an organisation is recognised as occurring on three levels: strategic, tactical, and operational. This distinction also applies to information systems planning. Each level of information systems planning focuses on a different aspect of the planning process.

- *Strategic* planning is concerned with the overall directions of information systems development in the organisation and will likely interface to a greater or lesser extent with the corporate plan.
- *Tactical* planning deals with the achievement of the goals and objectives established by the strategic planning process.
- *Operational* planning translates the tactical plan into specific resource allocations.

These can be viewed hierarchically (Figure 3.1) with the strategic level concerned with goal and policy setting, the tactical level with how those goals can be fulfilled, and the operational level with the detail of the implementation of the policies. The focus here will be on strategic information systems planning.

Figure 3.1: Levels of information systems planning (from Wysocki & Young 1990).

Strategic planning has two principle dimensions:

- *strategy development*, in which strategic information is gathered by monitoring the organisation's internal and external environments, and
- *strategy implementation*, which includes the design and implementation of systems to generate the information needed to accomplish strategic goals.

Information systems departments in organisations have concentrated on the implementation dimension in a reactive role (Synnott, 1987; Wysocki & Young, 1990, and others). Generally they have reacted to the corporate plan and managed the information systems resources of the organisation and the development of applications for the organisation as a response to their perceptions of the corporate goals and objectives.

It is becoming more frequently asserted (Porter, 1985; Synnott, 1987, and others) that information systems managers must become involved in formulating corporate strategy as well as developing systems to support it. Their contention is that opportunities to exploit information systems and new information technology may be overlooked by an organisation if it does not make full use of the information systems expertise in its corporate planning process.

Strategic Information Systems Planning and Corporate Planning

Strategic information systems planning can exist in a variety of relationships within the corporate business planning process (Figure 3.2). They are identified, from the least interaction with the corporate plan to the greatest integration with the corporate plan (and most preferred), by Synnott (1987) as:

- no planning,
- stand-alone planning,
- reactive planning,
- linked planning, and
- integrated planning.

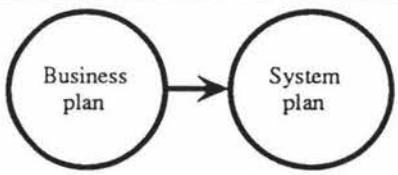
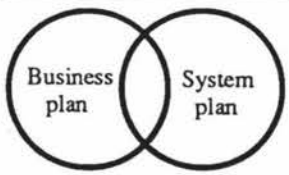
Type of Planning	Description	Degree of Integration
1. No planning	No formal planning takes place, either business or information systems.	
2. Stand-alone planning	The company may have a business plan or an information systems plan, but not both.	
3. Reactive planning	A business plan is prepared and the information systems function reacts to it—a traditional passive systems role.	
4. Linked planning	Business planning is "interfaced" with information systems planning. Systems resources are matched against business needs.	
5. Integrated planning	Business and information systems planning occur simultaneously and interactively. They are indistinguishable.	

Figure 3.2: The planning spectrum (from Synnott, 1987).

The situation of an organisation having no business plan and no information systems plan is an unlikely one. Certainly, New Zealand tertiary education institutions are legislatively required to produce a corporate plan, so a *no planning* scenario is not one that is a possibility for them.

Organisations practising *stand-alone* planning may have either a business plan or an information systems plan, but seldom both. If both a business and an information systems plan exist, there is no attempt to coordinate them. On one hand management may be producing business plans without consideration of the potential of information systems to the organisation. On the other hand information systems planning is done without reference to a business plan or with no business input. As a consequence, planning activity in the informations systems area of this type of organisation is generally limited to operational planning and tactical planning. The potential of information systems to provide strategic benefits for the organisation may not be understood by the management, and any such opportunities could be missed. Stand-alone planning is typical of organisations in the support category of McFarlan's strategic grid (discussed in Chapter 2).

Synnott states that most organisations are in the *reactive* planning category. A business plan is generated without direct input from the information systems area, and the information systems department is responsible for generating an information systems plan to support the business plan. In this type of organisation, the information systems department is more involved in tactical planning, but the strategic planning is limited to within the information systems area, and only impacts on the development of systems, not the use to which systems will be put, nor the types of systems developed. Reactive planning can be found in organisations within the support and factory categories of the strategic grid model.

Organisations practising *linked* planning link information systems planning to business planning. Information technology is examined to see how it might help meet business

goals. The information systems department has much more opportunity to influence the corporate plan. Organisations in the turnaround and strategic categories of McFarlan's model are amongst those which could use this type of planning.

Integrated business and information systems planning is the type of planning likely to bring an organisation the most strategic opportunities. Business and information systems planning are part of the same planning process, and so occur simultaneously and are indistinguishable. This type of planning requires the information systems manager to participate actively in the formulation of the corporate plan, and functional business managers to participate in the information systems strategic planning process. This requires information systems management who understand the business functions of their organisation and of the industry the organisation is operating within. Also required are business managers who understand the value of information systems and the role that information systems can have within the organisation's activities.

MODELS OF INFORMATION SYSTEMS PLANNING

A number of models of information systems planning have been developed to try to provide a framework within which to explain the planning process. A number of them are general enough to be more readily applicable in the tertiary education sector. These are examined to determine which might best assist in gaining a better perspective on information systems planning in New Zealand Universities, Polytechnics, and Colleges of Education.

Business Systems Planning Methodology

Business systems planning (Figure 3.3) was developed by IBM (1984) as a process for developing an information systems strategy that is to some extent coordinated with the organisation's business strategy. It is a very structured process that attempts to achieve a number of objectives:

- provide an information systems plan based on the business plan that supports the organisation's short– and long–term information needs,
- provide a formal, objective method for management to establish information systems priorities,
- provide for the development of systems that, because they are based on the business processes, will have a long life,
- ensure the effective and efficient management of information systems resources in support of the business goals,
- increase executive confidence that high-return, major information systems will be produced,
- improve the relationship between the information systems department and users by providing systems that are responsive to user requirements,
- identify data as a corporate resource.

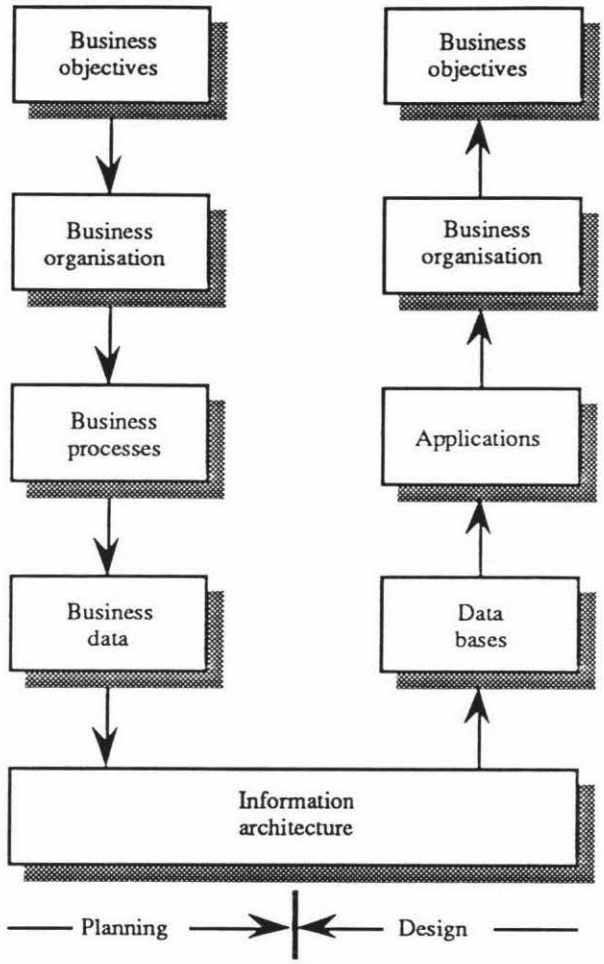


Figure 3.3: Business systems planning methodology (from IBM, 1984).

Business systems planning consists of top-down planning and bottom up implementation. It is a reactive planning approach with the information systems plan being developed to support the business objectives. The business objectives are identified through discussion among all executive levels throughout the organisation to ensure agreement about the business directions. The business processes are defined and they establish the main areas of information systems support in the organisation. The business data is defined by identifying what entities are important to the business and what data is required to manage those entities. From this planning process, the information architecture, which essentially is a statement of the long-term information

systems objectives, is developed. The design phase involves the development and modification of organisational databases, and the identification, scheduling, and development of required applications. The use of the new systems support the business processes throughout the organisation, which in turn contribute to the business objectives.

Information Systems Master Architecture and Plan

Atkinson and Montgomery (1990) view information systems planning as a dynamic process to support management decision making. The model is organisation-wide, allowing information technology developments to be considered at all levels.

The information systems master architecture and plan is a planning process that takes place within a framework (Figure 3.4) that examines the information systems strategies in the context of the organisation and its corporate plan, and of current information technology and the expected developments in information technology. The three levels of the model reflect the dynamics of the process. At the enterprise level, the current enterprise is to be transformed by the strategic plan to the target enterprise. At the information technology level, current technology will progress to a target technology. At the information systems level, a target situation will be achieved by applying a strategy to the current situation, taking into account the technological trends and business goals of the organisation.

The information systems level is developed in more detail than a simple model of a transition applied to a current state to yield a target state. To ensure the enterprise is business driven, a business model component is included in the information systems layer. This represents an idealised business data and business process view which is free of technological and other constraints. Also included to this level is an assessment of the current information system architecture. This is an evaluation of the existing information architecture and applications portfolio from both a user and an information

systems viewpoint. Finally a constraints component is included in the information systems layer to ensure that the target information systems architecture is realistic and feasible.

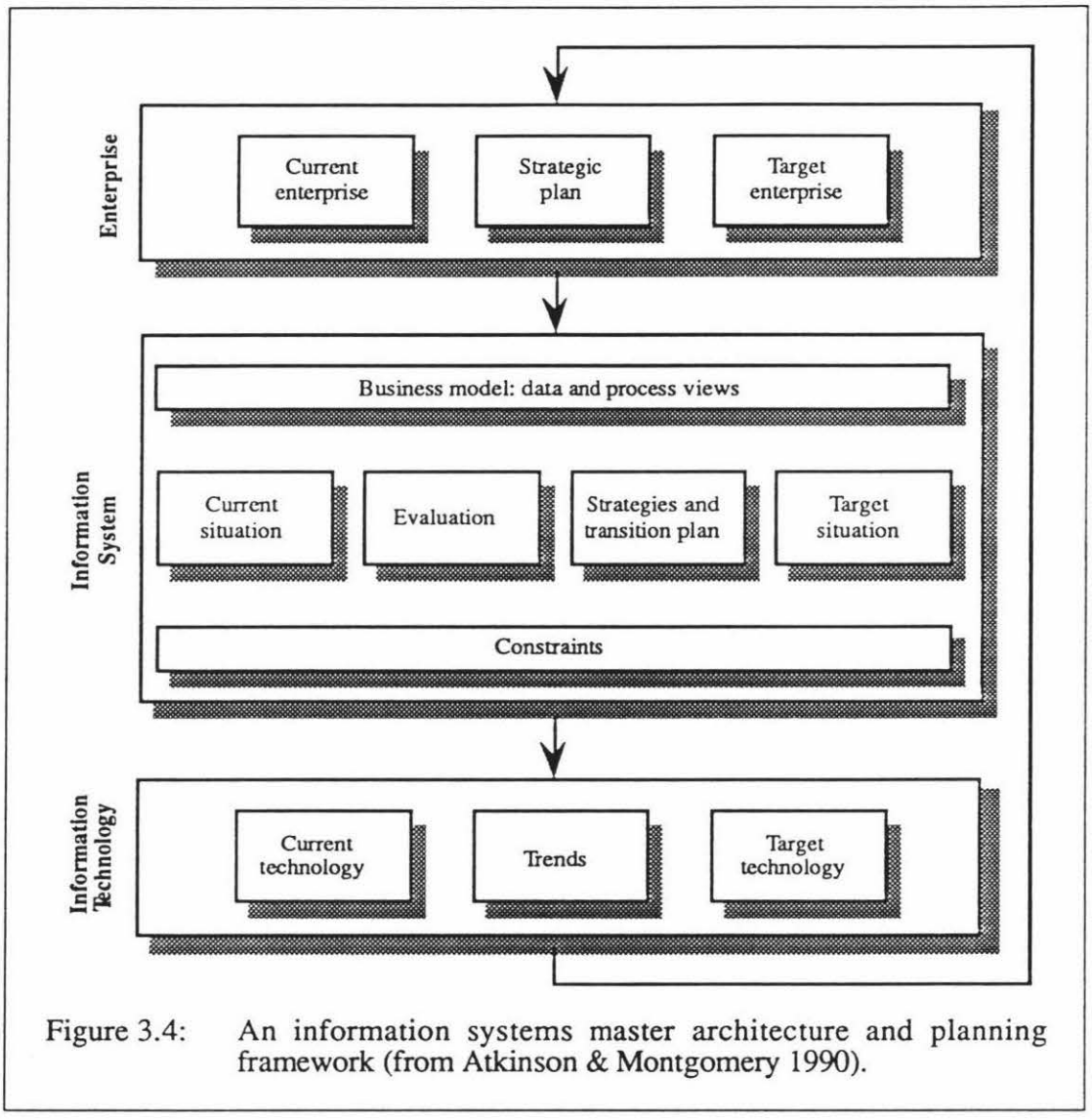


Figure 3.4: An information systems master architecture and planning framework (from Atkinson & Montgomery 1990).

Within this framework, the development of an information systems master architecture and plan proceeds through the following sequence:

- Describe the organisation: current situation, target vision, and transition strategy.
- Develop the business and information systems model.
- Describe the current information systems situation.

- Describe information technology: current status, trends, and target vision.
- Asses the technology impact.
- Evaluate the current information systems situation.
- Define the unconstrained target information systems architecture.
- Define the constraints.
- Apply the constraints to the target information systems architecture.
- Define the information systems strategy and transition plan.
- Use the resultant strategic plan to develop a tactical information systems plan.

Information Systems Systems Strategy Planning Model

Hayward (1987) details an information systems strategic planning model which identifies a number of key areas where management must make strategic decisions. The strategic decisions are the objectives, management, technology and applications of information systems. These strategic decisions provide a framework within which the information systems can be built.

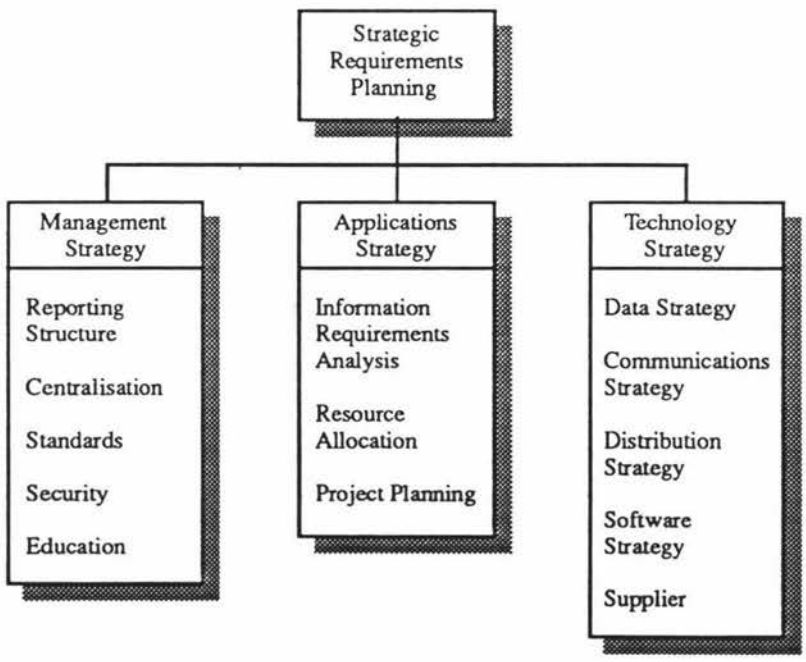


Figure 3.5: An information systems strategy planning model (from Hayward, 1987).

The four major activities comprising the planning model (Figure 3.5) are:

- strategic requirements planning,
- a management strategy,
- an applications strategy, and
- a technology strategy.

Management strategy includes the policies, objectives and strategies for the organisation of staff who perform information systems functions. This includes evaluating the reporting structure within which the information systems department will operate, and the scope of the department's activities. Another important factor in the level of involvement of the top management of the organisation in the information systems planning process. The degree of decentralisation of the information systems resource within the organisation needs to be decided. Certain strategic decisions need to be taken with regard to standards. The issue of security is an area that requires strategic direction. The speed of developments in the information systems area mean that continuing education of staff involved with them will be essential, and the framework for providing this education must be decided.

There are three problems to be dealt with when considering an *applications strategy*: the identification of the information needs and information processing needs of the organisation, application prioritisation and resource allocation, and project development. Information requirements analysis is concerned with understanding the information requirements of an organisation, including the underlying data and the processes that transform the data and deliver it as timely information throughout the organisation. Resource allocation may be simply a response to project prioritisation, although it may include considerations such as the sequencing of project development and the mix of development projects.

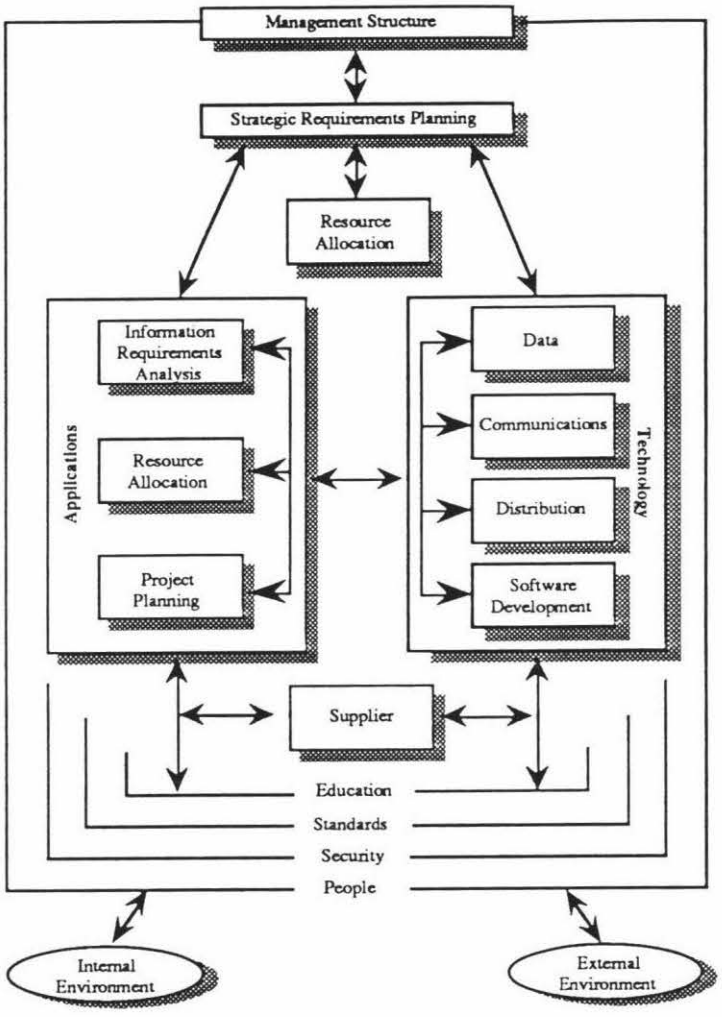


Figure 3.6: An interactive planning model (from Hayward, 1987).

The *technology strategy* is the perspective across the organisation of the hardware and systems software needs required to support the management and applications strategies. A data strategy is concerned with the administration of data using appropriate tools such as modelling systems, data dictionaries and database management systems. A communications strategy is required to deliver the distributed aspect of the organisation's information systems resource. Deciding the mix of functional and geographic distributions of the information systems requires a distribution strategy. A software strategy is necessary to ensure that the systems requirements as constrained by

the technology and the applications strategies are implemented. The relationship of the organisation with its supplier or suppliers is another issue of strategic importance.

Hayward's model describes a type of linked planning in which *strategic requirements planning* "...is a key activity since it links the plans and strategies for information systems with overall corporate objectives and strategies" (Hayward, 1987, page 103). The strategic requirements planning is essential as it unifies and aligns the information systems management, applications and technology strategies with the business objectives of the organisation. Strategic requirements planning is carried out first, followed by the concurrent planning of management (management strategy), information (applications strategy), and systems (technology strategy) architectures.

Hayward does place the model into an interactive framework (Figure 3.6) which shows the interactions amongst the components of the model, and various factors in the internal and external environments. This recognises the need to relate an organisations information systems strategy to the strategic opportunities in the environment within which it operates.

Hayward argues that in practice, for the sake of manageability and convenience, much work will be done in the individual areas of the organisation. Because numerous tradeoffs are required during the planning process, he strongly argues for a single person or small group to be responsible for the coordination of the development and revisions to the strategy.

The planning model interacts with the organisation's internal and external environment and hence links the planning model to the planning process. Developments in an organisation's internal and external environments may have a considerable impact on the strategy. The impact of the internal environment is illustrated by the applications backlog, the development of end user computing and their impact on the management and control of information systems. Forecasts, which take account of future trends, are made necessary by developments in the external environment. Planning scenarios must

take account of both technological developments and possible strategies of competing organisations.

Extended Critical Success Factors

The critical success factors model (discussed in Chapter 2) has been extended by Henderson and Sifonis (1988) to make it a more useful information systems planning approach. This model (Figure 3.7) is also a linked planning approach that matches strategic information systems planning to strategic business needs.

A consequence of the identification of key business processes at the business strategy level is the formation of strategic goals to be acted upon by the organisation. The model uses the strategic business goals to provide a direct linkage to the information systems plan. Critical success factors are used to focus the information systems strategy on areas that are critical to meeting the business goals.

The extended critical success factors model develops four object sets:

- critical assumptions set,
- critical decisions set,
- value-based processes set, and
- strategic data model.

This set of objects, along with the critical success factors, are the primary products of a strategic information systems planning process. Each of the object sets defines a area in which the information systems department can provide products and services. The object sets do not directly specify an information systems application, rather they identify a market for information systems products within the organisation that have strategic value to the organisation.

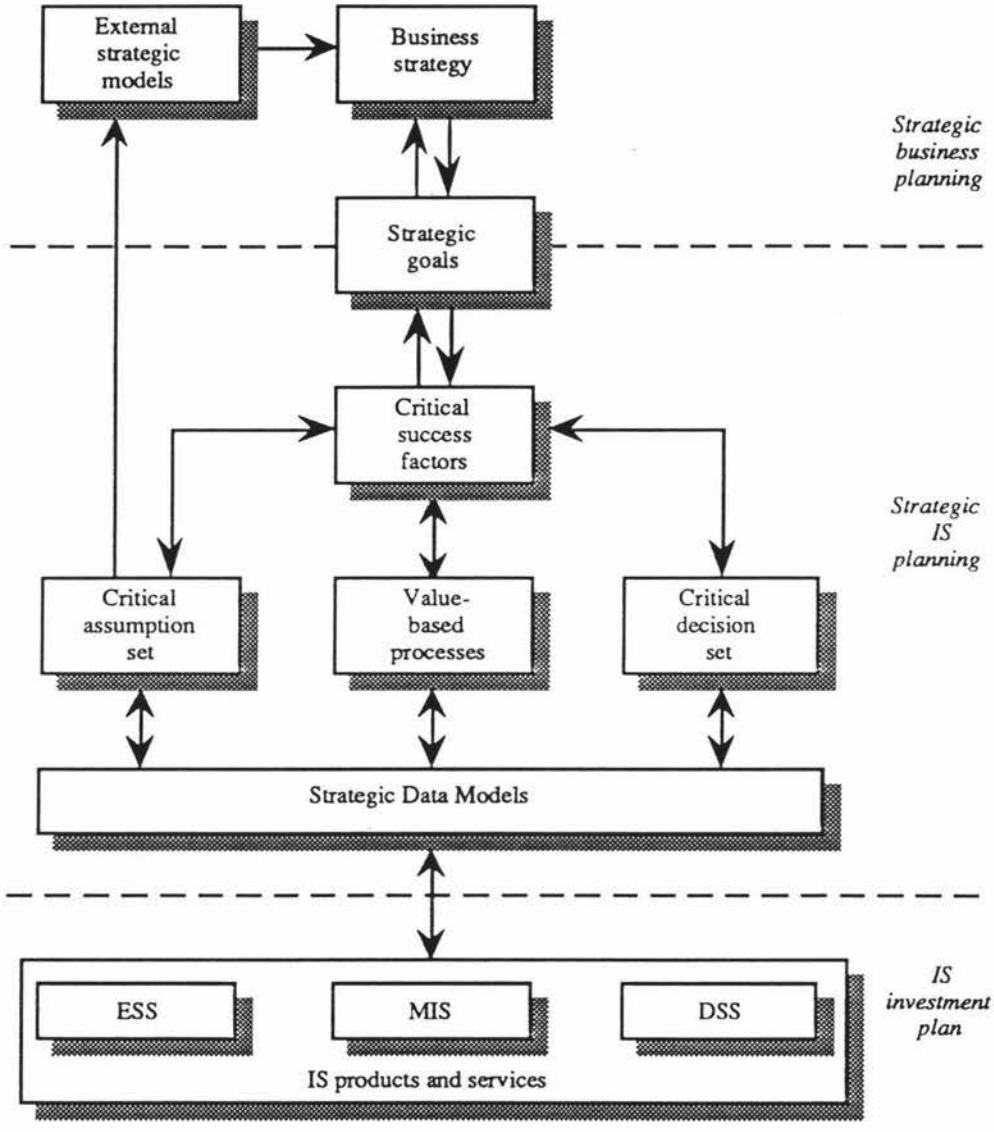


Figure 3.7: The extended critical success factors model (adapted from Henderson and Sifonis, 1988).

The critical assumptions set consists of assumptions that underlie the critical success factors. These assumptions are the reasons why the critical success factors are thought to be valid. This object set can be used to identify critical executive support systems that will be used to monitor and analyse critical assumptions. It also provides data that can be used to assess the external validity of the information systems plan.

The value-based processes set links the critical success factors to critical business processes. The efficient and effective management of these business processes will add strategic value to the organisation. The value-based processes set focuses on the products and services that have traditionally been the domain of the information services department. It provides a direct link to the existing applications base, many of which were developed to support business functions. This object set allows information systems planners to assess their strategy in the context of the existing information systems asset base, and assists in the effective implementation of information systems tactical and operational plans.

The critical decisions set contains decision processes that will affect the critical success factors. It identifies a critical subset of decisions from the set of all decision processes in the organisation. This object set identifies decision support systems products and services, and helps identify data that is strategically important to the organisation by providing a decision-making view of the data resource.

The strategic data model does not attempt to create a complete and consistent data model. Instead it focuses on identifying the significant value-added data classes and their inter-relationships. It facilitates the coordination of investments across management information systems, decision support systems, and executive support systems. Additionally, it focuses efforts to more effectively manage the data resource. The strategic data model augments rather than replaces the detailed data model that underlies the information systems infrastructure. It is concerned with the data needs critical to the organisational goals and critical success factors.

An Integrated Strategic Information Systems Planning Process

Wysocki and Young (1990) view planning as "...a way of guaranteeing and maintaining a competitive advantage" (page 97). They maintain that, as a consequence, information systems planning must be fully integrated with business planning at all levels of the organisation.

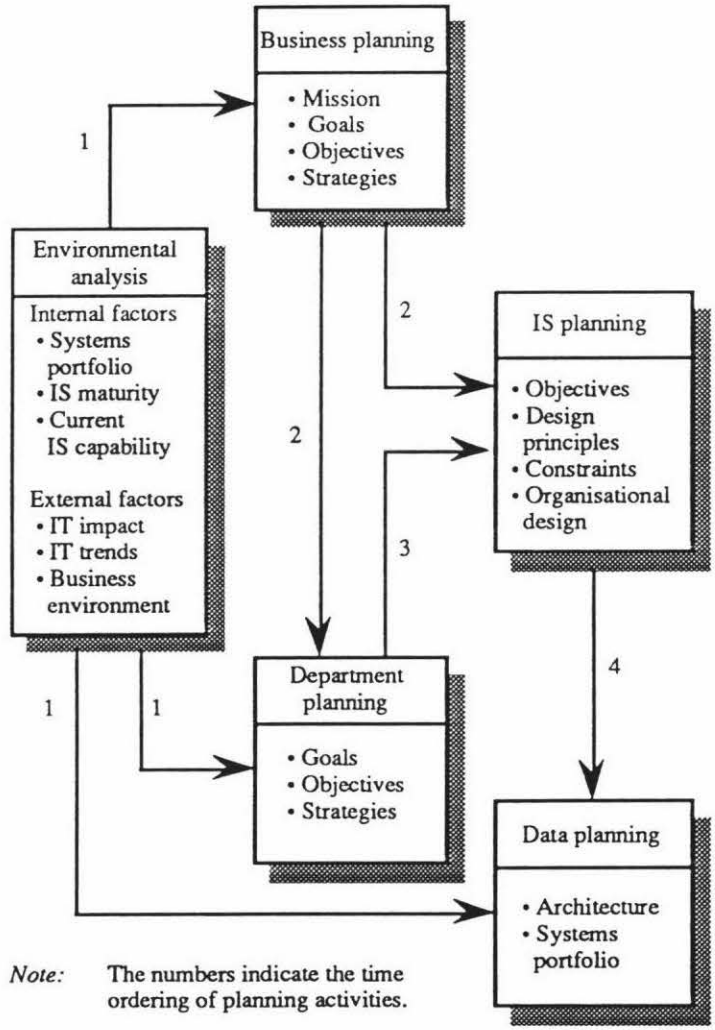


Figure 3.8: An integrated strategic information systems planning model (from Wysocki & Young 1990).

Wysocki and Young present an integrated strategic information systems planning model that involves the information systems department in a dual planning role. A proactive

role involves the information systems department in corporate strategic policy formulation. The reactive role is to provide support services to the organisation to assist the achievement of planning objectives.

The model (Figure 3.8) consists of five steps:

- environmental analysis,
- business planning,
- business unit and department planning,
- development of a strategic information systems plan, and
- data planning.

The environmental analysis is the responsibility of the information systems manager and involves documenting the internal and external factors influencing the organisation's use of information technology.

Internal factors define the organisation's current use of information technology and examine the potential changes in that use. This might include locating the organisation in information systems models such as the strategic grid in order to determine which information systems planning methodology would be consistent with the organisation's information systems climate.

External factors to be considered are those that determine the organisation's competitive position with respect to information technology. This includes an assessment of how developments in information technology have and could affect the industry and the organisation. The objective of this analysis is to identify information technology trends which might provide new strategic opportunities for the organisation.

Environmental analysis is a proactive, ongoing activity initiated and conducted by the information systems department. It will provide a continuous flow of information at both corporate and departmental levels of developments in information technology and

the strategic implications of those developments. This information is essential input to the strategic planning processes of the organisation at all levels.

At the corporate level, the organisation uses the information from the environmental analysis to determine if it can use information technology to make significant changes to its interactions with its markets. The output of this process will be a new or revised corporate strategy which will be input to departmental planning.

At the department level, information from the environmental analysis is examined to determine whether there are applications of information technology internal to the organisation which will improve the current business process. This information and the corporate strategy are input into the departmental planning process. Models such as value-chain analysis can be used to identify opportunities for competitive advantage.

With the corporate strategy and departmental plans now in place, the information systems department can now reactively develop a strategic information systems plan. A planning methodology directed at reactive planning, such as the business systems planning method, could be useful in the development of this information systems plan.

The final step in this planning process is the data planning. This is based on the information systems strategic plan and has inputs from the environmental analysis. As a result of this activity, an information architecture may be defined, and a portfolio of development projects prioritised. One approach to this stage of the process is to use the portion of IBM's business systems planning methodology that deals with the definition of the information architecture, and the design and development of databases and applications.

WHICH MODEL FOR THE TERTIARY EDUCATION SECTOR?

Placing a planning model in Synnott's planning spectrum (Figure 3.2) provides a useful measure of its relative merits, especially if the planning model is to focus on the use of information systems for competitive advantage. Of the models discussed in this chapter, Wysocki and Young's integrated strategic information systems planning model appeals the most because of its integration of business and information systems planning, and its incorporation of a planning process. IBM's business systems planning model and Atkinson and Montgomery's information systems master architecture and planning model are reactive planning models. Hayward's information systems strategy planning model and Henderson and Sifonis' extended critical success factors model are all linked planning models.

Because Wysocki and Young's model is the only one that provide an integrated business and information systems planning process, that is not to say the other models are without merit. Use of any of the models would ensure that strategic information systems planning was carried out, and that the information systems planning bore some relationship to the corporate planning. The business systems planning model at least relates the information systems plan to the business plan. While the information systems plan only follows on from the business plan, it is a well-defined process that can also be applied, in whole or in part, in other information systems planning models.

Atkinson and Montgomery's model views the planning process as a transition from a current state to a target state. This is applied at the enterprise level, the information systems level, and the information technology level. From the corporate strategic plan, a business model is developed which is taken account of, along with technological constraints, in the information systems planning process. Like the business systems planning model, this is better than no planning at all, and it may usefully be incorporated into part of another planning model.

Hayward's model identifies key areas within an organisation, the information systems infrastructure of which must be subject to strategic decisions by management. This is the interface between the corporate planning process and the information systems plan. The corporate management make the key strategic information systems decisions, based on the overall corporate goals.

Because it demonstrates a direct relationship between aspects of the strategic planning process and different types of information systems developments, Henderson and Sifonis' model has much to commend it. The model involves the corporate management of the organisation in the strategic information systems planning process, and it implies some involvement of information systems planners in the setting of corporate goals and critical success factors. Certainly the information systems products and services are clearly linked to the business' critical success factors.

Wysocki and Young's model is the only one which provides direct information systems input into the business planning process. Information systems planning and business planning are part of the same process. The entire planning process starts with an environmental analysis of internal and external factors, which include both information systems and business aspects. This is essential if information technology is to be exploited for competitive advantage. This integrated strategic information systems planning model allows for other planning methodologies to be utilised to fulfil parts of the model if they can appropriately do so.

The major difficulty with the planning models is that, as they move up through the planning spectrum, they require increasing commitment from the corporate management to the model. The reactive models could be implemented by enterprising information systems managers (assuming a corporate plan exists) with little reference to the organisation's top management. The linked planning methodologies require top management to be prepared to examine information systems issues and make strategic decisions about them or based on them. The integrated planning model requires full

commitment from management as it involves the application of information technology to all areas of the organisation. This means that there will need to be a considerable amount of information systems education, probably at all levels of the organisation.

Given the recent nature of New Zealand tertiary institutions' foray into corporate planning, and their general lack of information systems planning, it is difficult to recommend a sophisticated planning model as appropriate for them. Their management structures, especially in the information systems area, also complicate the issue. Information systems functions are carried out in many departments in many tertiary education institutions. The management of these functions not centralised to an information systems manager or department, but is dictated by the organisational structure. Tertiary institutions are not alone in experiencing a decentralisation of information systems functions, many organisations have endured the growth of end user computing and the loss of control over the information systems functions by information systems departments. The information systems reporting structure shows little consistency across institutions. Responses to the questionnaire showed the information systems function reporting to as diverse a department head as the Associate Director (Human Resources), the Academic Registrar, or the Finance Manager. There is a current trend to advocating the existence of a chief information officer reporting directly to the chief executive officer, who is responsible for the centralised information systems functions, information systems planning, and information management within the organisation. Clearly information systems management structures in tertiary institutions are structured in this manner.

Tertiary education institutions must move toward a model of information systems planning which is integrated with corporate planning if they are to benefit from the effective use of information technology in carrying out their business. Senior management will have to be convinced of the possibilities inherent in information systems use for competitive advantage and the risks associated with not incorporating information systems into the organisation's overall strategy. This will involve

individuals currently undertaking information systems planning taking a proactive role in communicating the potential benefits of the strategic use of information technology to the organisation. In the short term, one of the reactive or linked planning models could be adopted as the organisation's information systems planning process is established. Eventually, tertiary organisations must look to transforming their planning model from a reactive approach, perhaps through a linked approach, to an integrated model.

Chapter 4

A Survey of Information Systems Planning in New Zealand Tertiary Education Institutions — Results

THE QUESTIONNAIRE

A questionnaire (Appendix 1) was designed to determine the extent of information systems planning currently undertaken in New Zealand tertiary education institutions, the reasons for information systems planning, and the detail of the information systems planning process. There were two major sections in the questionnaire: a general institution information section, and an information systems planning section.

The general institution section was intended to paint an overall picture of the organisation against which to examine their information systems planning. It included questions about the number and type of staff, and information about the institution's budgeting, to establish the size of the institution, and its levels of information systems staff relative to other types of staff. There were questions on the management structure of the organisation and the information systems management structure. An understanding of the management structures within organisations assists in the examination of the planning processes. There were questions relating to the corporate planning process, as any examination of information systems planning must reference in some manner the corporate plan.

The second section of the questionnaire examined in much more detail the information systems plan and the information systems planning process. There were questions about the relationship of the information systems plan to the corporate plan, and the information systems budget. There were questions examining the information systems planning process including the evaluation of the information systems plan, and the involvement of the information systems department in planning activities. To try and establish the motivations behind the institutions' information systems planning, they were asked about their reasons for information systems planning, and their perceived critical information systems issues.

THE SURVEY

The questionnaire was sent to the chief executive officer of each of New Zealand's six Colleges of Education, twenty four Polytechnics, and seven Universities, with the request that it be completed by that institution and returned to the researcher. The questionnaire was despatched to the institutions at the end of October 1990. Over the next several weeks, a number of completed questionnaires were returned. Also during this period, a number of institutions replied declining to participate in the survey. After five weeks, at the beginning of December 1990, institutions that had not responded in any way were sent a follow-up letter reminding them of the survey, inviting them again to participate, and including another copy of the questionnaire. As a result of the reminder, several further responses, both completed questionnaires and letters declining participation, were received.

At the end of the survey, fifteen of the thirty seven institutions had completed and returned the questionnaire. A further ten institutions had indicated that, for one reason or another, they would not participate. One completed questionnaire was apparently lost in the post, and the institution declined to complete the questionnaire again. There was no response of any kind from twelve institutions.

It was initially proposed that there would be follow-up case studies of selected institutions, but time constraints curtailed the proposal. In any event, the intention was to explore in more detail the institutions' planning process, which in almost all cases was undocumented if it existed at all.

THE RESPONSE TO THE QUESTIONNAIRE

The final return of fifteen completed questionnaires from the total of thirty seven surveyed institutions represents a forty one percent (41%) response. This seems to be an adequate response from a postal survey (Cohen and Manion, 1989; Warwick and Lininger, 1975). The final response, by type of institution, is set out in Table 4.1.

Type of Institution	Number of Responses	Total Number of Institutions	% Responses
College of Education	1	6	17%
Polytechnic	11	24	46%
University	3	7	43%
TOTAL	15	37	41%

Table 4.1: Response to questionnaire.

Because of the small total number of institutions in each category completing the questionnaire, and because of the lack of significant differences in the responses between types of institutions, it was decided to amalgamate all the responses into a single total. These amalgamated responses will be discussed.

General Institution Information & Corporate Planning Section

There is some variance in the responses to question 3. Some respondents gave equivalent full-time staff figures while some gave actually staff numbers. Some had difficulty in giving a precise reply. Consequently, not much can be read into these results except that tertiary institutions range in size from very small (with less than 50 staff) to reasonably large (with over 1000 staff), and that staff identified as specifically

Information Systems are a small percentage (between 1% and 2%) of total staff numbers in the institution.

When the information systems staffing situation was explored further, it was discovered that information systems functions were performed by staff who are nominally designated in another category. The largest group were classified as administrative staff. These staff, together with the designated information systems staff, raise the percentage of staff performing information systems functions to between 3% and 5% in tertiary institutions.

Several of the institutions could not or did not separate their operating and personnel budgets. The average combined annual operating and personnel budgets of the institutions responding ranged from $600,000 to over $15,000,000. The annual capital budgets ranged from $300,000 to more than $10,000,000.

All institutions except one indicated that the organisation had a strategic or long range corporate plan. The other indicated that the organisation produced a statement of objectives.

In eleven of the fifteen institutions the success of the corporate plan was measured on the performance of the organisation, with several respondents indicating that there were specific performance indicators. Seven of the institutions indicated additionally that the corporate plan was measured by examining whether or not the specific objectives of the organisation had been met.

The participants in the formal review and evaluation of the corporate plan were usually the organisation's executives (2), the department heads (2), or both groups (7). One organisation depended solely on a special committee, although three institutions included a special committee in conjunction with the executives and department heads. Only three organisations used specialist planning staff in the evaluation process, and then only in tandem with executives or department heads. Several respondents

Information Systems Planning and Control Section

Only six of the institutions responding to the questionnaire indicated that they had a formal strategic or long range information systems plan. Five of those institutions with an information systems plan said that it was integrated into the overall corporate plan. However, several other respondents indicated that either a long range information systems plan was being developed or that some information systems planning was being done.

Information Systems Planning	No. of responses
no plan (corporate plan only)	6
supports corporate plan	4
interfaces with corporate plan	4
integrated closely with corporate plan	1

Table 4.2: Tertiary institutions' information systems planning and the planning spectrum.

The question inviting respondents to describe the characteristics of their long range information systems plan (Table 4.2) ties neatly to Synnott's planning spectrum (discussed in chapter 3, Figure 3.2). Six institutions had no information systems plan. Four others stated that the information systems plan was (or would be) developed to support the corporate plan. Four further institutions indicated that the information systems plan interfaced (or would be interfaced) with the organisation's long range plan. One respondent indicated that their information systems plan (yet to be developed) would both interface with and support the corporate plan. Only two respondents indicated that the information systems plan was integrated closely with the corporate plan; one of these was signaling an intention, not an accomplishment (their information systems plan was being developed), and the other had already indicated that their information systems plan was developed to support the corporate plan.

Many respondents found it difficult to ascertain the information systems budget of their organisation, as the management and accounting structure did not facilitate it. Those that were able to supply the information reported that the part of the operating budgets spent on information systems ranged from 0.3% to 2.5%, averaging about 1.2%.

The most frequent response to the question about the information systems planning horizon was three years, although replies ranged from two to six years. Given that the Education Amendment Act 1990 (section 203) specified a financial planning horizon of three years, it is not surprising that many institutions have adopted that period for corporate and information systems planning horizons.

Probably because few of the respondents actually had an information systems plan, less than half of them indicated that it was a part of current planning. Seven institutions had an information systems plan as part of the annual operating plan of the organisation, seven had it as part of the strategic plan, and five had it as part of the capital expenditure programme. These replies were not mutually exclusive, with four of the institutions indicating that the information systems plan was part of all three aspects of the corporate plan.

Overall, participation in the information systems planning process occurred throughout the organisations responding. Fourteen indicated that the corporate executive participated, fourteen stated that the computer services department participated, thirteen said that various user departments participated. It was indicated by eleven and ten respondents respectively that information systems management and corporate planners participated in the information systems planning process. There were not as many institutions which actually had an information systems plan as were indicating participation in the information planning process. It is possible that in many cases this response was indicative of the likely participants in the strategic planning process, or indicated the participants in the tactical information systems planning process.

Institutions had more difficulty responding on criteria for measuring the effectiveness of information systems to the organisation. Eight stated that results were judged on tangible benefits such as cost savings or improved delivery of services, and seven indicated that the development of projects on time and within budget was important. Several indicated that there was little measure of information systems effectiveness.

No. of responses	Reasons For Strategic Planning
11	To improve resource allocation
10	To increase user involvement and commitment
10	To improve the level of organisational confidence in Information Systems activities
10	To improve communications at all levels
9	To forecast Information Systems resource requirements accurately
8	To establish a foundation for Information Systems controls
7	It is a legal requirement
4	To examine the strategic implications of Information Systems use
3	To provide a framework to improving short term Information Systems investment decisions
2	To reduce one-time and recurring Information Systems expenses
2	To identify new Information Systems opportunities and value added services
1	To obtain long term vendor commitments
1	To identify future directions and plan resource implications
1	To ensure information systems support strategic direction and business requirements
1	To get a corporate feeling

Table 4.3: Reasons for conducting strategic and/or long range information systems planning.

The reasons why the organisations conduct strategic or long term information systems planning are listed in Table 4.3. The most frequently cited reasons dealt with improving resource allocation, increasing user involvement, improving the organisational confidence in information systems, and improving communication within the organisation. Forecasting information systems requirements and improving information systems controls were also seen as important.

One of the reasons for including this question was to see if the institutions were considering the possible strategic impact of information systems. However, examining the strategic implications of information systems use and identifying new information systems opportunities and value added services were reasons identified by only a few respondents.

No. of responses	Critical Information Systems Issues
12	Corporate wide systems design and development activities
10	Obtain user commitment
9	Compatibility (hardware, software, data elements, methodology)
8	Obtain senior management involvement and commitment
7	Organisational responsibility for Information Systems functions and mission
5	Regulatory compliance
5	Personnel recruitment, retention, and development
4	Security (access to data, resources, backup, contingencies)
2	Vendor support

Table 4.4: The most critical information systems issues faced by management.

Table 4.4 lists the most critical information systems issues in tertiary institutions as perceived by the respondents. The important issues were systems design and developments across the organisation, and obtaining user commitment. Compatibility issues were considered important as was obtaining senior management involvement and commitment. Perhaps surprisingly, issues such as staff recruitment and systems security were not frequently selected as critical. On the whole, the institutions seemed more concerned with tactical and operational issues, and gave little consideration to strategic issues and the overall direction of the organisation's use of information systems.

No. of responses	Roles of the Information Systems Department
8	Develop corporate (central) Information Systems plan
6	Develop policies for Information Systems resource acquisition and allocation
4	Issue and monitor corporatewide standards and guidelines
4	Identify major Information Systems issues to be addressed in all plans
4	Develop corporate long term Information Systems objectives/strategies
4	Develop a corporate Information Systems planning policy relating strategic and tactical Information Systems planning with corporate planning
3	Monitor departments' compliance with plan milestones
3	Define Information Systems planning guidelines, format and cycle
1	Review all long range and tactical plans from departments and provide comments
1	Too early in the development of MIS to adequately comment

Table 4.5: Roles of the information systems department in planning and control activities.

As can be seen from Table 4.5, information systems departments were not involved in many of the planning activities of their organisations. The most frequent activity, developing a corporate information systems plan, was a role of information systems departments in eight of the institutions. Six were involved with developing policies for information systems resource acquisition and allocation.

Many of the roles identified would be expected of an information systems department in any organisation. This question serves to highlight the lack of information systems planning in tertiary education institutions. The impression gained from the responses to the questionnaires is that institutions regard information systems as a high-cost budget item with little or no value-added effect to the organisation.

This impression was confirmed when organisations were asked to list the major constraints to their information systems planning and how they attempted to overcome those constraints. Many institutions were able to list constraints, but were unable to suggest measures to deal with them. A summary of the responses to the question demonstrates the lack of a strategic information systems outlook in the planning process, and sometimes a lack of an information systems planning process entirely.

Some institutions stated that "planning is a new development in the organisation," or that there was "no formal information systems planning," or that they were "only in the early stages of management information systems planning and development so [an] answer [is] not possible." In many institutions, the lack information systems funding or the dispersed nature of the fiscal responsibility was a problem. Of the institutions listing funding as a constraint, many had received some commitment from their management to improve the situation, either through corporate plan commitments, long range budgets, or other agreements to increase funds. The other widespread constraint was lack of appreciation or acceptance by the organisation and a lack of understanding by staff. Most institutions cited a need for training and education of both management and users as means of overcoming this type of constraint. Other constraints included:

"the changing environment and requirements in education," "limited human resources," and the "rate of change of technology."

When asked what were the major sections of their long range information systems plan, several respondents cited the heading of their corporate plan. Of the few who answered this question with reference to an information systems plan, their replies focused on the information systems infrastructure or on the applications portfolio of the institution. One institution had three sections: hardware, network, and software. Another had four sections: accounting information systems, student information system, course information system, and assets information systems. None of the responses indicated that an institution was considering the possible strategic opportunities offered by information systems; none examined the possibility of gaining competitive advantage by the innovative use of information systems in the teaching and research areas.

Most of the responding institutions had very little documentation of their information systems planning process. Only two had a corporate wide information systems standards manual. Four had a format or guidelines for their long range information systems plan. Only three institutions indicated that their information systems planning process was documented.

Chapter 5

Conclusions

This thesis has examined information systems planning and management in New Zealand tertiary institutions. As part of the research, a survey of the tertiary institutions was conducted. The results of the survey were presented within a framework of information systems models and models of the information systems planning process.

An Awareness of Strategic Information Systems Planning

A minor aim of this study was to promote some awareness of strategic information systems planning amongst the community of New Zealand tertiary educational institutions. To a great extent the success of this is difficult to measure. Some of the comments returned with (and without) the questionnaires give an indication that this aim was met to some extent.

One organisation frankly stated that they were "...not in a position to complete the questionnaire as requested as our progress in the area of Information Systems is not sufficiently advanced to make our response useful."

One organisation indicated that although in the past only the MIS manager had been involved in information systems planning, in the future all the groups outlined in question 8 of the Information Systems Planning section would be involved. The same organisation also indicated that they intended re-assessing the criteria measuring the effectiveness of Information Systems.

Another organisation's chief executive officer initially suggested that in return for the institution's participation in the study, there could be some feedback of information. They suggested that the "...material would be of immense interest to this [institution] in deciding future requirements and it would also be valuable to learn what other tertiary institutions have tried to do." The institution subsequently received assurances that there was the possibility of some feedback. Interestingly enough, their final response was to decline to participate (in a letter from their officer responsible for Corporate Plans) saying that they had "...had growing reservations about giving out this information..." because they were sure "...you can appreciate that the information you request is strategically important to our organisation." One can surmise that the questionnaire had stimulated their thinking in the direction of strategic information systems planning, and that their heightened awareness of the competitive possibilities had dampened their interest in participation in the survey.

In addition to these institutions which explicitly commented on the state of information systems planning within their organisations, there were many more that completed the questionnaire and it is hoped that that process sparked some consideration of the strategic implication of information systems to their organisation.

The Way Forward

Much of the impetus for the research came from recent legislative changes which had a major impact on the tertiary education sector. At least a part of the intention of these radical changes was to make institutions more accountable to the government for the investment in them. Many of the changes were focused on making the institutions behave more like organisations in the private sector than they had been in the past. Institutions were compelled to respond to changes in funding methods and to changes in the structure of the sector and the institutions. They found it necessary to initiate and undergo planning processes which were in part legislative requirements, and for which

many, if not all, were unprepared. The management of the institutions was altered to conform more closely with the norm in the private sector. The councils of the institutions became more like a board of directors, and the academic and administrative head of the institution became the chief executive officer.

The management of the tertiary sector has also been changed. The Department of Education was disbanded, as was the University Grants Committee. In their place, a new Ministry of Education was formed. A new body called the New Zealand Qualifications Authority was established with the power to accredit institutions as providers of approved courses at all levels of study. The Vice-Chancellors Committee was given the power of course approval and accreditation of institutions in relation to the universities.

Changes to the method of funding meant that an institution's funding became tied more directly to its student numbers, a move which has disadvantaged smaller institutions in the tertiary sector. A greater proportion of the costs of tertiary education is levied directly on students via course fees. These alterations to the funding method are consistent with the market-driven supply and demand approach to the economy which has been the philosophical underpinning to successive governments' policy since 1984.

Even before the education reforms, and certainly since, the behaviour of organisations in the tertiary sector has been sufficiently like the behaviour of business organisations to make the application of many of the models developed for one sector useful in examining the other. This is especially true in the information systems area where historically, the development of information systems do not appear to have been significantly different in the public and private sectors.

The application of models such as Nolan's stages model and Gibson and Hammer's benefit/beneficiary matrix to tertiary institutions show much the same results as does their application elsewhere. There is no reason to suspect that McFarlan's strategic grid

would not be as applicable, although because strategic use of information systems in tertiary institutions is almost entirely lacking, this model currently has a limited use.

The models useful in assessing strategic opportunity, such as Porter and Millar's value chain and Porter's competitive forces model, are as applicable to tertiary institutions as to any other organisation. They facilitate the identification of areas of the business and its interaction with its external environment that might potentially yield competitive advantage. The challenge to tertiary institutions is to exploit information systems to achieve that advantage.

Several information systems planning models were examined and their usefulness to tertiary organisations assessed. The assessment was in the context of Synnott's planning spectrum, which allowed a model to be categorised according to its degree of integration of the business and information systems planning. The underlying premise of the spectrum (and of this thesis) is that the complete integration of the business and information systems planning processes is the preferred scenario, as it best facilitates the use of information technology to gain competitive advantage.

Only one of the models examined had an integration of corporate and information systems planning. That was Wysocki and Young's integrated strategic information systems planning model. It had the advantages of having internal and external information systems factors as inputs to the strategic planning at both organisational and departmental level, and having the results of those planning processes as inputs to the strategic information systems planning.

Even though Wysocki and Young's was a preferred model, it is doubtful whether it, or any other integrated model, could be immediately implemented within tertiary institutions, simply because it is too great a leap in the conception of the planning process from the current planning situation. The main finding from the survey was that there is very little information systems planning being carried out in New Zealand tertiary institutions, extremely little of that occuring is strategic planning, and none is

focused on the use of information technology for competitive advantage. It was clear that the top management in the organisations had yet to be persuaded that information systems could have a part to play in their overall strategy, and that information systems planning should, as a consequence, be included in their corporate planning process. This means that integrated information systems and business planning will be a longer term goal, arrived at by using in the shorter term, reactive and linked information systems planning models.

Tertiary institutions are not unique in facing this challenge in their information systems planning process. Like their counterparts in other industry sectors, information systems personnel in the tertiary sector will have to take a proactive approach to this issue. Their first step will be to begin to think strategically in their current planning function, and to communicate to the entire organisation the strategic implications, both to the information systems infrastructure and to the institution, of alternatives in information systems usage. In combination with a strategic approach to the planning process, they must produce a strategic information systems plan, using as a framework an information systems planning model appropriate to their organisation. This might initially be a reactive planning model like Atkinson and Montgomery's master architecture and plan. It is critical that the information systems personnel in the organisation adopt a strategic outlook to the management of the information systems resource, because to accomplish the crucial task of convincing the top management of the potential of information systems, they will need to rise above the technical level and be able to demonstrate how information systems can contribute to different areas of the business.

When the top management of the organisation have been convinced that they should begin to take greater cognisance of information systems planning, a reactive model would no longer be appropriate. A linked model such as Hayward's information systems strategy planning model or Henderson and Sifonis' extended critical success factors model would consolidate management participation in the information systems

strategic planning process. The choice of model for an individual institution will be dependent on its corporate planning model, the level of commitment of the executive, the value-added activities within the organisation, and a variety of other factors unique to the organisation.

The use of a linked planning model should only be a transitional phase. Tertiary institutions should strive to achieve an integrated business and information systems planning process. With an integrated planning process, organisations are not necessarily committed to expensive investment in information technology, but they reduce the possibility of overlooking opportunities for using information systems for competitive advantage.

The discovery of the general lack of information systems planning in the tertiary education sector is a major, albeit not entirely unexpected, disappointment. Perhaps as the planning processes of the institutions become more familiar and more sophisticated, the level and integration of information systems planning will increase. The survival of an institution in the more competitive tertiary education environment might well depend on their effective use of information systems to establish and maintain competitive advantage.

Appendix 1 — The Questionnaire

General Institution Information & Corporate Planning Section

1. Name of Institution (Optional): _____

2. Nature of institution:
   _____College of Education
   _____Polytechnic
   _____University
   _____Other (specify): _____

3. Total number of staff:
   Academic: _____
   Administrative: _____
   Technical: _____
   Information Systems: _____
   Other (specify): _____

4. Are there staff performing Information Systems functions, but designated... (estimate number):
   Academic: _____
   Administrative: _____
   Technical: _____
   Other (specify): _____

5. What is the total budget of your organisation?
   Capital: _____
   Operating: _____
   Personnel: _____
   Other (specify): _____

6. Does your organisation produce a strategic or long range corporate plan?
   _____Yes
   _____No

7. How are strategic corporate plans measured or judged?

_____Not really measured

_____Comparison with previous plans

_____Performance of the business

_____Judgement of the Chief Executive Officer

_____Other (specify):_____

8. Who participates in the formal review and evaluation of corporate plans?

_____Corporate executives

_____Faculty or Department Heads

_____A special committee

_____Corporate planning staff

_____Other (specify):_____

9. Could you please outline the management structure of your organisation.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

10. Could you please detail the Information Systems management structure of your institution.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Information Systems Planning and Control Section

1. Does your organisation have a formal strategic or long range Information Systems resources plan?

   _____Yes

   _____No

   _____Other (specify): _____

2. If yes, is it integrated into the overall corporate plan?

   _____Yes

   _____No

   _____Other (specify): _____

3. Indicate which of the following characteristics describe your long range Information Systems plan...

   _____no formal long range plan

   _____developed to support the corporate plan

   _____interfaces with the corporate plan

   _____integrated closely with the corporate plan

   _____other (specify): _____

4. What is the total Information Systems budget?

   Capital: _____

   Operating: _____

   Personnel: _____

   Other (specify): _____

5. What is the Information Systems long range planning horizon:

   _____years

6. Is the Information Systems long range plan part of the...:

   _____Annual business operating plan

   _____Capital expenditure programme

   _____Strategic corporate plan

   _____Other (specify): _____

7. Do the following groups participate in the Information Systems planning process?

_____Corporate executive management
_____Corporate planners (non-Information Systems)
_____Information Systems management
_____Computer Centre/Services department
_____Information Systems teaching departments
_____User departments (teaching and/or non-teaching)
_____Other (specify):_____

8. What criteria are used to measure the effectiveness of Information Systems in your organisation?

_____Developing projects on time and within budget
_____Full cost recovery for all Information Systems expenditure
_____Low-profile provision of services
_____Tangible benefits (e.g. cost savings, improved delivery of services)
_____Other (specify)_____

9. Why does the organisation conduct strategic and/or long range planning?

_____It is a legal requirement
_____To improve communications at all levels
_____To provide a framework to improving short term Information Systems investment decisions
_____To identify new Information Systems opportunities and value added services
_____To examine the strategic implications of Information Systems use
_____To reduce one-time and recurring Information Systems expenses
_____To establish a foundation for Information Systems controls
_____To forecast Information Systems resource requirements accurately
_____To improve resource allocation
_____To increase user involvement and commitment
_____To improve the level of organisational confidence in Information Systems activities
_____To obtain long term vendor commitments
_____Other (specify):_____

10. What are the most critical Information Systems issues faced by management?

_____Organisational responsibility for Information Systems functions and mission

_____Regulatory compliance

_____Security (access to data, resources, backup, contingencies)

_____Personnel recruitment, retention, and development

_____Compatibility (hardware, software, data elements, methodology)

_____Corporate wide systems design and development activities

_____Vendor support

_____Obtain senior management involvement and commitment

_____Obtain user commitment

_____Other (specify)_____

11. Does the corporate Information Systems department have a role in the following planning and control activities:

_____Develop corporate long term Information Systems objectives/strategies

_____Develop a corporate Information Systems planning policy relating strategic and tactical Information Systems planning with corporate planning

_____Review all long range and tactical plans from departments and provide comments

_____Monitor departments' compliance with plan milestones

_____Develop corporate (central) Information Systems plan

_____Define Information Systems planning guidelines, format and cycle

_____Identify major Information Systems issues to be addressed in all plans

_____Develop policies for Information Systems resource acquisition and allocation

_____Issue and monitor corporatewide standards and guidelines

_____Other (specify):_____

12. Do you have a corporate wide Information Systems standards manual?

_____Yes

_____No

13. Please list the constraints you encounter in developing your Information Systems plan and how you attempt to overcome them.

_____

_____

_____

_____

_____

_____

14. What major sections make up your long range plan?

_____

_____

_____

_____

_____

_____

15. Does your organisation have a format or guidelines for the long range Information Systems plan?

_____Yes

_____No

16. Is your Information Systems planning process documented?

_____Yes

_____No

17. Would you be willing to participate in a follow-up interview to this questionnaire?

_____Yes My name is: _____

My electronic mail address is:_____

_____No

18. I have included the following with this completed questionnaire:

_____Information Systems planning format or guidelines

_____Information systems long range plan

_____Documentation of your Information Systems planning process

_____Corporate planning format or guidelines

_____Corporate long range plan

_____Documentation of your corporate planning process

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