INFORMATION REQUIREMENTS ANALYSIS IN THE DESIGN OF MANAGEMENT INFORMATION SYSTEMS/DECISION SUPPORT SYSTEMS IN ACADEMIC LIBRARIES, USING THE CRITICAL SUCCESS FACTORS METHODOLOGY

BY

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ABSTRACT

Academic libraries are complex organisations/professional bureaucracies in dynamic environments. Corporate information as a resource through well-designed management information systems/decision support systems (MIS/DSS) is vital to their success and strategic survival, but these are not being used in academic libraries. 'Off-the-shelf' (network or turnkey) MSS/DSS will not answer their needs. Custom-designed systems are necessary, based on the individual organisation's planning situation and needs. Technical requirements for MIS/DSS are in place, through current automated integrated library systems (ILSs), information technology links, and software extensions. Data is potentially unlimited. Information overload is a problem for acquiring operational, tactical and strategic management information.

Assessment of information requirements of library managers without information overload is seen as the greatest impediment to the successful design and use of MIS/DSS. Information requirements analysis methodologies select only the most relevant management information, thus forming the most cost-effective basis for the design and use of MIS/DSS.

Using Davis' contingency method, the most appropriate information requirements analysis methodology is identified for academic libraries, the Critical Success Factors (CSF) method. Applied strictly, using Bullen and Rockart's *Primer*, at a case study site, this exploratory study primarily examined its ease of use, its success in eliciting both individual and corporate CSFs from senior academic library managers, and secondarily its ability to establish relevant performance measures, reports, and linkages to data elements from their ILS, as a basis for the design of a MIS/DSS. The use of the methodology can be replicated in any library environment, noting possible organisational factors influencing its success.

Organisational influences on the decision-making environment in academic libraries will impact on the recognition and need for management information. This in turn affects the need for MIS/DSS. It also affects the success of the CSF methodology's application. Some of these influences, e.g. organisational structure, management approaches, and planning techniques are briefly reviewed. Future studies should take these into account. Examining these further will improve assessments of information requirements using the CSF method for the use and design of MIS/DSS in the library environment.

Key words/phrases:

(1) Critical Success Factors methodology

(2) information requirements analysis

(3) management information systems/ MIS

(4) decision support systems/ DSS

(5) decision-making, academic libraries

(6) organisational structure, academic libraries

(7) strategic planning/ management, academic libraries

(8) performance measures

PREFACE

This thesis contains no material which has been accepted for the award of any other degreeor diploma in any tertiary institution and that, to the best of the candidate's knowledge and belief, the thesis contains no material previously published or written by another person,except when due reference is made in the text of the thesis.

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CHAPTER 1

INTRODUCTION

In the tertiary environment of the late 1970s and 1980s, financial constraints and demands for greater accountability, together with rapid environmental changes (new technology, curricula changes, amalgamations, co-operative ventures, etc.) led to a concern for better planning (costing, forecasting, marketing, evaluation of performance) to achieve greater efficiency and effectiveness, and competitive advantage.

Good management techniques and effective decision-making rely on quality information derived from relevant data, usable by the manager concerned, (with the assumption being that the manager is capable, with a strategic and problem-solving sense). Sophistication in computer hardware and software in the 1980s and 1990s had facilitated a variety of developments which could effect the above goals. Collecting data and manipulating it is no longer as problematic in the current computer environment as it would have been in a manual one. Data from automated integrated systems abounds (both in the university library and university administration areas). Microcomputers, PCs, and laptop computers allow the flexibility of combining these sources of data with other external data, and analysing it with sophisticated and specifically designed software packages from the mathematical, statistical, economic, and social sciences fields. These would form the basis for a management information system/decision support system (MIS/DSS), which if designed for the specific needs of individual managers in the academic library would improve the library's planning, control, productivity, and effectiveness in its services and operations.

The research problem:

Despite the technical sophistication and capabilities for management information extraction and manipulation of 3rd and 4th generation computers installed in academic libraries, and the availability of many software programs for data analysis, MIS/DSSs are not in place, and management information available through integrated library systems (ILSs) and external data sources are not fully utilised by all levels of academic library organisations, especially by those higher than the operational one.

MIS/DSSs are designed and implemented to aid managers make decisions . Managers should make decisions appropriate to their position within the organisational structure, and related synergistically to their organisation's strategic management. Planning questions (problems) within this strategic framework should indicate information needs for their solution. Information is required to make decisions, and information is drawn from data, internal and external. How are the designers of MIS/DSSs for academic libraries to assess what data/information should be selectively targeted for

decision-making at all levels, and which evaluative analyses would best inform these decisions? How are decisions made in academic libraries? What organisational influences affect decision-making, information seeking and hence a requirement for a MIS/DSS?

Information needs for all possible decision tasks are difficult to predict, and costly to acquire and maintain. To produce these within a MIS/DSS would also result in information overload. A well-designed and therefore well-used MIS/DSS will produce a selection of information relevant to prioritised and significant decisions within any strategic planning phase, and of particular use to the individual manager concerned, that is, the selected information will relate most directly to that manager's current mission, goals, and objectives.

An information requirements analysis which will elicit these information needs applicable to academic libraries, and responsive to the planning needs of each individual academic library, is necessary before a successful and relevant MIS/DSS can be designed. There are currently no generally accepted and used information requirements analysis methods in place in academic libraries. The ASSUMPTION behind the research questions is that, if a reliable, portable, and flexible methodology for information requirements analysis, applicable to an academic library environment, were found and successfully tested, the **first requirement in the design of a MIS/DSS would be resolved,** and MIS/DSSs would be more successfully used.

The research question, therefore is:

(1) Can the identification of an information requirements analysis methodology be made from another field (since none is generally visible in the field of librarianship) which will be appropriate and applicable to an academic library environment?

Can the methodology's application in a test site:
(2) identify prioritised selective information requirements at all levels of academic library management, both individually and corporately (i.e. synergistically)?

(3) translate those information requirements into selective data elements, (e.g. internally available from the ILS (integrated library system), and externally available from specified sources)?

(4) translate those information requirements into (a) analytical reports specified, and (b) performance measures necessary , to monitor and control performance to meet objectives for each level of management?

If successful in the above, these identified data elements (i.e. identified data elements to meet information requirements, specified analytical reports and performance measures requiring tracking through the data/information) will form the design of the MIS/DSS.

(5) Can the test application of the methodology, and an analysis of the results, (a) indicate problematic or significant influences in the decision-making or planning environment of academic libraries which **may affect the success of its application, or (b) suggest extensions or improvements to the methodology** which would make it more appropriate for future applications in academic libraries?

Scope and limitations:

The scope of the study is contained in questions (1) to (4). Question (5) indicates possible influential factors which must be considered, and, if found to have some influence, these could possibly be expanded and form designs of future studies.

The questions posed are not a test of a hypothesis, but involve the search for answers to an exploratory set of interlocking questions. Since the factors involved are complex, and the testing of the methodology possibly intensive, limitations must be made to the research through a case study approach. Therefore, the study will be restricted to applying the chosen methodology to one academic library, and inferences made may not be transferable to all academic libraries. The study is one of practical rather than statistical significance.

In as much as the researcher will interact with individual managers of the test site, it will constitute 'action research' (where the research question , rather than a hypothesis, directs the study), attempting to contribute to the organisational effectiveness of academic libraries through an appropriate approach to the design of MIS/DSSs, and therefore use of management information. Inherent limitations applying to 'action research' may well occur during the study, viz. the different interpretations which can be placed on reality by individual researchers.

Since the methodology's application is new to academic libraries, the study is exploratory, conducted to discover and describe what exists, to identify variables or causal factors associated with the observed phenomenon (that is, the methodology's application and its ability to elicit information requirements of use in designing a MIS/DSS).

Methodology:

This is expanded further in Chapter 4. However, once identified, the methodology will be applied empirically at one test site, examining its specific context in relation to its planning stage, and associated information requirements. This will be done through an examination of its documentation, a series of structured interviews, and group discussions.

CHAPTER 2
THE SETTING OF THE RESEARCH PROBLEM : LITERATURE REVIEW.

Strategic planning and information needs:

"Organisations that want to be adaptive are increasingly turning to strategic planning as the major systematic theory for adapting to change ... Strategic planning is the managerial process of developing and maintaining a strategic fit between the organisation's goals and resources and its changing marketing opportunities." (Kotler 1982, 83) The process is a cyclic one of collecting information for the various decision stages within the strategic planning process, evaluation using knowledge of the current state against the desired state, and thus the setting of performance criteria, and feeding the results back into the cyclic loop. (Figure 1).

Strategic planning is reasonably new to libraries, although systems analysis and self-analysis techniques (e.g. MRAP (Management Review and Analysis Program), MbO (Management by Objectives), ALDP (Academic Library Development Program), CAP (Collection Analysis Project)) have been used, mostly in the U.S., since the 1970s, with many academic libraries beginning the strategic planning process in the 1980s, e.g., the work of the Association of Research Libraries. For a historical overview and the various techniques which could be applied in the strategic planning process, see Koenig & Kerson (1983), and Broadbent & Koenig (1988). The Ross report to the Higher Education Council makes specific recommendations that "higher education libraries undertake self-analysis and assessment within a systematic process of strategic planning ... that performance measures be used ... in the evaluation phase of the strategic planning process." (*Library provision in higher education institutions* 1990, xix) The report stresses that performance measures be developed and interpreted in the context of individual organisation environments and of strategic planning objectives (context of intention). Development and understanding of strategic planning is acknowledged as fairly recent, with many institutions producing strategic plans for the first time in the last few years. The importance of the following are stressed - clear objectives, specified time frames, an ongoing planning committee, strong links with decision making processes and budget formulation, and input from special planning/R & D staff. Strategic planning processes are to be carried out both corporately, and in individual operational sectors.

Five strategic planning steps are recommended as essential, but the needs analysis/user needs analysis stage and the importance of actionable, not abstract, objectives, is not discussed. An insufficient investigation into needs analysis, current versus desired states , and actionable objectives make the design of performance measures relevant to each institution difficult.

Figure 1. A theoretical framework for strategic planning. (Adapted from Sherman 1982, 231.)
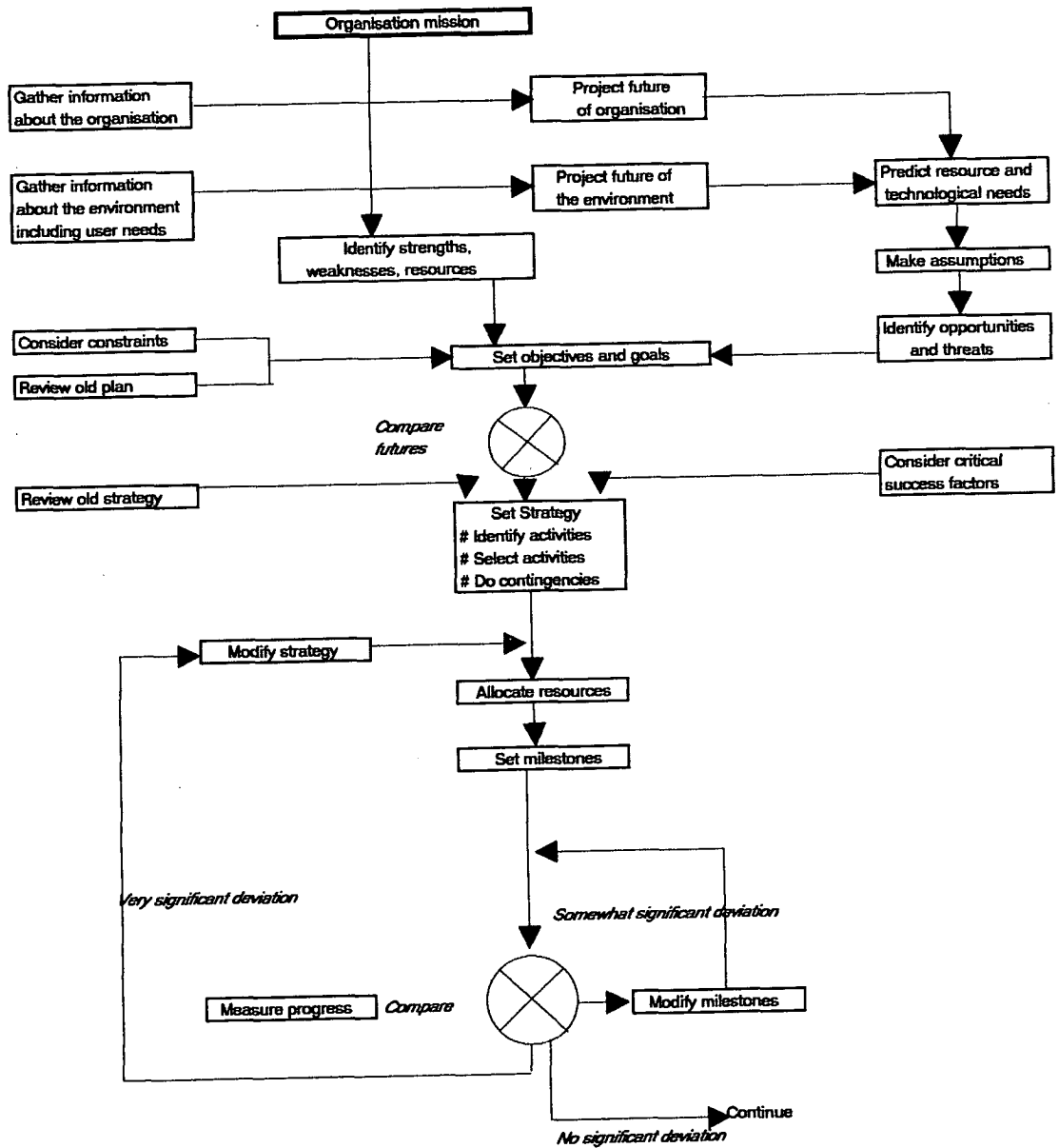
However, a strong need for integration is stressed in the report, and many recommendations agree with the approach taken by the Association of College and Research Libraries - University Library Standards Review Committee (1989). Included in the report are two recommendations requesting CAUL (Committee of Australian University Librarians) to set up Working Parties to arrive at standard performance indicators and methods of cost analysis. The literature on both is extensive (e.g. work by Cronin (1985), Hamburg (1974), Kantor (1984), Lancaster (1977a), Palmour (1980), Swisher & McClure (1984), Van House (1987), Zweizig (1982), etc. in the area of library performance measures, and Flowerdew & Whitehead (1974), Kantor (1985), King (1983), Oldman & Wills (1977), Roberts (1984,1985), to name but a few in the area of library cost and cost-benefit analysis) and the recommendation either (a) reflects the desire for overall synthesis of research findings and the use of standardised or encompassing methodologies in problem solving, or (b) the use of the word "standard" may mean standards for calibration of performance (Figure 12). It should be noted here that "performance is idiosyncratic, heavily dependent upon the library's planned outcomes" (Brown 1981, 209), tied in therefore with each organisation's unique strategic planning needs.

The report further comments on the collection of data individually and nationally by higher education libraries, and recommends that, with automated systems, it is desirable to maintain all statistics which the computer will collect, even if they are not reported regularly - that is, the usefulness of archival, aggregated data. Appropriately qualified staff should be employed, with expertise in subject specialisation, computers, mathematics, economics, and also with management skills (noting not many staff have formal qualifications in this area). The need is seen for improved management information, but the use of MIS/DSSs is not mentioned. However, the implication is that the onus for finding and using management information must be with the library manager.

These recommendations fall clearly into stages two and three of strategic planning development, and the appropriateness, advantages and constraints for libraries as organisations concomitant to these stages should be noted (see below, Chapter 6.)

Implicit throughout all stages of the strategic planning process is the use of data leading to information. Brown (1981) constructively relates possible sources of information for each of the strategic planning stages, with all library planning resting on a common foundation, the information system. She emphasises both the importance of information to planning, and also the "holistic perspective, which assumes complex and multidimensional relationships among all agents, actions, reactions within the system", with data as "unidimensional facts (number, colour, age, length) that provide information when combined into a system of cohesive and meaningful descriptors." (Brown 1981,188)

She sees information needs being occasioned by planning questions, but admits the critical difficulty in library data collection is not the absence of data. Data of many kinds are collected and stored. The

major handicap is that data remain data, instead of being converted into meaningful information. Her solution is that libraries should stop collecting passive information that is not used (McClure's 'avenue of least effort'). In order to develop a planning information system (or MIS/DSS), libraries should establish a rational point of departure - planning questions must be posed that need to be answered, with the requisite data clearly specified.

Decision-making and information needs:

Decision-making of necessity takes place throughout the strategic planning process, and relevant, timely, accurate, complete, reliable information is vital to the quality of the decision made. The decision-making process is a choice of actions from among multiple feasible alternatives, guided by strategic objectives. That is, a decision is based on (1) the creation of a desired state of affairs, (2) the apparent state of actual conditions, and (3) the kinds of action to close the discrepancy. A decision is, therefore, a conversion of information into proposed activity, led by a purpose. Data is used in this process, and becomes information. Information is data of value in decision-making (from Dubey 1985, 119). To be effective, the decision made must be timely, etc., acceptable to those affected by it, and achieve the desired objectives (Figure 2, from Middlemist & Hitt 1988, 121 -122).
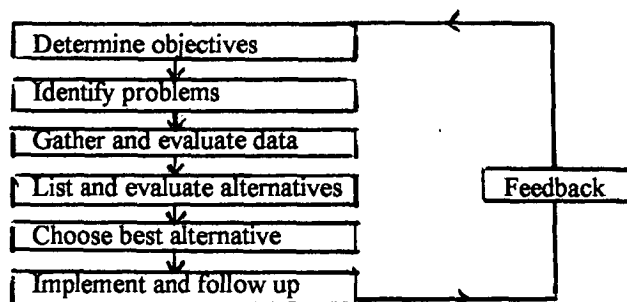
Figure 2. Decision-making process.

It is seen as a scientific, systematic process. Quality of decisions is dependent on quality of information, its relevance to the problem, and to that particular manager making the decision (this can include a multitude of influencing factors such as decision making styles, attitudes, values, propensity for risk-taking, work-value orientation, etc.)

Although information is needed to make decisions, these decisions can't always be fully anticipated, and information needs are therefore difficult to predict. A MIS/DSS therefore must trap data about relevant events and generate suitable information from it.

Programs can be designed for computers related to all stages in the decision-making process, except for "setting objectives because objectives are 'will-directed' ... Nonetheless, given an objective, programmed instructions, and the needed resource, computers are exhibiting astonishing prowess in certain decision-making situations" (Hodge 1984, 123). Hodge sees the two major problems in

decision-making as inadequately specified objectives, and inadequate information, a surplus of data and a deficient amount of information. Too much data may mask the true situation and knowledge needed by the manager.

Management consists of planning, organising, staffing, budgeting, directing, controlling and reporting - involving processes of setting strategies, forecasting, leadership, co-ordination, communication. Managers at different levels (strategic, tactical, operational) of an organisation, using different processes, require different information, aggregated or presented in different ways. Hodge (1984) sees decisions as having four influencing factors - What factors are significant enough to include? What is the direction of effect of each factor? What is the magnitude effect of each factor? What non-linearities should be recognised for each factor? The environment of decision-making is extremely complex, with many factors influencing the outcome. For an older, but extremely thorough conceptual investigation of these influences see Snyder in Bundy and Wasserman (1970).

Decision-making and the information system:

The information system should provide operational and tactical managers with (in libraries) transactional information, resource information, control information and current status information (operational performance for each unit). More senior managers will require strategic information, especially in a holistic and integrated mode, showing pertinent interrelations (which managers should specify) , performance overall, and the influence of external environmental factors as constraints and opportunities on current and future goals and objectives (which they have identified). The following diagram (Figure 3) indicates types of library decisions as a framework for library information systems.

The information system (MIS/DSS) should play a central role in the organisation's activities. An interesting study by Belohlav & Raho (1987) of the perceptions of the information system in 132 organisations found that the degree of integration of the information system within the organisational processes affected greatly the degree of effectiveness present in decision-making at strategic levels, with the appropriateness of information system level critical in match to the type of decision situation, together with the need for managers to thoroughly understand how to use the information system to its full potential. "One of the significant reasons for the lack of integration is that, in spite of it strategic importance, the ability of most businesses to assimilate and apply information technology lags far behind the available opportunities" (Belohlav & Raho 1987, 250). Their recommendation was that unless an integration of the information system within the organisational framework is achieved, productivity and competitive advantage will inevitably decline as both organisations and their milieu increase in complexity.

Figure 3. Types of library decisions (From Dubey 1985, 131):

A Framework for Information Systems*

Types of decisions	Management activity			
	Operational control	Management control	Strategic control	Information system
Structured	Acquisitions, cataloging, circulation, etc. (routine and repetitive operations)	Flexible budgets, cost analysis	Branch location, network nodes; computer location, terminal location	Clerical; MS/MIS
Semistructured	Acquisition policy, buy-no buy decisions; scheduling of operations	Forecasting service promotions, estimating and evaluating network capacity for satisfying demand; cost-benefit analysis, economic break-even points; network synergy	Centralization vs decentralization, local processing vs resource sharing; network configuration	DSS
Unstructured	Determining user needs; situations involving group behavior	Hiring staff, motivation, payoffs in financial and social returns	Planning, goals and objectives, R&D	Human intuition

Figure 4. (From Hodge 1984, 41) :

Techniques Available to Assist the Managerial Decision Process Today

Basic	Advanced
Economic and Financial Analysis	Mathematical Modeling
Break-even analysis	Deterministic
Capital budgeting analysis	Inventory theory
Ratio analysis	Stochastic
Marginal analysis	Queuing theory
Incremental analysis	
Analysis for Planning and Control	Resource Allocation
Time study, motion study, work sampling	Transportation methods
Learning curve analysis	Assignment methods
Forecasting techniques	Mathematical programming
Regression analysis	
Exponential smoothing	Cost-Benefit Analysis
Statistical techniques	System simulation
Network analysis	

Extra aids (i.e. programs beyond the simpler calculations available on the system) to manipulate the information for more unstructured decision-making must be fully understood by managers and used as required. These may be independent software applications separate from the main system which then contribute to a decision support system (e.g. using more sophisticated statistical or modelling techniques for "What if?" questions). Dubey (1985) indicates that DSSs have been characterised variously by different authors on the basis of the characteristics or function of the software used, (e.g. data-oriented, model-oriented, simulation-oriented). It should be noted, however, that the data supplying the information is still the same data from the system as is used at operational and tactical levels, though probably selected in aggregated form, analysed by previous level managers, together with additional external data as needed for the problem. Figure 4 gives examples of areas in which such software packages exist. To what extent are library managers familiar with these techniques?

To avoid information overload, and best improve managerial decision-making, the design of a MIS should begin with an identification of the important types of managerial decisions required by the organisation. This should define relationships among decisions as well as determine the flow of decisions. Therefore, the patterns of communication, information flow both upwards and downwards in the organisation, and hence the effect of organisational structure, are all relevant to the design and use of a MIS/DSS. "Management often loses sight of the seemingly obvious and simple relationship between organisational structure and information needs ... the most striking example in the public sector of this gap between information needs and decision-making responsibilities is found in those jurisdictions that have adopted more programmatic approaches to ... management" (Steiss 1982, 130).

Technical requirements for a MIS/DSS:

Unless library managers understand the basics of their ILSs, - the database management system (DBMS), the query languages, and especially the independence of the data within relational databases, - the capabilities of the ILSs for management information will not be fully utilised.

Definitions of a MIS/DSS:

It would be best to start with a comprehensive definition of a MIS/DSS, but it is impossible to find this in the literature, which has definitions ranging from complex technicality in the systems literature to philosophical approaches regarding the value of information and its use in the management literature. Mitra gives Churchman's definition for either a computer or manual environment "as a communicative process in which data are accumulated, processed, stored and transmitted to appropriate organisational personnel for the purpose of providing information on which to base management decisions. As such, then, an information system consists of, at least, a person of a certain psychological type, who faces a problem, within some organisational context for which he needs evidence to arrive at a solution, where

the evidence is made available through some mode of presentation" (Mitra 1986, 24). This definition encompasses the human/problem/solution elements. Mitra then develops his definition from a distinction of the five types of computer-based systems:

1. Operating systems (OS)

2. Database management systems (DBMS)

3. Application systems (e.g. in library terms, acquisition, cataloguing, circulation subsystems, etc.)

4. Management information systems (MIS)

5. Decision support systems (DSS) (sometimes called Executive Support Systems (ESS), or Executive Information Systems - that is, management alerting systems)

Mitra sees the MIS/DSS as operating outside the OS and DBMS. Misconceptions in this area may lead many library managers to expect the onus for management information presentation to come from the system, e.g. see discussion of papers by Willers(1989), Ferguson and Whitelaw (1992). However the DBMS is essential for retrieving data from the application subsystems. The operating system is essential software that enables the computer to function, working in conjunction with the hardware. All application systems need the OS for efficient operation.

A DBMS is the "software that isolates the application programs from the physical file structure, presenting logical data structures" (Hodge 1984, 160). It contains two language interfaces, a data definition language and a data manipulation language, which specifies the data to be accessed. That is, the DBMS captures, manipulates, updates, and retrieves pertinent data, with natural language queries, reducing data redundancy and ensuring data independence -that is, it integrates files and produces a relational database (useful where application systems' files overlap, and for allowing simultaneous multiple user access to multiple programs). Activities involve data collection, maintenance, access, update, retrieval and protection.

Mitra therefore defines the MIS/DSS as a "collection of all the application subsystems and the decision support system, if one exists ... a true MIS should be supported by a versatile DBMS with a non procedural query language capability to retrieve data from the integrated database" (Mitra 1986, 4-5).

That is, the MIS/DSS has three functional parts: (1) data-collection subsystem, (2) data-processing subsystem, and (3) data-analysis reporting subsystem. The MIS/DSS in a computer environment requires an integrated database (from application subsystems of an automated integrated system), using a versatile DBMS to access and retrieve data from the relational databases, using both procedural and non procedural query languages, if possible, and perhaps extending the analysis of data using software packages as relevant to the problem. These are available in third and fourth generation environments. Most ILSs have procedural query languages, at least, and the ability to produce standard reports, with the capability of simpler statistical calculations and spreadsheets, and more complex reports (if written

by programmers) available from the system, before the need for extended use of specialised software programs. Data can be manipulated, therefore, either directly in on-line mode within the integrated system, or downloaded into a PC for extended analysis. Diagrammatically, the database is on one side, the model base on the other, and the user/decision-maker and DBMS in the middle, the decision-maker contributing the intellectual process to a greater or lesser degree, dependent on the nature of the problem (structured/unstructured) and the complexity/sophistication of the software packages in the model base (Figures 5 and 5A).

Therefore, the boundary lines between MIS and DSS are not clear, the same data can be used for both, but the questions asked are different. Brophy (1986, 64) sees the differences as one of degree within a continuum, while Dubey(1985, 144-145) lists the DBMS requirements for a DSS as encompassing data reduction, support for memories, varying levels of detail, multiple sources, catalogue of sources, wide time frame, varying degrees of accuracy, set operations, random access, support for relationships and views, performance (response time), and end user interface. Scott Morton (1983) includes external information from existing information technologies (ITs) such as teleconferencing, electronic databases, and graphics workstations. However, he does provide an interesting distinction - he finds that DSS, since they focus on a particular type of decision, "tend to have as their foundation a model of some aspect of the decision problem. The model provides a structure for the relationships between relevant data and allows the decision-maker to perform complex analysis with relative ease. Executive Support Systems do not focus on one type of decision. They provide support for many problems and processes. This flexibility cannot usually be accommodated by a model or a series of models. Thus, most ESS are data retrieval oriented" (Scott Morton 1983,10). Again, Henderson & Schilling have shown that "DSS design cannot be independent of the MIS function ... the distinction between model-oriented DSS and data-oriented DSS does not appear appropriate ... successful DSS applications will generate requirements to link the DSS to the basic data processing systems in the organisation "(1984, 14). Therefore, regardless of whether a MIS/DSS or ESS is being designed, data from an ILS is an essential component, and readily available in academic libraries. A well-developed MIS/DSS should be able to respond to the following questions:

1. What information is needed?

2. When is the information needed?

3. Who needs it?

4. Where is it needed?

5. Why is it needed?

6. How much does it cost?

Figure 5. Components of a decision support system (Hodge 1984, 98) :

DATA BASE

Transaction Data	
Finance	
Production	
Marketing	
Personnel	
Research	other
Etc.	internal data
Etc.	external
Etc.	data

DATA BASE MANAGEMENT SYSTEM

USER INTERFACE

DECISION MAKER

MODEL BASE

| Strategic Models |
| Tactical Models |
| Operational Models |
| Packaged Modeling Routines |
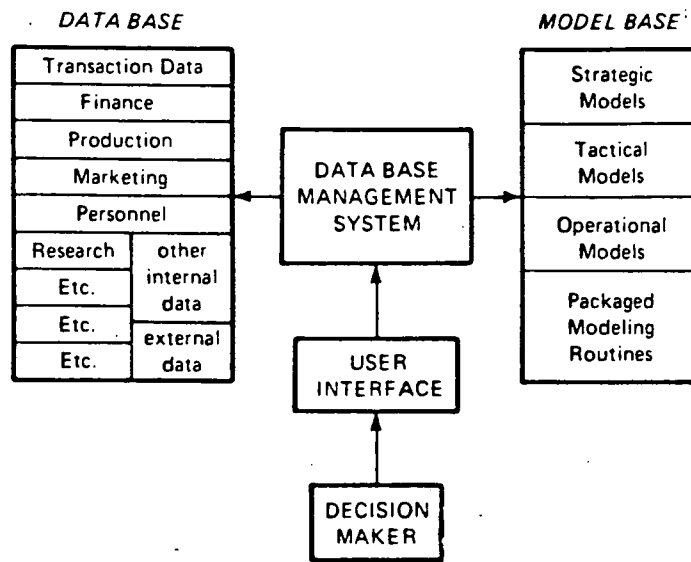
Figure 5A. Conceptual structure of a library decision support system (Bommer & Chorba 1982, 16)

				Data Base Subsystem		Decision Models Subsystem	

INSTITUTIONAL

TRANSACTION DATA

- Goals and Objectives
- Research Projects
- User Profiles
- User Productivity
- Course Offerings
- Etc.

LIBRARY

TRANSACTION DATA

- Acquisitions
- Circulations
- Interlibrary Loans
- Bibliographic Searches
- Reference Services
- Etc.

External Data Sources

Decision Support Data Base

Model Generation and Update

Strategic Planning Models

Management Control Models

Operational Control Models

Data Analysis Programs

Standard Modeling Programs

Command Language and Display Screen

Decision Maker

Decision Maker Subsystem

Source: Adapted with permission from "A Decision Support System for Banks," by Ralph Sprague and Hugh Watson, *OMEGA*, Vol. 4, No. 6, 1976, Pergamon Press, Ltd.

However, as seen in the discussion above, information derives value by its impact on some user's productivity or decision-making, and while productivity may be easy to evaluate, information that affects decisions is more difficult to appraise, with the quality of the information dependent on:

"Accuracy: the correctness of information in reflecting reality;

Timeliness: the degree to which information is current (up to date);

Reliability: the certainty that information sought is available;

Response time: the speed of retrieving sought information;

Completeness: the thoroughness of information in relation to what is sought;

Relevance: the ability of providing that information, and only that information, desired by the potential user" (Mitra 1986, 100).

Requirements of different levels of decision-making in an organisation, and the capability of systems to respond to these, follow the development of computers themselves. First generation computers allowed operational functions to be monitored and controlled, data from application subsystems forming the base point for MIS. The second generation computers allowed capability to draw inferences or evaluate policy alternatives, using information in the system with basic model building, operational research techniques, perhaps incorporated into the system (e.g. PERT (Program Education Review Technique), CPM (Critical Path Method), MIPES (Management-information and program-evaluation system)). Third generation computers allowed the evaluation of policy choices (strategic planning), a more sophisticated extension of modelling capability, with on-line terminals, and data manipulation using DBMS software. Relational databases allowed integration of data which greatly affected overall planning capabilities, and even altered tasks, work flow, and organisational structures. The highest level, fourth generation computers, allow alternative policy choices to be determined by the system, not the manager (programmed decision-making) - that is, once the desired programs were written as specified by managers concerned. By the third generation, however, data is definitely viewed as an important corporate resource by organisations. (For values and benefits of information as a resource, especially intangible costs of information, see also Dubey 1985; Hodge 1984; Keen 1991; Mitra 1986; Parker 1982; Taylor 1986).

How many libraries are making full use of the capabilities of 3rd and 4th generation ILSs?

Academic libraries and use of MIS/DSSs: Practice and theory:

Most academic libraries have acquired third, and many are now moving to install fourth generation ILSs, therefore all software and hardware requirements for MIS/DSSs are available, with integrated relational databases giving flexible access to data across any combination of functions. Standard report capabilities have been made use of operationally (especially in technical services areas), but the capability of more sophisticated report requests has not been made use of. Most academic libraries have systems staff, able to write access programs, using Computer Aided Software Design (CASE)

techniques as directed by library managers as users of management information. Microcomputers exist as additional aids for downloading and manipulating data, and software packages are proliferating in all areas of data analysis, meeting every possible decision-making situation, thus extending the already available simpler calculations and spreadsheet capability of ILSs.

What impact have these ILSs made on use of management information?

In the early days of ILS installation and use, expectations in libraries were that, somehow, the system would provide the "magic" of MIS, although very few Requests for Proposal (RFPs) showed a request for management information. Some authors with an interest in MIS reviewed the ILSs available for their management information potential (e.g. Brophy 1986, 117-129). A more common approach is reflected in the studies by Willers (1989), and Ferguson and Whitelaw(1992), (see below), where libraries were dissatisfied with what the system could produce, and were waiting for computer suppliers to rectify the situation. It has long been emphasised in the systems literature that communication is notoriously weak between systems people and management people, and libraries are no exception. Some librarians are more enthusiastic in examining and understanding their systems than others. Goodram, in evaluating the local URICA installation, describes the system overall, including the system's dictionaries, and says: "These dictionaries provide very powerful tools for exploiting the data in the system and make it possible to produce complex reports with little or no programming effort" (1984, 56). (**Note**: the tools exploit the data in the system, thus forming a MIS/DSS, the tools themselves are not a MIS/DSS as Ferguson and Whitelaw (1992) seem to understand it.) To date, however, standard operational reports are certainly being used, but few complex reports are in evidence.

Lancaster (1983, 1) says "In the last twenty years, two of the most significant developments in the library field have been the increase in the adoption of automated procedures and the growing interest in the measurement and evaluation of library services. Yet, the marriage of the two trends - that is, the use of automated systems as sources of data to permit improved management and decision-making - has not been a major focus of professional interest."

Rush (James E. Rush Associates, Inc. 1984, 10) echoes this view. "To date, few management services systems of any kind have been designed or implemented. Because of the dearth of computer-based management services now available, there is essentially nothing to evaluate."

Brophy says also (1986, 117) "there is little evidence that a high priority has been placed on the development of management information systems in most libraries and certainly it is difficult to find much evidence of resources for the development of such systems in their own right."

Harris (1987) concludes that libraries have always been notoriously weak in their use of management information.

Yet Brophy points out that herein lie discrepancies in library needs , with designers commenting "that librarians pay lip-service to the need for a highly-developed management information system, but, in practice, when offered a choice, nearly always prefer to have developmental efforts put into improvements to the operational aspects of their automated systems," while at the same time "libraries consistently rank 'better management information' among their foremost requirements" (1986, 129).

MIS/DSSs in practice:

In 1983, Lancaster edited papers from the 1982 *Clinic on library applications of data processing* looking at *Library automation as a source of management information,* the "first conference to deal in toto with this particular topic". GEAC's source of management information is given fairly operationally; management information systems in a network environment; and in a special library; Dowlin covers the work at Pikes Peak Library to study inventory/use ratios against their mission statement; Evans & Beilby cover the work at SUNY's Office of Library Services since 1975. Pressures which brought this about are listed, and are similar to those operating in academic libraries everywhere. The structure of the SUNY model, using operational data, comprises input, control, decision, output, and feedback, with central decisions being those of acquisition and retention, input decisions relating to supply (available materials) and demand (academic and research programs), with output being the library (collection/catalogue). Feedback is use (circulation, interlending, internal use, etc.) The control is the software and tables which drive the management information system. Data elements used for analysis are OCLC numbers and LC class numbers. Input/demand are HEGIS enrolment data, also converted to LC class numbers. Component analysis and overlap analysis on library holdings is also made. However, this development at SUNY has been very slow, and few other libraries seem to have taken advantage of it. Evans & Beilby admit "there is also difficulty in obtaining acceptance and integration of the results into the academic and bibliographic decision-making processes" (Evans & Beilby in Lancaster 1983, 196).

In 1982, Goldstein and Dick reviewed the ILS developed for the Lister Hill National Center for Biomedical Communications (R&D arm of the National Library of Medicine), and indicated how they used management information for collection control and development, using 'intelligently' assigned bar-codes to track in-house use, and how this data was integrated with usage data, acquisitions policies, weeding policies, and shelving policies. This is one of the most creative and practical small studies in the library literature. Bar-coding has, in fact, been used for some time in industry to input data into laptop computers or larger computer processing systems to facilitate the development of just-in-time management alerting systems, up-to-date trends, and exception analysis - all techniques essential to

competitive and user-oriented organisations, especially in the total quality management (TQM) environment. The combination of this technology with smart cards, for instance, opens up enormous potential for management information in relation to collection management, reference, and circulation services (as already applied by 3M to library self-circulation systems, investigated in Australia by Unilinc), and further extends, in the Japanese recommended method of management improvement by minor and continuous incrementation, the total quality approach to library management.

The report on ELMIS (Essex Libraries Management Information System) given by Redfern (Redfern in Harris, 1987) is more positive. This piece of 'action research' was initiated in 1984 when the County Librarian identified management areas impacting on use: "a restructuring of the staff and service delivery through twelve areas; shortening lines of communication; an objectives based approach to management committed to increasing the effectiveness of services by extending and systematising the flow of information available to staff. The intention is to develop an organisation with a high degree of flexibility and responsiveness, with an emphasis on more management and less administration" (Redfern in Harris 1987, 93). This was a committed, top-down approach to management information. Redfern points out that, at the outset, a regular flow of statistical reports was in place, and reasonably sophisticated software for manipulation was used. However, inventory elements for management information systems are seen as demanding and complex. Broad objectives were also in place, but " fine-tuning of these was begun by the establishment of multilevel, across area task forces, examining and developing objectives within the service matrix structure" (p. 96). These produced documents, and discussions were held, then targets and indicators that could be used to develop a systematic basis for performance measurement were considered. Redfern saw that objectives, policies, strategies and information systems were all interdependent, information being a major constituent of effective decision-making. In the process of collecting data from widely different sources, internal and external, emphasis was placed on the relationship of the different elements of information to each other.

With 1986 British Library Research and Development funding, a research process was designed which relied on the exploration-questions-analysis-re-examination-investigatory approach. "Developing a management information system for any organisation is not a simple job of collecting data and manipulating it in as many ways as possible. Rather it is a learning process for an organisation ... to decide what it is that will inform it." (Redfern in Harris 1987, 98). It is interesting to compare this structured procedure with the Critical Success Factors method used in this study. Perceptions of practising Chief Librarians (8) on management information systems were gathered, in 'one-to-one focused interviews'. Information was seen as critical at strategic and operational levels. Everything was initially seen as relevant data. Within the interviews, an attempt was made to probe what indicators of efficiency or economy were used by the services. Interviews attempted to raise questions about managers' decision-making and their perceptions of the role of information in those decisions. The UK Audit Commission type enquiry (see also Gallimore's study, below) was used as a basis for the interview process, to elicit performance indicators for economy and efficiency of services. "It seems to

be common knowledge among management information systems practitioners that users of MIS can seldom articulate their needs - it often requires stimulation by an embryo system to assist them." (Redfern in Harris 1987, 99). From these interviews a new approach to performance indicators was attempted. They are now testing a battery of data collection methods focused on uses made of libraries. Redfern concludes that the design of a MIS is a management task, not a technical task, requiring clear lines of authority and responsibility in relation to use of management information.

In 1986, Neuman published her Ph.D. thesis which examined the extent to which management information systems influence strategic planning for collection development in academic libraries. She conducted a survey to determine whether academic libraries follow the management information systems (or strategic planning) model (i.e. analyse needs- determine strengths and weaknesses - develop policies - identify critical information needs - define constraints - estimate timing and resources needed - devise plans to guide decisions) in the area of collection development, and, if not, what model they do follow; to reveal the management tools being employed, and the type of data being collected to improve planning and decision-making for collection development; to uncover the environmental factors being considered for these decisions; and to learn the extent to which collection or acquisition plans were being devised. Her survey was in two parts, sent to 67 out of 92 Association of Research Libraries(ARL). (It is of interest to note that ARL's strategic planning document was published in 1984). She concluded that "libraries are using some automated tools for collection development planning, that the institutional MIS/DSSs are not being used as part of this process, that environmental factors are being considered as part of collection development planning, and that a minority of libraries are developing collection development plans to guide acquisition decisions" (iii). She found that the extent to which libraries are using management information or decision support systems is not presently revealed in the literature. In her appendices, she lists tables of library functions across departments, and a breakdown of the information needed to manage these library functions. However, these do not seem to be used in her study in any way, nor does she indicate any 'critical information needs', the information used by managers, or environmental influences on decision-making. Although she sees a lack of empirical studies on management information systems in libraries, she seems to have ignored the UK literature altogether, e.g. Overton's study (1979), nor does she mention the delightfully practical little study by Goldstein and Dick (1982).

In 1988, a survey was undertaken by Willers (1989) on the use of management information from turnkey systems in 67 polytechnics in England and Wales (utilising an 85% response to a survey questionnaire) in order to ascertain whether management information had been a factor in the choice of those systems, what the opinions of libraries were about facilities for management information, and the sorts of use librarians made of these facilities. Results indicated no apparent correspondence between systems chosen and viewing management information as a factor in the choice, and the general view was that management information was inadequate and more should be provided. Comments made

included: - No real means of archiving statistics, so most usable statistics have to be extracted from raw data and translated into more meaningful figures, - more precise information needed, - cumbersome to get out, - drowning in printouts, not all useful, - high cost of extracting non-printed data for manipulation in suitable DSS environments, etc. Strangely, although new report generators were seen as improving the range of options, routine delivery of management information was still wanted. Is this view of the collecting and use of management information the fault of librarians, library managers, or their systems staff? Who makes the decisions on what constitutes management information? library decision-makers or the 'magic in the system'?

Willers' study showed that the importance of management information was a reflection of Brophy's earlier views, in that operational factors were weighed as most important. The date of current implementation (i.e. 1980-1988) appeared to have little effect on the perceived importance of management information in selection. Most of the management information being extracted was for national statistical purposes (e.g. COPOL, SCONUL, UGC, etc.), and other uses were for simple operational reports, with no attempt at overlay of variables between operations. Simple software for calculations was used, e.g. SPSS-X, while some were attempting to build a statistical model of the library on micros. Access to the production of information was through senior staff, usually the person running the system, though anyone could initiate requests for information. Management information seemed an afterthought, and a common problem seemed to be insufficient staff time allocated to it. Interesting comments were - the major deficiency is imprecision about goals, which partly is an internal problem, while - standardisation of requirements by librarians is needed before suppliers can reasonably be expected to supply more. Willers went on from this survey to look at means of improving the situation, and admits software packages abound and report generator languages were in place for effective retrieval. What remained was the need for data (i.e. the identification of needed data to form the base for a management information system).

Payne & Willers (1989) went on to do a study of management information in a particular polytechnic library (City of London) using SWALCAP shared circulation data, to obtain data on the user and library/user benefit ratios. Using a written loan policy, it was attempted to link measurable performance criteria with its objectives. Results showed that aggregated data should be able to be downloaded and kept, and performance measures are acceptable, but 'norms' haven't yet been established, nor compatible terminology between libraries. Problems of organisational context were found, where variants in information processing techniques may require skilled mediation in presenting information to a group. Problems in information requirements not being considered enough were admitted, nor was data extracted to match hierarchical level or management practice. However, a growing use of management information was detected, and a possibility to maximise opportunities recognised.

The above surveys the type and range of use of management information with ILSs in place. In what way has the theoretical background of librarianship contributed to the use of management information or MIS/DSSs?

In the 1970s, the systems analysis approach (following the first generation of computers) was reflected in library literature in its approach to management information (e.g. Hamburg 1974; Lancaster 1977, especially containing the work of Leimkuhler; Mackenzie 1977, etc.). Hamburg recommended that the complexity of the library organisational environment meant that libraries should utilise comprehensive frameworks for planning and decision-making. His work was based on research "to design and develop a model for a library statistical information system (or synonymously 'management information system') " providing a "comprehensive and flexible framework ... for rational planning and decision-making" (Hamburg 1974, 1). (Interestingly, Brophy later says that "libraries are such complex organisations that attempts to build comprehensive mathematical or analytical models of them are rarely even attempted, and, when attempted, almost never satisfactory" (1986, 21)).

Hamburg very clearly placed the information system as crucial to the holistic and strategic approach to library management, with especial emphasis on the user (customer). To Hamburg, the evaluation and utility of information was very important. His work was based on the PPBS (Planning-Programming-Budgeting-System) method, and seven characteristics were isolated on which to base overall costs and benefits in library operations. Information overload was avoided by selecting data elements by the 'management by exception' method, with tolerance limits for critical decision variables. The Hayes Becker system design is used, where information subsystems are decomposed to files, then to data elements, and also reports. These elements are then grouped into the major categories of: time period, population, subject, document subset, library unit, exposure type, staff type, storage locations, use period. These can then be combined with other decision dimensions: input, output, performance, etc. by taking ratios of appropriate data elements. This method puts performance measures in the context, holistically, of the total number of interacting variables, as Hamburg saw them, of the library. It is interesting to compare this approach to that of others in the study of performance measures as individual output measures. Hamburg's concerns in 1974 with the difficulty and cost of data extraction are no longer necessary. However, evaluating the utility of data still applies. Hamburg saw this as an extremely difficult task. Not only is it difficult to estimate the utility of including individual autonomous data elements in the management information system, but it is even more difficult to estimate this quantity if it is dependent upon which other data elements are included. In his appendix, Hamburg gives a tabulation of a *University Program Structure* with program, subprogram, element, component, task. Brophy (1986) considers Hamburg's work to be one of the most significant contributions to library MIS design. It certainly indicates the necessity of identifying and prioritising desired data elements for a MIS/DSS to be usable, and the importance of a holistic integrated approach to decision-making, planning, and performance measurement, and hence of the MIS/DSS.

In the late 1970s, the strategic management approach began to influence the search for management information, (e.g. as reflected in Webster's (1977) work, although he ruefully notes that library managers paid little attention to analytical techniques of the time, operations research or simulation modelling techniques), and the search for relevant data elements went on. In 1981, Lynch & Eckard attempted to describe basic management information useful to all types of libraries, with lists of data elements with brief comments and glossary, within seven broad classes, e.g. collection resources, financial resources, etc. The elements would seem to be too broad except for summary national reporting.

Runyon (1981) starts with Lynch's elements, but sees them only as a base. He sees the answer as an 'off-the-shelf' management information system (compare this to Brindley's comments below), designed by a network (OCLC, etc.). Runyon stresses the "total systems approach, based on standardised terminology, machine-aided data collection, and customised computer processing and reporting", while "the conceptual model that seems to be required here is a set of integrated, decision-related categories appropriate to the overall administration of a library." (Runyon 1981, 540). There may be some conflict of interpretation of the need for data here - is this for a national information system, or for an individual library manager's decision-making processes? An abbreviated example is given by Runyon of such a data set in his *Appendix A*, listed under services (e.g. active users, total target population, turnstile count, facilities, collections, budget). The data categories should be precise and well-defined, with fundamental terms, definitions, and relationships established. Both Runyon and Hamburg suggest the use of sampling technique, since they see most library measures being very stable over time. Runyon also favours the model approach, simulation models for individual libraries, and distribution models for regional and national resources, but admits we do need data to start, and especially comparable, long-range interpretation of longitudinal data. He also stresses the need for performance measures to relate the output to input.

Bommer & Chorba studied the problem of management information (Chorba & Bommer 1979; Bommer *et al.* 1979; Bommer & Chorba 1982; Chorba & Bommer 1983), and admit there is plenty of data from operational transactions, but see little attempt to organise the database in a manner responsive to the real needs of management. Further, they saw that most of the data reflect only the manifest demand for library services and the current status of the collection, with a lack of direct, objective data concerning the needs of the client community and benefits imported by various services, thus stressing the aims of the TQM approach of the 1990s. Therefore, they chose to develop a comprehensive approach to decision support (see Figure 5A for their conceptual DSS) combining data about user productivity, including a review of the value of information, user activities, use of library resources, and availability of library materials, " to identify and analyse parameters and indicators important to the design of a decision support system (DSS) for academic and special libraries" and to

"develop an integrated system for identifying, collecting, and analysing those measures and data which are critical in making effective management decisions and plans" (Bommer & Chorba 1982, 6). To do this, they examined what kind of data should be captured to provide sufficiently valid information for decision-making, and how the data should be captured from the standpoint of efficiency. A framework for mapping out various types of decisions was developed along four dimensions: degree of structure, function area, decision level, decision stage. They then went on to examine current library findings from the extant literature in each of the areas of : library objectives, resource allocation concepts, assessment measures, decision tasks and related information needs, (for example, in collection development and reference services). From these findings, management information elements relating to the various decision tasks were identified as key data elements of value in the decision-making process. For example, five areas requiring management information are specified for collection development from Evans & Beilby (1983), and 20 prioritised activities performed by collection development staff are taken from Parker & Carpenter (1979). However, overall, these information requirements do not emerge very clearly, and no mention is made of any information requirements analyses to elicit these over the whole library organisation, and at different managerial levels. From these, through the process of both individual measures and aggregations, would be produced an organised, conceptual view of this environment, which would lead to a data model of relevant entities and activities in the library and parent institution, forming the basis for the DSS. Data external to library operations are considered essential management information. Aggregations of data are considered very important, and are made by bibliographic subject area, time, and subsets of the user community, and tied to user/academic productivity. Library of Congress categories are mapped against HEGIS (curricula/course) classifications, and a database dictionary for these devised. Staged implementations of their findings are recommended. Brophy (1986) criticises the study in terms of its performance measures as 'crude' (the jump from input to output in terms of productivity is, I admit, somewhat lacking). However, he acknowledges that their work "has both a promising theoretical framework and a series of innovative approaches to data categorisation" (Brophy 1986, 95). Bommer & Chorba at least do offer a workable, integrated, user-oriented, starting point to incremental MIS/DSS design and use.

The only other major work considering key data elements in the automated system to be useful for management information was that of James E. Rush Associates Inc. (1984) in his *Library systems evaluation guide*. Rush understood a key element from the system designer's point of view as meaning a specific and selective descriptor of an element within the system, that is, any one portion of a system record could only have one verbal descriptor, which could not then be confused with any other portion. In doing so, Rush has drawn up an extensive volume for the purpose of evaluating a purchased management information system, listing (i) a table of functions and features of a management services system, with a weighting device for the intending purchaser, and (ii) a checklist of data elements required in an automated management services system, for supporting effective management work.

Although claiming to be not exhaustive, it lists some 893 elements, from a systems viewpoint, to indicate specificity, avoid ambiguity or overlap, for the purpose of retrieval efficiency. Data relates to personnel, inventory, physical library planning, financial, and library processing activities. These elements have been keyed to LC Marc data element identifiers wherever possible. However, there is no attempt to prioritise the elements in any way as key/critical elements, and presumably, these could be used in this way to meet individual library managers' needs, once these needs have been identified as critical.

A CLAIM (Centre for Library and Information Management) report (Brockman, 1984) reviewed academic library management research in Britain, the Commonwealth, and North America from 1974 to 1983, to identify the principal problems which libraries might face in the ten years to come (1983-1993). Not one piece of research quoted indicated a concern for management information as such, or MIS/DSS design or use, although Brockman had previously been involved in a study of academic library statistics for management (1982), and later in their on-line access for ANZALDATA (1985), and as a basis for planning and managing library services (1985).

There have been a number of other minor studies in the design and implementation of MIS/DSSs in libraries (e.g. McDonald 1986; Sowell 1989, with Sowell's bibliography indicating 'expert systems' for specific cataloguing, reference, and collection selection decision tasks). The article by Gallimore (1989) on how to devise a microcomputer-based MIS for public libraries, using the UK Audit Commission's recommendations on the collection of data and statistics within a strategic planning framework is more relevant. This again points out that information should not be collected unless there is a need for it, but also recommends a structured interview process to elicit this needed information. Gallimore bases his structured questions on the work of Murdick, et al. (1984) and Davis and Olsen (1985). (Murdick (1980) also influenced the design of Neuman's (1986) work.) Although Gallimore's questions start with manager's objectives and attempt to locate sources of information to meet their decision needs in relation to planning, many of the questions are too broad to be useful (e.g. "What is the present use of and attitude to management information?", "What extra information is required?", "What is the attitude towards computer systems?", What other information about your department/unit would you like to obtain to improve your work in managing the department /unit?") If the managers are not using or are unaware of management information in relation to planning decisions, then these questions (broad, and fairly abstract) would not focus on and produce very specific responses in relation to information requirements.

Data collected nationally in a formalised, aggregated way are used by many librarians in gross planning and decision-making, usually in making resource allocation requests in a comparative mode. Such data are produced all over the world, and many are available on-line, e.g. COPOL, SCONUL, LIBGIS, HEGIS, AARL, ANZALDATA, DEET. Problems in inconsistency of collection and interpretation

have led to studies in standardisation of data elements and descriptors, or measures (e.g. Lynch & Eckard 1981, Brockman 1984, etc.) These data form a reasonable starting point to MIS/DSSs, but are not specific enough to relate to planning objectives at different organisational levels, nor are the data turned into information through any specified planning questions or as a solution to planning problems in their national summation and publication.

Academic library requirements for MIS/DSSs :

Does the library literature indicate why MIS/DSSs are not used, or what is necessary to make more use of management information, and the capabilities of ILSs? Much of the earlier criticism for lack of MIS/DSS use is now historical and irrelevant. A recent overview of MIS/DSSs in libraries echoes the criticisms of the earlier Willers/Payne studies, and comments for non-use as made by, e.g., Hall in Harris (1987), and is reviewed here in some detail as the interpretation of MIS/DSSs contained in this article shows many of the reasons why they are still not being correctly designed and used, within the planning context and requirements of each individual organisation. Ferguson and Whitelaw (1992) review MIS/DSSs in place, and describe examples of management information generated by commercial library management systems, asking how these relate to management needs. They examine reasons why MIS/DSSs are not fully exploited, what their limitations are, and what can be done to overcome the limitations. Although they see that "in a management information system, regular pre-defined information is provided to the manager" (p. 185), the way the 'pre-defining' is achieved is not examined, and the implication is that this is the vendor's responsibility. They refer to the summarising reports that ILSs are capable of providing, and comment that "it is in the librarian's hands to decide whether such tools provide management information or just interesting statistics" and again "are the tools provided in current automated systems giving library managers the kind of information they require for performance measurement?" (p. 186). Is this a misunderstanding on their part of the purpose of 'tools' (presumably the standard reports and simple calculations, together with the more complex capabilities through use of DBMS and query languages)? **Tools cannot provide management information, per se. They can summarise or analyse (depending on the tool) extracted data (once identified as relevant to a decision need) turning it to information - all dependent on management input,** (i.e. in a manager's request for specific information, through an appropriately designed program, using the extracting and calculating capabilities of the ILS). Ferguson and Whitelaw (1992) suggest that operational data can't be used as management information, and that Dowlin's question "How is the library today?" (Dowlin & Magrath 1983, 58) is an unrealistic expectation of a MIS/DSS. They seem to have missed the point that all data, (and data is independent of the "tools" until it is chosen for manipulation in some way), from any level, can be useful if it fits the planning question, and much data is aggregated, analysed and handed up the decision-making chain, to be used, albeit in a different form, by other levels. Dowlin's question was not simplistic, or unrealistic, but holistic, and dependent on the evaluative composite picture of many such smaller analyses.

Ferguson and Whitelaw (1992) have not put the problem sufficiently within the strategic planning and decision-making context, where the planning questions asked will indicate data needed. They have looked at reports generated by various ILSs, (e.g. in technical services), but have missed very obvious operational data available from the system which can form the design of locally written operational /tactical reports, the results of which can be fed up strategically (e.g. one bibliographic entry alone in the technical services area can give the reason an item is purchased, its budget source, its supply source, date ordered, the date it is acquired against the final date the item is processed, and the number of times alterations are made to a bibliographic entry, etc. - which data alone can provide information for many planning questions to do with purchase policies, supplier reliability, cataloguing relevance and productivity, and, linked to OPAC use / circulation, its user relevance, user productivity, co-operative network opportunities and constraints, and probably more). Standard reports probably don't exist for all these, but the capability for designing in-house relational and specific reports from the systems are available, depending on the planning questions and strategic stance of the questioner. Ferguson and Whitelaw, however, see writing programs locally as too time-consuming, with 4-6 hours for running an analytical program as too long. (How significant, then, are the planning questions? Is management effort worthwhile? Is this an example of McClure's 'avenue of least effort'?) Instead, attempts are made to locate successfully written programs from elsewhere (e.g. Bell Labs.).

No more than simple combinations of data are examined, and no mention is made of Hamburg's work, or that of Bommer & Chorba, or even an indication that a holistic picture must be found to meet strategic planning needs, with the statement that "to obtain a comprehensive picture of library use, it appears there is no substitute for time-consuming surveys" (p.190), which is not only depressing, after the theoretical work that has gone before (together with planning common-sense), but would seem a contradiction their own criticism on time-consuming programming and running of the program.

They find that MIS cannot supply the information required by top managers, and attention should turn to DSS, with modelling, combined with various software packages, as the answer. (Modelling still requires data of some kind as a starting point.) Relational DBMSs "allow managers to extract the kind of information required" and "download some of the data on to spreadsheets" (p. 194). How the manager is to arrive at this required information is not investigated. Contradictory conclusions are made. Vendors, they recommend, "should be addressing the problems of allowing managers to extract data and then to manipulate it" (p. 195) - (it would seem the systems already have this capability); while proactive librarians should see that "systems are driven by management needs and not 'data supply' ", by putting a "value on our own management information and so raise its priority in system specification" (p. 196).

Broad human behavioural factors influencing attitudes to acceptance or rejection of MIS/DSSs have been well covered in the social and behavioural sciences and library literature (e.g. Heim 1983; McGrath 1983; Best 1985; McClure & Samuels 1985; Cox 1987; Belohlav & Raho 1987; Forgione 1988, etc.). Woodman (in Cronin 1985, 97) lists factors constraining development of information

management in large organisations as "people not knowing what information they need; lack of accessibility; frequency of misinterpretation; 'overload' resulting from multiple copies and massive reports; the association between information, politics and power; organisational inertia; ambiguous ownership of information; information 'float'; legislation and external pressures; intangible business value of information; and users with variable cognitive styles."

Lancaster (1983) edits papers which discuss the nature of MIS, with two papers covering the possibilities of management information rejection, one reason being too much data, and the other being the lack of a library model for each library. Yet neither the SUNY model, nor the schema proposed by Bommer & Chorba (see above) have caused much interest in application in academic libraries.

Brophy's work is guided by the premise that experience in other fields has shown that management information systems which 'evolve' or 'grow' out of general computer systems are rarely successful. "If there is one guiding principle above all others which should govern the development of a management information system, it is that the manager and the information which he needs to aid his decision-making must form the starting point of system design." (Brophy 1986, viii). He covers theories of management, organisational structures, forms and levels of decision-making, management techniques, the systems view, objectives and the measurement of performance, in order to put management information, and hence MIS/DSSs, into their proper context. The design of a MIS/DSS should "begin with a detailed analysis of management's information needs in relation to organisational objectives" (Brophy 1986,68). To make a successful use of the computer in decision-making, Brophy says that we should identify, classify, and weigh every decision and decision situation that is significant to performance. Managerial information needs are evoked through information requirements analysis or information analysis, whereby "the information required by each library manager will depend on the external environment and market of the library, the degree and type of structure within the library, its management style" etc.(Brophy 1986, 68). He reviews management information systems in place, and concludes that most are crude, highly-structured, and systems by-products, with more enthusiasm for control software rather than exploiting services or encouraging use. More involvement of senior management is recommended, with a synthesising of existing statistical data systems and sources of information of use to senior managers, in a co-ordinated and integrated approach.

Another MIS/DSS overview was edited by Harris (1987), which again looks at management information systems and design, as well as management information needs in varying library environments, library education's influence on management information systems, the network approach, and an academic consumer's point of view. Brophy's paper in this collection again deplores the lack of use of management information "after a decade of relegation projects and library studies...hardly any management action has been taken in academic libraries ... the information systems we are using are not enabling or encouraging us to build on external work to resolve the problems that we face" (Brophy in

Harris 1987, 37). He is critical of Lynch's work in the United States on the *Library Data Collection Handbook* as 'data led' instead of 'needs led', and still sees the overwhelming need as a "major systematic effort to identify those managerial information needs and design methods for fulfilling them through comprehensive information systems" (Brophy in Harris 1987, 39).

Brindley's paper (in Harris 1987) puts management information systems squarely within strategic planning, with external and organisational variables accounted for in management information collected. MIS/DSS implementation would reinforce management styles, be dependent on modes of information flow, centralisation or decentralisation of decision-making, levels of responsibility in decision-making. Top-level management must be actively involved in management information systems development, defining their information needs, with lower level task force implementation at those levels. Information needs and concrete objectives are crucial. "We are unaccustomed to expressing issues in terms which suggest information needs, and to making inferences based on sound information drawn from reliable sensible data. Training in management techniques, information quantification, and good quality questioning becomes all important" (Brindley in Harris 1987, 150). She agrees that the end result should produce a diagnostic answer to Dowlin's question, followed by "Why?", which will result in summary reports of all the key success indicators of performance using predefined criteria and indicating expectations. She recommends a MIS 'evolve' from transactional data, with an interventionist approach of a top-down picture of needs, with an interrelationships of the data elements. Key success elements at the top level will then be used as a driving force of the system design. As with strategic planning, the design process will be cyclical, redefining, and better able to articulate, needs. Off-the-shelf management information systems are not worthy of merit; but a series of library management information system frameworks, model systems which take into account key characteristics of different kinds of library services, related to size, range of services, client groups, user technology, functional orientation, etc. could be beneficial. Links to external data are vital, e.g. national statistics, suppliers, institutional financial data, student records, academic profiles, performance indicators on research and productivity (grants, awards, publications).

A further factor to consider for current lack of MIS/DSS use is that most academic libraries now have in place 3rd or 4th generation computers (usually updates of previous ones). Their original systems analysis process would have been for the first RFP (perhaps 1st or 2nd generation computers). Most original RFPs concentrated on a systems translation of operational procedures and have not specified a need for management information, nor analysed management needs thoroughly enough, or they may no longer be relevant due to environmental and technological changes since they were written. Many systems analysts consider that managers find it difficult to state their needs. "Many managers are only vaguely aware of the deficiencies in their informational inputs for an MIS. They often tend to be unaware or unconcerned about the different sources of managerial information. Knowing what information is really required to furnish a sound basis for a decision is a difficult task. A manager's common sense and intuition often fail to provide sufficient insight into the real problems for these

problems to be defined adequately, and good, timely decision methods developed " (Hodge 1984, 316). Further, the "manager needs an appreciation of how data are managed by the operating system of the computer to realise more fully the concept of data independency in formalising problems." (Hodge 1984, 201).

CHAPTER 3

THE IDENTIFICATION OF AN APPROPRIATE INFORMATION REQUIREMENTS ANALYSIS METHODOLOGY : LITERATURE REVIEW.

Review of extant information requirements analysis methodologies:

Inadequate management information was identified as a problem in the business world as early as the 1960s, when Daniel (1961) first proposed that information systems should be tailored to meet the specific information requirements of individual managers, and that these information sources should be selective and significant, focusing on the few (3-6) success factors relevant to a particular industry and responsible for its success. Evaluation (through monitoring) was an essential component of continuing success. Since then, many methodologies have evolved to identify information requirements. These have come from the fields of behavioural science, management science, business, and information technology.

Scott Morton (1983) analysed methods and tools for building a MIS/DSS, and these are grouped into six categories "on a continuum that roughly represents their portability, that is, the ease with which they can be used by someone other than the original inventor or designer" (p. 11) - methodologies, database, languages, models, interface, hardware. He sees methodologies as the least portable, and all (at that time) were based on Simon's basic view of decision-making. However, he saw that in the area of Executive Support, the most visible methodology was Rockart's Critical Success Factors (CSF), based on work by Robert Anthony and Ron Daniels. This had been used successfully by others, and thus could be said to meet the test of portability. He recommended the description of a case study as valuable MIS/DSS methodology research, since it allows a rich sense of context and nuance in an area with many dimensions and facets, with empirical testing of a methodology, and reporting the results, as a "powerful means of improving the methodology" (p. 30).

Koenig & Kerson (1983) produced an article to serve as a primer to the methodology and the literature of strategic and long range planning in libraries and information centres. The methodologies reviewed are planning techniques, e.g. forecasting, simulation, consensus, multiple scenario analysis, goal programming, etc. They then give specific recommendations for different types of libraries, but information requirements analysis (or enterprise analysis) is mentioned only in relation to special libraries. Interestingly, they parallel the focus required to elicit information requirements to the information transfer process in the reference interview (an approach also taken by Taylor, in Bundy and Wasserman (1970), and later by Broadbent & Lofgren(1991)). Various methodologies for information requirements analysis are listed, e.g. Strategy Set Transformation, Critical Factors Analysis, Process Analysis, Decision Analysis, etc., but no evaluations or recommendations are made of these, other than to indicate that this "information needs assessment and the classification of those

needs, and of what information is on hand ... are increasingly being regarded as of central importance to the organisation" (p. 248).

Parker (1982) investigates enterprise information analysis (a form of information requirements analysis) as a cost-benefit analysis methodology. He incorporates and reviews IBM's Business Systems Planning (BSP) and Business Information Control Study (BICS) as top-down information requirements analysis methodologies, and as inputs to strategic and tactical planning. He indicates the BSP application generally takes two to three months, building an enterprise-specific model through the discovery process (see Davis 1982, below), while BICS uses a generic data model of the business which the organisation team, whose information requirements are being elicited, then verify.

Zachman (1982) compares BSP and BICS from their capabilities to meet business requirements in the most cost-effective way, - that is, giving the greatest relative potential for the business as a whole, producing short term results without high costs, and feasible within resource constraints. BICS was at that time still under development and not generally available, nor sufficiently "supported with an adequate theoretical foundation" (p. 49). BSP's quality is "very dependent upon the team's understanding of what they are looking for and their ability to find it" and is "highly customised" with "little transferability or comparability with other study structures", and "it is very difficult to bridge between the planning activity of the study and the implementation" (p. 48).

Broadbent & Koenig (1988) chart the importance of information and IT to the business world, and in the section on the *Design of automated information systems* they cover, briefly, tools for assessing organisational information requirements, including enterprise analysis and critical success factors, with an interesting comment from the literature that to successfully align IT strategy with business strategy, strategy formulation must be arrived at in a combination of top-down, bottom-up, and mixed approaches.

Cooper (1988) describes and evaluates MIS research from 1981 to 1985, and states that significant progress in generating answers to research questions may be made in the future due to theory-generating empirical research testing the methodologies. Progress is seen as slow because of the fusion of disciplines for MIS study (behavioural, technical, and managerial). Processes for information requirements analysis determination must be assessed in terms of the methods employed to aid the analyst in determining information needs, how far the users should be involved, which in turn impacts on the effectiveness of both the requirements identification and the MIS implementation and use. These must be considered in choosing an appropriate methodology. The two major methods reviewed are (1) Critical Success Factors and (2) Prototyping. Case studies indicate the CSF method provides useful results for individual managers, and for information systems planning at the firm level. Two key CSF strengths are (a) its intuitive appeal, generating user acceptance at the senior management level, and (b)

it facilitates a structured, top-down analysis allowing an evolving design that can be continuously examined for validity and completeness. However, warnings are raised in relation to "human information processing biases such as representativeness, availability, and inappropriate causality" (Cooper 1988, 82) as possible degradations of the method. Recommended methodologies for organisational information requirements analysis are BSP, CSF, Business Information Analysis and Integration Technique (BIAIT), and ends-means analysis. CSF's success as a methodology depends on the level of information system diffusion and infusion in the organisation - (diffusion being the degree to which information technology has been disseminated throughout the organisation, and infusion the degree to which information technology has penetrated an organisation in terms of importance, impact, or significance). The implication is that the higher the diffusion/infusion, the more eclectic methodologies are successful, while the lower the diffusion/infusion the more standardised methodologies produce better results.

Organisational characteristics and the appropriate methodology: Davis' contingency method:

The most thorough and helpful paper for choosing an appropriate information requirements analysis methodology is that of Davis (1982). He identifies two distinct levels of information requirements: the organisational information requirements reflected in a planned portfolio of applications, and the detailed information requirements to be implemented in a specific application. Constraints on humans as information processors must be understood before choosing a methodology (Figure 6). A contingency approach is then presented for selecting an appropriate information requirements strategy.

Characteristics and procedures of each organisation will affect the ease/difficulty in obtaining information requirements. He sees these as:

1. The constraints on humans as information processors- problem solvers.

2. The variety and complexity of information requirements.

3. The complex patterns of interaction among users and analysts in defining requirements. Therefore, a single approach may not always be appropriate.

A successful information requirements analysis methodology provides a structure for problem solving (or the problem space) - the task environment is the problem as it exists; the problem space is the way a particular decision-maker represents the task to work on it (Figure 6). He stresses the importance of analyst training in formulating and using a problem space, and in considering important non-data issues such as context, organisational policy, and roles. Good methodologies constrain the structure of the problem space, and assist in searching efficiently within it, while overcoming biasing factors. He sees the available methodologies as falling into one of four strategies for information requirements determination applying to both organisational and applications levels:

(1) The asking strategy: assumes users have a satisfactory way to structure their problem space, can overcome or compensate for biases. It is used in very stable systems, with well-defined structures, or those established by law, regulation, or outside authority. Asking methods can include closed or open questions, brainstorming, guided brainstorming (e.g. IDEALS method), and group consensus - usually more than one is used.

(2) The deriving strategy: is for replacing an older system, comparing systems, or using a data analysis approach, where the information system is performing fairly standard operations and providing fairly standard functions (e.g. transaction/accounting systems), and where the objective is to improve processing functions only.

(3) Synthesis from the characteristics of the utilising system: providing information services to facilitate the operation of systems - therefore information requirements will be derived from an analysis of the characteristics of the utilising system. This is appropriate when the utilising system is changing, for any reason. Methodologies appropriate here are: - normative analysis (e.g. BIAIT, a complex technique designed specifically for an ordering function in a business/retail environment); -Strategy Set Transformation (used at the organisational level only, and tied to objectives); -Critical Factors Analysis (method for eliciting significant decisions or other factors than can be used in determining information requirements, used at both organisational and application levels, for both critical functions that must be performed, or critical decisions that must be made), requiring " **relatively little effort to arrive at the critical factors"** (Davis 1982,17);-Process Analysis (including BSP - used for non-transient needs, relatively constant over time, a top-down approach, defining business processes as the basis for data collection and analysis- processes are clarified, key success factors and problems identified); - Decision Analysis (where the decision process is fairly well-defined);- Socio-Technical Analysis (patterns of interaction and group behaviour, and appropriate for application level analysis with many participants or both primary and secondary users); - Input-Output Analysis (systems top-down approach, e.g. Information Systems work and Analysis of Changes (ISAC), or Accurately-Defined Systems (ADS)).

(4) Discovering from experimentation with an evolving information system: used where information requirements can't be established correctly and completely, or users may not be able to formulate information requirements because they have no existing model (normative, prescriptive, or experimental) on which to base requirements, finding difficulty in dealing with abstract requirements or visualising new systems. Here, it may be best to capture an initial set of requirements and implement an information system to provide these, and add additional requirements after use. This is known as **prototyping** or heuristic development,, but are more suitable to some circumstances than others.

Figure 6. Effect of application characteristics, human characteristics, and information determination strategies and methodologies on information requirements obtained (From Davis 1982) :
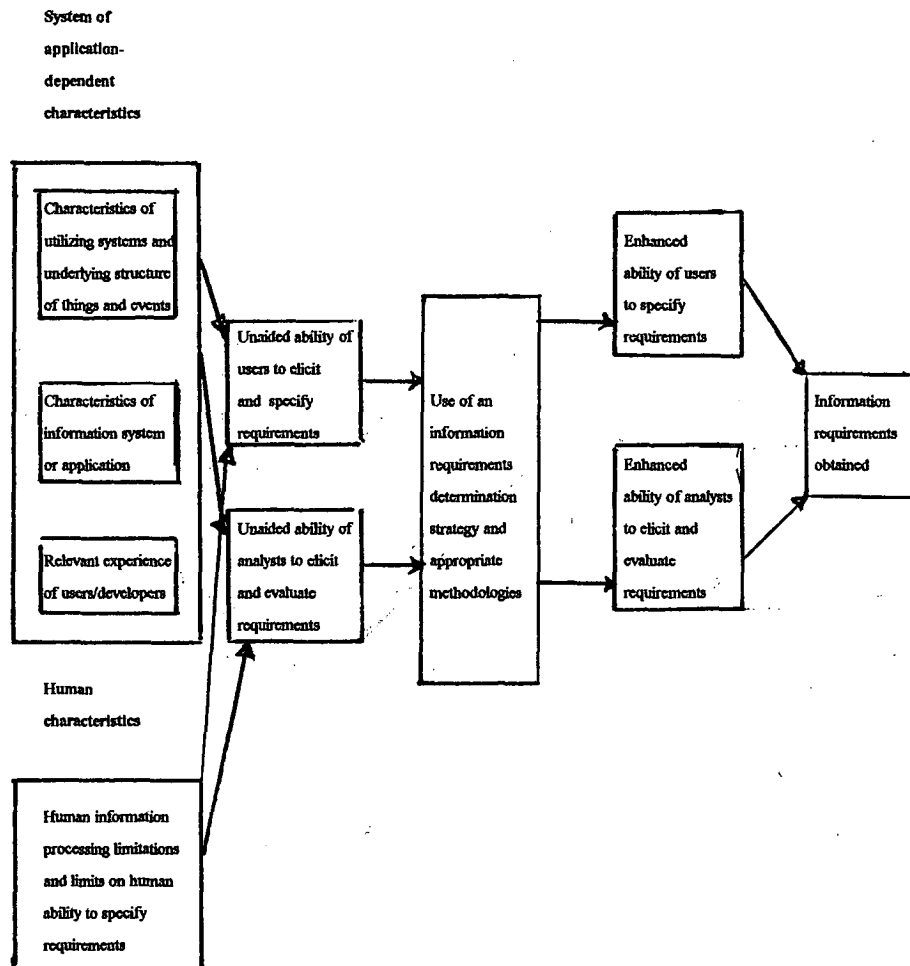
Figure 7. (From Davis 1982):

Conditions suggesting use or nonuse of iterative discovery methods for information requirements determination:

Conditions suggesting iterative discovery method

There is no well-defined model of information requirements.

Experience of users and/or analysts is insufficient to define requirements.

Users' need for information is evolving (such as in managerial or decision support applications.)

Conditions not supporting iterative discovery method

There is an existing well-understood, well-defined model of the utilising system and its information requirements.

There is need for stability in an information system because of number of users, complex interfaces with outside systems, etc. Examples are major transaction processing systems.

Figure 8. (From Davis 1982):

Steps in selecting a strategy and methods for information requirements determination:

1. Identify those characteristics of the four elements in the development process that affect uncertainty of information requirements determination:
    - Utilising system
    - Information system or application
    - Users
    - Analysts
2. Evaluate the effect of the characteristics of the four elements in the development process on three process uncertainties:
    - Existence and availability of a set of usable requirements
    - Ability of users to specify requirements
    - Ability of analysts to elicit and evaluate requirements
3. Evaluate the combined effect of the process uncertainties on overall requirements uncertainty
4. Select a primary requirements determination strategy based on the overall requirements uncertainty

Uncertainty	*Strategy*
Low	Asking
	Deriving from an existing system
	Synthesis from characteristics of utilising system
	Discovering from experimentation
High	Discovering from experimentation

5. Select one or more methods from the set of methods to implement the primary strategy.

Figure 9. Selection of an information requirements determination strategy (From Davis 1982) :
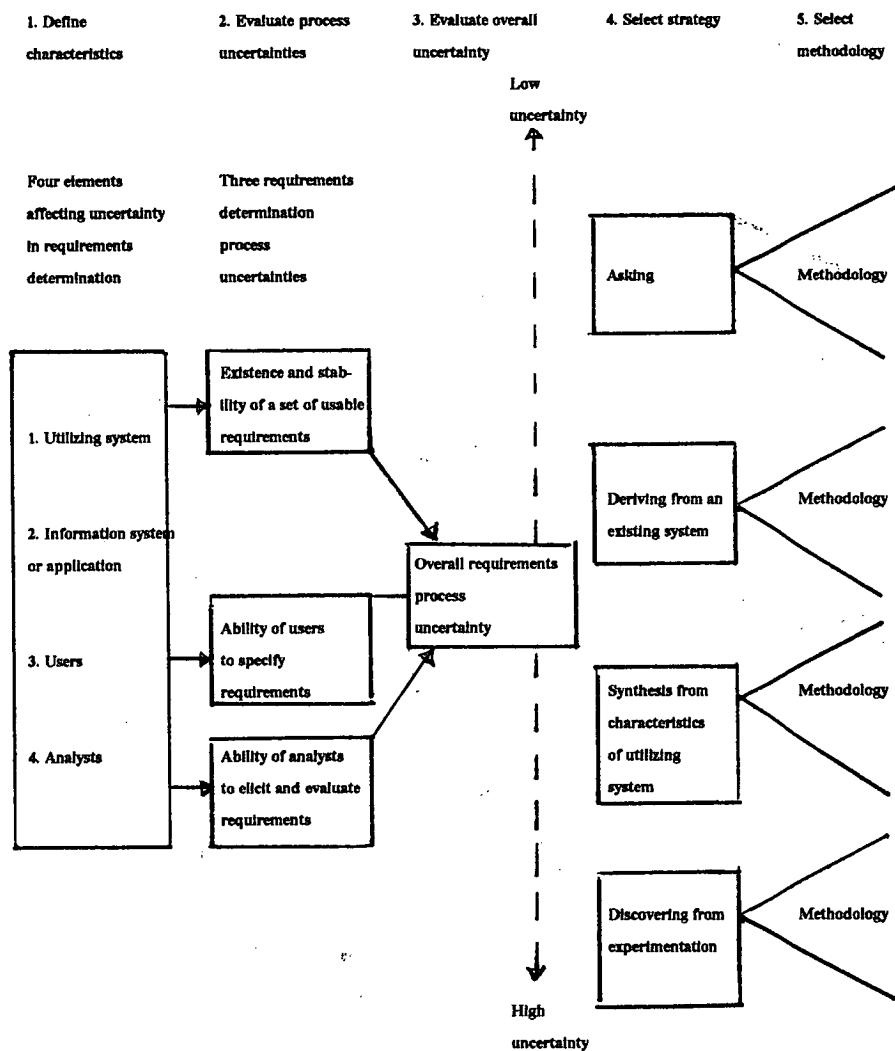
Figure 10. Characteristics of elements in the development process (From Davis 1982) :

Elements in developmental process	Examples of characteristics that:	
	Reduce uncertainty	*Increase uncertainty*
Utilising system	Stable, well-defined system, not in process change	Unstable, poorly under stood system in process of change
	Programmed activities or decisions	Nonprogrammed activities or decisions
Information system or application system	Traditional, simple set of requirements	Complex or unusual set of requirements
	Clerical support system	Management support system
Users	One or few users High user system experience	Many users Low user system experience
Analysts	Trained and experienced with similar information system	Little prior training or experience with similar information system

Davis (1982) suggests **steps to choose the most appropriate of the above strategies.** This is his **contingency approach based on the level of uncertainty** of the three information requirements determination processes (Figures 7, 8, 9 and 10). To aid in the determination of choice of strategy at the organisational level, various examples of organisations/companies at different levels are given. I have made the assumption, based on professional experience, the evidence given in the literature reviewed in the Introduction, and using the above categories and examples of organisational stages, that **most academic libraries follow the following pattern:**

- have computers for transactional processes, but would now like management/decision support applications, query capabilities and planning applications, with
- stable systems processes,
- management control change,
- fairly mature in the use of computers,
- management level applications,
- complexity and integration high,
- experience of users (in MIS/DSSs) low,
- experience of analyst moderate to high (?)

Davis evaluates these characteristics **at the organisational level** as a **"moderate to high uncertainty** in existence and stability of requirements, a fairly high uncertainty as to user ability to specify requirements, and a moderate to high uncertainty as to analyst ability to elicit and evaluate requirements. Overall, there is a moderately high degree of uncertainty as to requirements determination" (1988, 25), and he recommends a strategy from (3) above.

At the application level, an example of an on-line order entry transaction system, and order management tracking application is given a **moderate uncertainty** level, again fitting strategy (3) above, while problem identification and problem finding at application level indicates a **high level of uncertainty** where methodologies from (4) above may be more appropriate.

The identified methodology: Critical Success Factors:

The Critical Success Factors methodology falls into strategy (3) above, noting that Davis(1982) advises that some form of socio-technical analysis may also be needed (Middlemist & Hitt explain socio-technical analysis as various factors affecting behaviour in social information processing, including "the type of organisational control system and the distribution of power in the organisation, as well as influences from outside the organisation" (1988, 183) and the relationship of these influences with both organisational structure and job design, giving Volvo's famous example of a socio-technical approach through the formation of autonomous work teams).

A comparison of the choice of a level (3) strategy from Davis (1982) can be made with the approach of Rockart (1982, 10) in his use of Gibson & Nolan's (1974) EDP growth and stage analysis, where the academic library would fall into Gibson & Nolan's early stage three: a complex environment at the control stage (i.e. remaining within budgetary constraints, and concentrating on various aspects of service delivery), undergoing change, with transactional computerisation in place but with no management information system/ decision support system as yet, also with a **certain level of uncertainty in its decision making environment and therefore information requirements determination**. The use of the Critical Success Factors method is recommended for information requirements determination for organisations in this stage.

In 1989, Forster & Rockart reviewed the use of the CSF methodology, in an annotated bibliography selected from some two hundred CSF studies over ten years. None of these were in the library field. The CSF concept was traced from Aristotle to Drucker, with a move in the 1970s into the information systems area, where, as a tool for managerial focusing, it was developed in 1979 by Rockart and his team at the Center for Information Systems Research (CISR), Sloan School of Management, M.I.T. During the 1980s, the methodology was expanded from its original purpose, in defining critical information requirements (information needed to track progress in critical areas of the organisation), to helping management think about information systems priorities, to finally being used by management teams more generally, to aid in determining an organisation's priorities and the ensuing action programs. Reasons for its success as a methodology are its simplicity as a concept being easily understood. Its costs are low, and action results. The methodology overall is clear, explicit, structured, economical, efficient, reliable, portable, flexible (adaptable), and has an integral position within a strategic planning process. It is recommended to avoid information overload, as well as the null approach, where too little or the wrong information is collected, and avoids only using 'easy to collect' information. It allows either a top-down or bottom-up approach and is user-oriented (i.e. manager as user of a MIS/DSS). It targets key areas needing attention, and therefore the selection of good monitoring/performance measures and the design of relevant reports.

Looking back to the research questions of this study, the Critical Success Factors methodology has been identified and chosen as most appropriate, and should be able to answer the questions raised, applied as strictly as possible, that is, in accordance with Bullen & Rockart, *A Primer on Critical Success Factors* (1981), i.e. the *Primer*. This form of the methodology is chosen, since (a) the structured approach will maximise the structure of the problem space, and (b) as an aid in an application of a methodology which is relatively unknown to library practitioners, and where therefore it is felt that there will be a strong possibility of difficulty in information requirements determination. Because of the limitation of time and finance in this study, socio-technical analysis (as recommended as a possible extension to the CSF method) will not be able to be added. However, any possible socio-technical influences that may be present in the academic library environment during the application and

analysis of results will be noted, and could well prove fruitful avenues for further research. (Borbely's (1981) addition of MbO to the CSF method (see below) may have been appropriate in his organisation, but may not be in the case study site, since MbO is an intensive and subjective application, taking time, and requiring motivation for involvement of staff as participants - neither of which was appropriate to the limitations of the study).

Use of the CSF methodology in the library literature:

There has so far been little mention of information requirements analysis as a basis for the design of MIS/DSSs in the library literature, or the testing of any methodologies for these in a strict sense. Zweizig (1987), in a paper on planning and evaluation in libraries, points out that the need to concentrate on key indicators of service or 'critical success factors' is essential to make the best use of management information from automation, and therefore to track activities for performance **in relation to measuring services for the user**. This evaluative approach to services of critical benefit to the user is also visible in the use of the CSF method (though in a different form from the strict application) by both Borbely (1981) and Broadbent & Lofgren (1991), - the only other two applications of the CSF method visible in the library literature.

Borbely's (1981) application of the CSF method occurred at AT & T Longlines (a special library) over 1979-1981, with the emphasis on the evaluation of the library's performance in a changing and volatile environment (corporate reorganisation), rather than with the design of a MIS/DSS. The structured technique recommended in the *Primer* (1981) is not visible. The CSF method may have been chosen as a change agent, and was used in conjunction with MbO, in order to clarify and specify objectives derived from the elicited CSFs, which is seen by Borbely as a difficult task in a library environment. However, Borbely assesses the CSF method as a simple but powerful management tool, relating well to a strategic focus and to priority issues, and through these the identification of relevant performance measures drawn from the derived objectives , resulting in a more productive and effective library. Repetition of the CSF method over three years resulted in a growing sophistication in targeting key areas, and further specification for actions to be taken, and measures for monitoring these. However, since his intention was to use the CSF method as a planning tool, no indication is made of a MIS/DSS tied to the selective data elements of the ILS. Borbely's application was a top-down solo approach, incorporating frequent discussions with key individuals. His listing of categories helping to focus attention on areas of potential significance in his Phase I application (i.e. the choice of relevant objectives and key CSFs) would indicate a leading approach, not recommended at this stage of the methodology's strict application in the *Primer*. (Compare this approach to that of Broadbent & Lofgren (1991) in the presentation of their 'generic' CSFs for their sample managers to prioritise, below). Borbely's Phase II was combined with MbO, to make objectives more specific and actionable. Phase III was the establishment of monitoring reports and performance measures, some objectives lending

themselves to this easily, others proving very difficult, and Borbely recommends that these must be determined largely through inference, especially for user assessment of library performance.

Broadbent & Lofgren's study (1991), funded by CIRCIT (Centre for International Research on Communication and Information Technologies) and ACLIS (Australian Council of Libraries and Information Services) was published after this study's initial research and application of the chosen methodology at the test site, but it is relevant to review it here, and to compare its CSF prioritised results with those of this study. Their study was a two part evaluation of library and information units' (LIUs) services in the context of both the perceived benefits by LIU staff and by LIU users, using an 'extension' of the CSF method for the first part - a priority and performance evaluation - while a cost-benefit analysis formed the second part. They point out that their approach in the use of the CSF method has been as an assessment of effective performance, rather than as an enhancement of relevance and quality of management information systems. Therefore, theirs is a different approach to and use of the CSF method than that proposed in this study, where the assumption is that without access to, and use of, relevant management information, decisions about efficiency or effectiveness within an organisation could be adversely affected, and hence affect priority decisions and performance.

They acknowledge that the CSF approach has not been given much attention in the library and information area. The *Primer's* structured questions were not applied in face-to-face individual manager interviews, nor the results aggregated. Their derived CSFs used were not tied to an examination of mission, goals, objectives, nor did they take into account the CSF influencing factors of industry position, strategy, environmental factors, temporal factors. In their study, a list of 43 potential CSF indicators is first drawn up - ranked in a preliminary order of significance (derived from reports in the non-library literature, "as well as discussions with researchers at CIRCIT") (see Figure 11), and then grouped by the researchers prior to sending out "into four broad categories of Staff, Management, Service and Location as a form of checklist to ascertain that all significant attributes of the LIU were covered by the questionnaire" (Broadbent & Lofgren 1991, 20). This list was then sent to 67 senior LIU professionals, chosen because (a) they had recently attended a workshop on the value of library services, (b) were listed as office bearers of the ALIA Special Libraries section. They were asked to mark a Likert scale for each of the ranked potential 43 CSFs, within the four broad categories (Figure 11A). 30 survey forms were returned, mostly from special library professionals, admitted as not a representative sample of LIU managers. These ranked CSFs (looked on as 'generic' CSFs by Broadbent & Lofgren) were then presented to a two-organisation sample (a Victorian government agency and a large government business enterprise). These are then again ranked by the sample's LIU managers and their LIU users, in order to establish whether effort in performance is directed to the right areas (matched for both providers and users of services) for an effective/ cost-effective service. A number of interesting points emerge from the derived and prioritised potential list of 43 CSFs: (i) as with the Van House, ACRL, and many other evaluative lists, few direct assessments of customer requirements are indicated, and most of these appear low in priority; (ii) existing services are

considered worth promoting, rather than evaluating other types of service the customer may prefer; (iii) 'advanced management and planning methods' appear fairly low on the list; (iv) marketing techniques by librarians are still in the main confined to sample surveys and simple interviews, rather than the many more sophisticated instruments for market measurement and analysis (e.g. Kotler, 1982). Perhaps a comparison with Browne & Edwards current study (1991 +) could be beneficial.

Broadbent & Lofgren (1991, 15) state that an " understanding of generic factors of importance to success can be beneficial to planning and management. Identifying the critical success factors applicable to a particular organisation or organisational unit is to take the approach a step further". This may be ambiguous. Is their recommendation to start with generic CSFs? and that an individual CSF application in a particular organisation is to take the method a step further? If an ambiguity exists, it could affect results in future library CSF applications. This is the opposite to the method of arriving at generic CSFs proposed by Rockart, where individual applications of the methodology must come first, and individual CSFs should be obtained by the identification of mission, role, goals, and objectives, applicable in each individual organisation, by each individual manager. These may well be different from one organisation to another depending on their environmental situation, temporal factors , geographic location, or strategic situation. This initial elicitation of individual CSFs should not be led, the analyst's role being one of drawing these out (having understood, from prior examination, the organisation's context) without influencing the choice. Rockart implies that generic CSFs for both an 'industry' (1979) and an occupational role (1982) can be derived from aggregates of many individual CSFs, within a given industry (e.g. LIUs) or an occupation (e.g. Collection Development Librarian). This set of generic CSFs can then serve as a 'model' against which each organisation can test its particular set of CSFs, comparing their results with those obtained in different LIUs, and the common, or overlapping CSFs could then be an indication of generic CSFs for the industry at that particular time.

Broadbent & Lofgren (1991, 17) admit the identification of CSFs may be difficult as "these factors are not likely to be directly evident", and would be of a fairly abstract nature ('service', 'supplier relationships', 'innovation' etc.), involving the combination of both hard and soft data in monitoring. Further, in the LIU context, an understanding of the information transfer process (for information users, information suppliers, etc.) is necessary. However, they see the CSF methodology as assisting the integration of the information function with the general planning and management process, leading to a better understanding of factors which tend to make the information transfer process of LIUs successful (or unsuccessful). They also see potential for the method's application, regardless of formal results, as a "useful process which actively involves management and staff in the explicit identification of the full range of internal and external relationships, functions, operations, activities, services, and products" (1991, 23), but these have not been shown in their study. They recommend further CSF research. It is of interest to compare their study's resulting CSF priorities with those of Borbely (1981) (see Appendix V), and with those of this study (Figure 19 & 19A).

It should be noted that any number of ideal CSFs can be **presented** to library managers, but that if they are not relevant to that particular manager, they may not be recognised as critical. Similarly, performance measures also must be relevant to particular managers within their particluar organisational environment. This should be borne in mind in referring to the Broadbent & Lofgren study in relation to future CSF applications.

Although the study was a 'priority and performance evaluation', no performance measures came out it. No mention is made by Broadbent & Lofgren (1991) of the study by Oldman & Wills (1977) which attempted something similar, viz. the interactions between library type information systems and their receiving communities, where impact or derived value of libraries as information providers is the measure of benefit, and total information behaviours were examined. The use of cost-benefit analyses as a possible way to achieve this was initially looked at and abandoned. The derived value in this case was the difference between the value the user expected and the value he felt he has received from this use. No information requirements analysis methodology was used, although a very detailed analysis of users' information requirements, i.e. information seeking behaviour and value put on information sources, was made, and this method and approach could well contribute to management information systems design. Nor is mention made by Broadbent & Lofgren (1991) of Bommer & Chorba's work (1982) on linking user demand/productivity, and the value of information from users as expressed in user activity/productivity.

Figure 11. Initial ranking of 43 potential CSFs (From Broadbent & Lofgren 1991, 21)

Broadbent and Lofgren indicate the appearance of a CSF in the upper or lower part provides an indication of perception of importance by this group of LIU professionals:

1. Competence and qualifications of LIU staff.
2. Availability and accessibility of LIU staff.
3. Image of LIU and its staff within the organisation.
4. Top management support.
5. A clear role and purpose for the LIU.
6. Quality of information services and products (reliability, currency, etc.)
7. Quality of LIU staff assistance and support to users.
8. Timely delivery of LIU products and services.
9. People and service orientation of LIU staff.
10. Responsiveness of LIU staff to user requests.
11. Understanding of users' business and information needs.
12. Regular communication between LIU and management.
13. LIU initiation of services for users (being proactive)
14. Training and professional development of LIU staff.
15. Staff satisfaction, motivation, and morale.
16. Up-to-date material in LIU collection.
17. Regular communication between LIU and organisational departments/users.
18. Access to databases (on-line and CD-ROM).
19. Promotion of LIU and its (existing) services and products.
20. Inter-library loan service.
21. Marketing of LIU services and products.
22. Development and introduction of new LIU services and products.
23. LIU service area atmosphere (noise level, staff friendliness, etc.)
24. Provision of cost effective LIU services and products.
25. LIU servicing of all sections of organisation.
26. Application of advanced management and planning methods within LIU.
27. Procedures for user feedback to LIU staff.
28. Application of survey, interview and other techniques to identify user needs.
29. State of the art technology within LIU.
30. LIU service area convenience (physical layout, lighting, equipment, facilities for reading, etc.)
31. Training of users in accessing resources and services.
32. Presentation of services and products (design, readability, etc.)
33. Provision of services and products customised for individual users.
34. Range of material in collection (e.g. subject areas covered).
35. Physical accessibility of informational resources in LIU (books, reports, journals, etc.)
36. Development and management of in-house databases.
37. Provision of analyses and/or syntheses of information in response to user requests.
38. User participation in LIU policy decision-making.
39. Physical proximity of LIU to users.
40. Provision of a large spectrum of services and products.
41. Revenue raising.
42. In-house training in searching of external databases for users.
43. Size of collection.

Figure 11A. Category ranking of CSFs (Staff, Management, Service, Location) on a Likert scale of 1 - 7. (From Broadbent & Lofgren 1991, 22)

Category ranking of CSFs
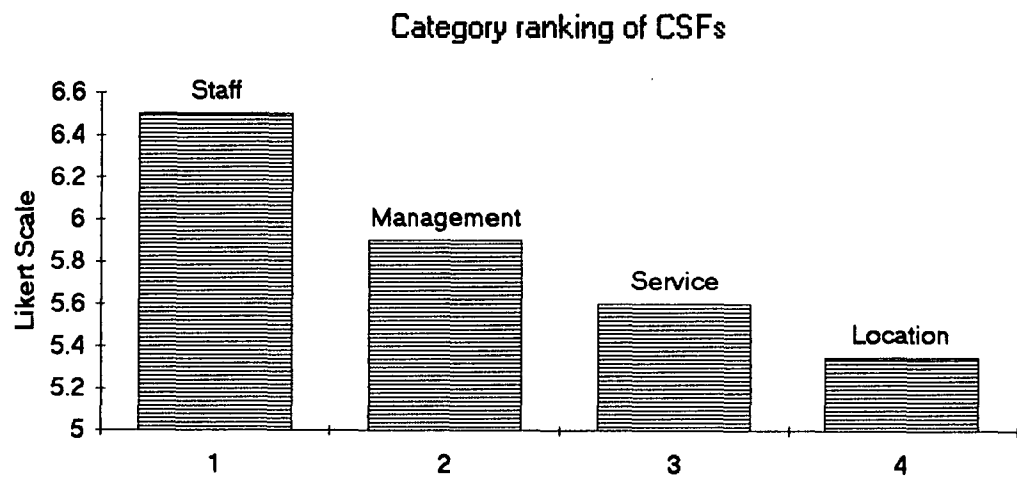
CHAPTER 4
RESEARCH DESIGN AND METHODOLOGY

Location of the structured Primer:

The *Primer* for the structured application of the CSF methodology (Bullen & Rockart 1981) was obtained from John Rockart at the Center for Information Systems Research, Sloan School of Management, M.I.T., together with written assurance that there are no restrictions to its use.

Location of the case study organisation:

A package was put together describing the proposed study, its purposes and possible outcomes, with an outline of the background to and procedures of the CSF methodology. This was sent to four major university libraries, chosen for their progressive management attitudes. Although all showed interest, three felt the study would be too time intensive, difficult conceptually, at possible variance with their strategic planning approaches, or too early in their strategic planning stages, and possibly invasive. The fourth agreed, being particularly interested in achieving performance measures, and felt the study's methodology fitted in with its planning stage. Some of its senior staff had undergone or were undergoing higher degrees, including economics and management, as well as librarianship, and had attended the recent Van House seminars on performance measures.

The case study site was organised, with ten senior academic library managers (including the university librarian) happy to undertake the exploratory investigation. It was agreed to apply the methodology strictly, in individual interviews, but, at the university librarian's request. these were to be followed by group discussions, to clarify corporate CSFs. Although the *Primer* itself does not include structured approaches to group sessions, Rockart admits this is a valid component, and group sessions have been cited in a number of the studies reviewed by Forster & Rockart (1989), especially that of Brosseau (1987), and was included in the study by Rockart & Crescnezi (1984). Broadbent & Koenig (1988) also recommend, from the literature's examples, a combination of top-down, bottom-up, and mixed approaches for the best alignment of IT strategy (including MIS/DSS design) with business strategy. Borbely's (1981) later CSF applications involved a team approach, while Brosseau (1987) used a CSF team approach as a project selection/strategy implementation process (incorporating management style analysis and interface studies to enhance management focus and improve co-operation). Brosseau found that the design of action plans by the group, following CSF choices, neutralised group concerns and fixed problems. In this study, group sessions took the form of reviews of aggregations, and agreement on refined matrix elements which in turn would lead to action plans and performance measures. Consensus mapping was incorporated in this process.

The CSF methodology, as applied, consists of:

(1) a pre-interview study of the organisation and its environment; (2a) pre-interview preparation procedure; (2b) individual interview procedure; (3a) aggregation and analysis of individual interview results; (3b) group session's clarification of corporate CSFs; (4) establishment of performance measures arising from the resulting CSFs; (5) Linking of performance measures, through reports, to data (internal and/or external). This last forms the design basis for the MIS/DSS.

Depending on the complexity and development stage of the organisation, (and hence the ease of application of the methodology), and the time available, Bullen & Rockart (1981) recommend that these steps can be achieved in a **single investigation, or broken up into two or more investigations, e.g. (1), (2) and (3) being the minimum for the initial investigation, with a possible follow up investigation for (4) and (5).** Since the strict application of this methodology had not been written up in the library literature previously, the study aimed to cover as many of the five steps as possible, and certainly to complete the first three according to Rockart's recommendations, noting any difficulties, or otherwise, which might affect the completion of all five steps, and comment on these for future improved use of the methodology in academic libraries. Although all five steps would be necessary to completely answer the research questions posed, since the study was the first to apply the methodology strictly in academic libraries, it was felt that this approach would produce more meaningful research results for ongoing studies, and hence be more productive in achieving a greater understanding of information requirements assessment for MIS/DSS design.

The time-frame of the study:

In the context of available funding for interstate travel, it was agreed that the research time should be allocated over **two organisational visits, of three days each, with the preparatory investigation of the organisation, and the pre-interview preparation having been completed beforehand.** The first visit would encompass individual interviews, allowing one hour per senior manager and about one and a half hours for the three most senior positions. Written records of first interviews would be clarified, posted to interviewees for acceptance, and followed up by telephone for any further adjustments and final verification. The second visit was to cover further individual interviews to examine results and then cover the group sessions. During the first day, results of individual CSFs would be reviewed with one-to-one interviews, using the *Primer's* recommendations for aggregation analysis, a further discussion of possible performance measures, a review of possible corporate CSFs arising from the aggregation, and a discussion of the group session to follow. Group sessions would occupy the next two days, with organisationally acceptable performance measures ensuing from all CSFs.

(1) Pre-interview study of the organisation:

This must be undertaken to properly understand the organisation and its environment, its organisational climate, planning development stage, its relations externally, its possible opportunities and constraints at that time, and any external or temporal influences of note (e.g. technological developments). This overview of the organisation, together with the analyst/researcher's knowledge of the 'industry', helps in assessing and drawing out the relevant goals and subsequent CSFs. Documentation of this nature was therefore requested, and examined before the first interviews, including university (parent organisation) mission and goal statements, Library Committee goals, library organisational chart, individual senior manager position descriptions, library mission and goal statements (corporate view), library strategic planning/ planning documents, etc.

(2) (a) Pre-Interview preparation procedure:

Prior to interviews, a **preparatory package** was put together and distributed to each interviewee, one month before the first round of face-to-face interviews. This explained the CSF methodology, what it should achieve, its definitions and terminology, **noting particularly 'goals' and 'objectives'** (Figure 12), its process (Figure 12A), an outline of the interview process (both individual and group), and the aims and purpose of this research study. As Rockart instructed, a copy of his major CSF article on the methodology *Chief executives define their own data needs* (1979) was included. Since commitment of the chief executive is vital for MIS/DSS development, implementation, and use, a covering letter for the package was added by the university librarian to each interviewee, requesting her staff's co-operation and involvement in the study. The researcher asked interviewees to carefully study the package, and prepare a list of their current mission, role, and goals, with special emphasis on those critical or key areas needing their attention to succeed in achieving their goals. Ways of measuring this achievement, from the practical to the intuitive, were also to be considered in a preliminary and creative way. This preparation, on the part of the researcher/analyst and interviewees, formed the basis for the first round of interviews.

(2) (b) Interview procedure - Individual interviews:

Senior managers are interviewed face-to-face, using structured questions, to elicit CSFs, and from these their information requirements for management information. Rockart indicates this can be done top-down, or bottom-up. Corporate CSFs emerge from an aggregation of these individual CSFs. "In theory, the development of CSFs should be from top-down. However, where corporate or sub-organisation CSFs have not been explicitly developed, they can be inferred upward from a careful analysis of each individual manager's stated CSFs" (Bullen & Rockart 1981, 21). Since this was a first strict library application of the methodology, a bottom-up sequence was chosen.

Figure 12. (Bullen & Rockart 1981, 7 - 9).

Definition of terms used in Critical Success Factors *Primer*

Strategy: the pattern of missions, objectives, policies, and significant resource utilisation plans stated in such a way as to define what business the company is in (or is to be in). and the kind of company it is or is to be. A complete statement of strategy will define the product line, markets and market segments for which products are to be designed, the channels through which these markets will be reached, the means by which the operation is to be financed, the profits (or benefits for non-profit organisations), the size of the organisation, and the 'image' which it will project to employees, suppliers, and customers.
(Example: Regional airline transportation.)

Objectives: general statements about the directions in which an organisation intends to go, without stating specific targets to be reached at particular points in time.
(Example: Develop profitable route structures.)

Goals: specific targets which are intended to be reached at a given point in time - an operational transformation of one or more objectives.
(Example: Eliminate all routes with less than "n" % average seat use.)

Critical Success Factors (CSF) : the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organisation - the few key areas where "things must go right" for the business to flourish, and the manager's goals and objectives to be attained.
(Example: Obtain certification for high-density routes.)

Measures: specific standards which allow the calibration of performance for each CSF, goal, or objective. Measures can be either "soft" (subjective), or "hard" (quantitative).
(Example: Average % seat capacity used.)

Problems: specific tasks rising to importance as a result of unsatisfactory performance, or environmental changes, which can affect the achievement of goals or performance in a CSF area.
(Example: Increasing price of fuel)

Figure 12A. The CSF process used in determining individual managerial information needs (From Bullen & Rockart 1981, figure 9) :
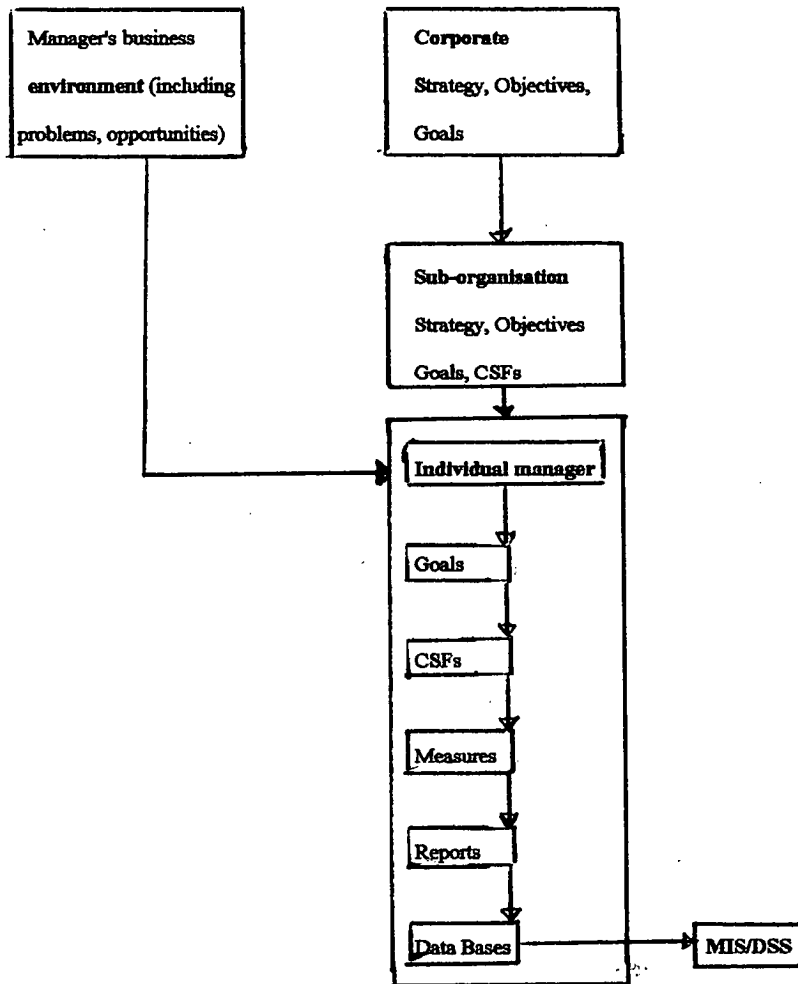
Structured individual interview questions:

(1) Opening the interview;

(2) Interviewee's description of his/her mission, and role;

(3) Discussion of interviewee's goals;

(4) Developing CSFs;

(5) Prioritising the CSFs;

(6) Determining measure for the CSFs (identifying measures, and their sources); specifying report requirements to track these CSFs;

(7) Relating these to data elements available from the ILS or elsewhere.

The clarification of steps (1) to (6) produce the information requirements for each manager, while (7) is the first step in designing the MIS/DSS. The following structured questions from the *Primer* (p. 50 et seq.) were asked of each interviewee:

A. "As you know from the material you have received, we are using a method for assisting managers in looking at the way they manage, and for determining their information needs. This technique focuses on identifying those factors in a manager's environment which must go right for the manager to achieve his/her goals and objectives. These are called critical success factors, CSFs."

B. "In this interview, we are going to start by describing your mission and role, move on to your objectives and goals, and then discuss the CSFs to support these."

C. "Describe your mission and role, as you see it, in relation to your job, and its place in the library organisation. What is important about your job? Your responsibilities?"
(Note: A manager's CSFs should consistently relate to his perceived role. Answers show the manager's 'view of the world', and their strategic stance.)

D. "Discuss your goals. Discuss their short/long term horizons that are most meaningful to you."
(Note: These should include both formal, significant, agreed-on goals, and also informal, unspoken or unstated goals. The choice of goals and their time span provides insights into their view of the job, and the preparation for the interview. Written lists can be important.)

E. "Do you have any less formally stated goals? These are often just as important as agreed-on goals. What are these?"

F. "Will you please tell me, in whatever order they come to mind, those things you see as critical success factors in your job at this time?"

If clarification is needed for the concept of a critical success factor, the following is asked:

G. "Let me ask the same question concerning CSFs in another way. In what one, two, or three areas would failure to perform well hurt you most? In short, where would you most hate to see something go wrong?"

H. "We discussed your goals earlier. Which of the CSFs you listed/discussed best underlie these? What must happen to make your goals achievable?"

The role of the interviewer is to:
- make sure the interviewee does not focus on only one type of CSF, from different angles;
- make sure the CSFs relate to mission and role descriptions;
- check that all relevant areas are covered;
- make sure CSFs don't overlap, that two or three aren't the same;
- try to elicit all CSFs, not just those that can be measured with 'hard' data;
- be helpful, non-directive, non-judgmental;
- try to stretch the interviewee as much as possible.

Prioritisation of CSFs:

CSFs are then reviewed for overlap, ambiguity, and clarity. Then prioritisation is asked for, acknowledging some CSFs are of equal value:

I. "Try and prioritize your CSFs, not absolutely, but give general indicators as to which are most important. Quite often, no one is more important than another."

Performance measures:

A **preliminary attempt only** is made in this first round of interviews at measures, in relation to the average three to five CSFs of each manager. Measures may be taken continuously, sampled, or statistically manipulated. They may be cyclical, seasonal, or related to the time frames of goals stated. They must relate to the CSFs, therefore avoid the trap of only looking for 'easy' measures. It is up to each manager to state what type/frequency of measure best suits his needs. These then form the basis of reports, displaying the value of each measure, also with timing, format and direction (information flow) as set by each manager. The analyst/researcher may help here. "The interviewer may suggest a

way of measuring that the interviewee did not think of but likes and will use." (Bullen & Rockart 1981, 59).

J. "It is useful at this stage to determine measures, or to identify what might be the source of such measures. Can you think of any possible ways to measure your CSFs? These can be quite creative and unusual. Indicate how you would measure them now (at this point in time)."

K. "Later on, we can zero in on these and redefine them more clearly. We can also match these measures to the data base elements in greater detail for the required content to form the management information system. Some measures may need external data as well, and these, together with their possible sources, should also be identified."

Second individual interviews, and preparation for group discussions:

Individual CSF results were written up after the first round, posted to each interviewee, and followed up by telephone, for clarification and any further changes that may be required. At the beginning of the second individual interviews, these are finally checked. Aggregation results and analysis of individual CSFs are discussed, as well as matrix elements used in the aggregation process. Since the CSF process is very conceptual, full agreement must be obtained on CSFs, individually, and corporately, before the MIS/DSS design can begin (that is, information requirements must be made very clear).

To make the group sessions as productive as possible, especially in relation to possible choice of performance measures, **facilitating sheets** were provided by the analyst/researcher to each interviewee during this second individual interview, in preparation for the following day (Figure 12A and Appendices I - IXf). These were:

Figure 12A. The CSF process used in determining individual managerial information needs (Bullen & Rockart 1981, fig. 9).

I. Criteria for high-performance organisations (Golembiewski & Kiepper 1988, 3).

II. A comparison of traditional and information support data bases (Bullen & Rockart 1981, fig. 13).

III. Section D: Evaluative criteria (ACRL University Library Standards Review Committee 1989, 686-687).

IV. The measures (Van House 1987, fig. 1-2).

V. Borbely's CSFs for the IRC: 1979, 1980, 1981 (Borbely 1981, 207).

VIa & VIb. Decision tasks (Bommer & Chorba 1982, 26-27)

VII. Model of functional components of an academic research library (Bommer & Chorba 1982, 78).

VIII. Complete data base schema - academic library (Bommer & Chorba 1982, 126).

IXa. Profile of all faculty by publications authored (Bommer & Chorba 1982, 105).

IXb. Profile of all faculty by research survey (Bommer & Chorba 1982, 107);

IXc. Profile of all faculty by serials used (Bommer & Chorba 1982, 108); ·

IXd. Profile of all faculty by combining score from research projects and publications authored (Bommer & Chorba 1981, 110);

IXe. Circulation and interlibrary loan transactions-summary report (Bommer & Chorba 1982, 118);

IXf. Distribution of teaching, research, interlibrary loan and circulation activity (Bommer & Chorba 1982, 121).

These facilitating documents were also chosen to:

- show how an organisation may wish to view, and therefore approach, measures of performance;

- to explain graphically the process of arriving at a management information system from corporate strategic planning, through unit strategic planning, CSFs, measures, reports, information data bases;

- to explain the components of an informational support data base;

- give an example, tied to traditional academic library programming, of evaluative criteria;

- give an example of output measures;

- give an example of another library's CSF results and performance indicators arising from these;

- show the evolution of performance measures from management control decisions made in key functional library areas;

- show a schematised aggregation of broad data bases in an interrelated way, giving possible statistical manipulations (e.g. correlations) across integrated files to extract relevant management information (e.g. cause and effect queries on library policies, library effectiveness in relation to user productivity, etc.).

(3a) Analysis of individual CSFs:

The *Primer* indicates that the analysis of the results can be as wide (in an organisational analysis context) or as narrow as the user wishes, or is able, to make, depending on the research objective. The *Primer's* main thrust is directed, as is this study's, towards the design of a management information system, and therefore concentrates on the linkage of the information requirements elicited with the data bases within and without the organisation which will provide the required information. However, Bullen & Rockart emphasise the hierarchical nature of CSFs, and the influences these exert on individual managers' CSFs, both from externalities, industry-based influences, and the organisational structure itself, as well as the individual manager's place in the organisational hierarchy. With changes to any of these elements, changes will also occur to individual and corporate CSFs. "CSFs are the particular areas of major importance to a particular manager, in a particular division, at a particular point in time. They therefore demand specific and diverse situational measures ... No standard set of organisation-wide 'key indicators' can provide the necessary operating information." (Bullen & Rockart 1981, 14). There will not normally be more than three to five CSFs for any one manager at any time. Individual CSFs allow a better allocation of resources, show whether or not a unitary purpose exists in the organisation, show attitudes of managerial staff to innovative change, indicate areas operating

efficiently/effectively or those having problems and requiring attention, may indicate need for organisational changes, and indicate information flow.

There are **five prime sources of CSFs**:

(1) the **industry**, or characteristics within the industry that distinguish it, factors which are of prime importance within it (e.g. in a for-profit sector these could be product mix, inventory, sales promotion, price - in the academic library these could be collection development policy (specific collecting areas), available documents from and outwith the collection, marketing of the collection and associated services, conditions of use, etc.).

(2) **Competitive strategy and industry position:** This is the organisation's place within the industry, dependent on its history, geographic location, industry niche, specialisation, competitive strategy, use of technology, innovation, domination by more powerful organisations in the industry, etc.

(3) **Environmental factors:** factors over which the organisation has very little control, e.g. politics, economy, legal requirements, population trends, etc.

(4) **Temporal factors:** something occurring only at a particular point in time, out of the norm.

(5) **Managerial position:** each functional managerial position has a set of generic factors associated with it (e.g. nearly all manufacturing managers are concerned with product quality, inventory and cash control, etc.)

CSFs can also fall into **two types**: (1) **internal versus external** (under a manager's control, or outside it); (2) **monitoring versus building/adapting** (near-term operational planners vs. future-oriented planners implementing major change programs).

Bullen & Rockart (1981) suggest two approaches to CSF analysis. First, an **analysis of individual manager's CSFs using the CSFs elicited on a multi-dimensional scale**, using the five sources as well as the two types above (Figure 13). This would show both the sources of the organisation's CSFs and its strategic stance, as well as the strategic stance of its individual managers. These elements are familiar components in strategic planning. The hierarchical influences on CSFs are downwards, with industry CSFs affecting corporate CSFs , affecting sub-organisation CSFs, affecting individual CSFs (Figure 14). Managers at sub-organisational levels will have an individual set of CSFs which depend more on their particular roles and on temporal factors, and less heavily upon industry and the environment . CSFs are in fact recommended by Bullen & Rockart (1981) as helpful in the strategic planning process, with industry CSFs affecting corporate strategy, and corporate and sub-organisation CSFs affecting shorter-term action plans. Relevant CSFs lead to better resource allocations to key programs and activities.

Figure 13. Major dimensions of CSFs (Bullen & Rockart 1981, opp. p. 18)
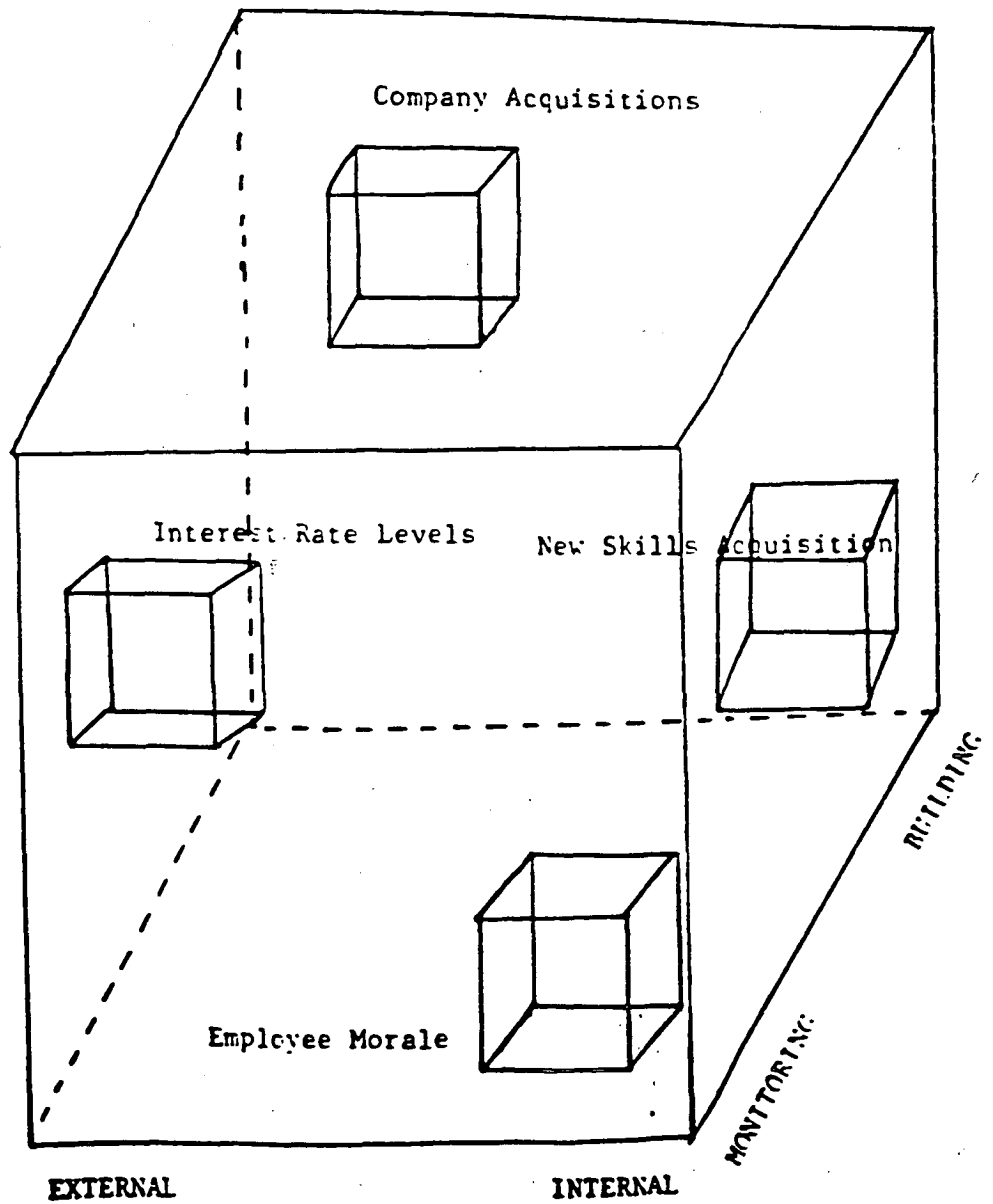
Figure 14. Hierarchy of corporate & individual CSF sources (Bullen & Rockart 1981, opp.p. 19).
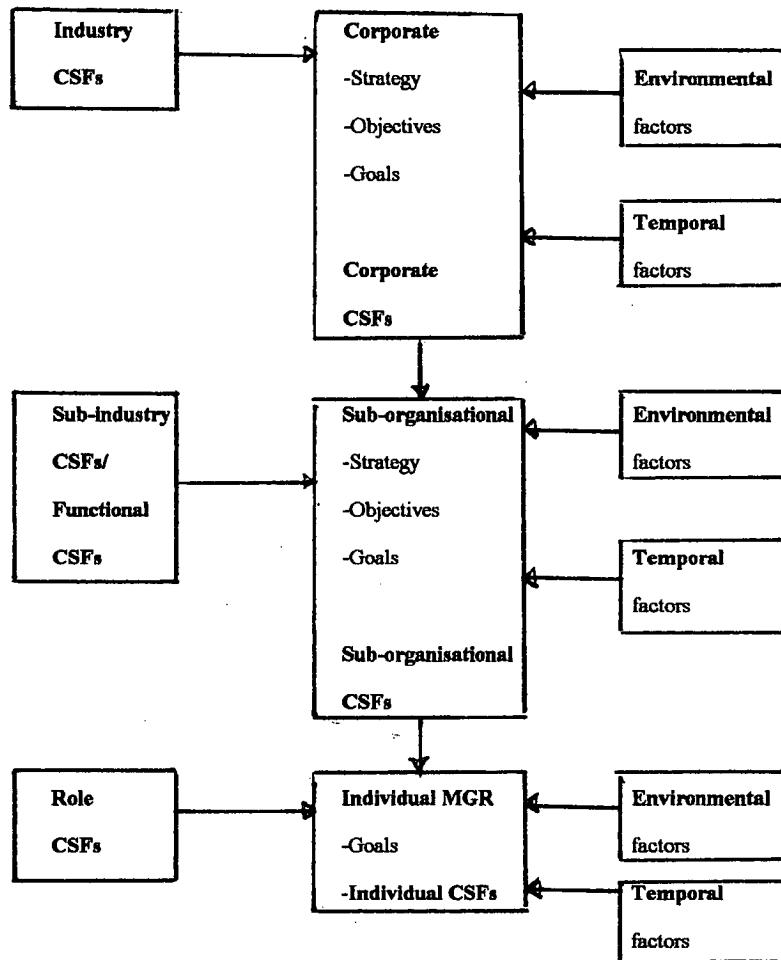
Figure 15. Matrix for corporate CSFs (Bullen & Rockart 1981, opp. p.39) :

Corporate executives	Human resources	Strategy	Efficiency of operation	Quality of service	Pricing strategy
Holding Company:					
Harris	1	2	3	4	5
Connors	5	1	2	-	-
Wolsky	2 [X]	3 [X]	1 [X]	-	4
Property & Casualty:					
Contreras	1	4	-	3	2
Pollack	3	1	-	2	-
Jordan	2	-	5	1	-
Holloway	5 [X]	-	1	2 [X]	-
Life:					
Wensley	3	1	2	-	4
Firenze	3	4	-	1	2
Washington	4	1	-	3	2
Rubenstein	-	1 [X]	-	-	2 [X]

[X] = Areas receiving greatest concentrations of individual managers' CSFs, therefore areas requiring access to management data, or priority data bases for MIS/DSS.

(3b) Corporate CSFs:

The second recommended analysis is an aggregation technique determined by an overlay of individual managers' CSFs, with multiple CSFs indicating corporate concern, and therefore the prime areas needing management information. These are verified with top management . This can be arrived at through a matrix of individual managers in sub-organisational units against tasks, decision areas, programs, etc. (Figure 15). "Priority should be given to the development of these data bases" (for management information) "since they represent the means to satisfy the information needs of the key people of the organisation" (Bullen & Rockart 1981, 39). Corporate, or relational, CSFs (as are provided through this overlay) are most helpful to top managers who require information spanning various subunits of the organisation, often combined with other, external data.

Group sessions: These were held as an additional step to the individual interviews, to guarantee both mutually agreed on corporate CSFs, and a holistic approach to evaluation and performance measures overall, if this stage was reached.

(4) and (5) Performance measures, reports, and links to databases:

The *Primer* indicates that these can be established where time permits, (often forming the basis for a second investigation), determining measures for each CSF and identifying the sources of the measures. Actionable and precise objectives help in determining performance measures. However, these steps "can wait until after the initial CSF exercise described in this primer has been completed. Then, when the desired information data bases have been decided upon, a more probing second-stage interview can be held. Here measures should be defined in great detail to zero in on the contents of the required information data bases" (Bullen & Rockart 1981, 60). It was hoped that initial indications of performance measures would be made at least.

CHAPTER 5

RESULTS OF CSF INTERVIEWS : AGGREGATION AND ANALYSIS OF RESULTS

(1) Pre-interview study of the organisation and its environment:

The **site library's parent organisation** had recently undergone a period of change, considering choices of amalgamation. Although relatively isolated geographically, it had close to it large, well-established library collections. The university's goals were to achieve a distinctive academic character based on the provision of a liberal and vocational education, with applied research contributions especially in teaching/pedagogical research. Staff, courses, and student numbers were to be rationalised and reduced through a more effective deployment of funds and proper costings, and cross faculty teaching. Quality community service was emphasised . A strategic planning approach was to be central to all activities and departments.

The **site library** was also undergoing change. A new university librarian had been appointed a few years before, and during the time of the study's CSF methodology application, a new (first) ILS was being implemented. Although subject specialisation staff was desirable, this was not currently economically possible, but to accommodate a strong user orientation, the organisational structure had recently been changed (Figures 16 and 17).

The library had already produced a number of **planning documents,** including a strategic plan for IT, papers on productivity and self-assessment, and library goals for the current year (executive, planning, and operational). In its self-assessment and evaluation of current status, - which included the results of a broad local user priority survey , interviews with library staff, reviews of major operations, and a comparative study with other libraries (using national aggregated academic library statistics) - it was found to have a reasonable collection size, but insufficient research depth and serial titles, high short-term user demand, good reader education, acceptable staff expenditure, low expenditure on interlibrary loans, low on-line searching, with co-operative arrangements in place (regionally, nationally, and within a strong tertiary network) at a good operational level. However, organisationally, it was found to have a current state of inertia, with a perception that staff potential was not being developed and was under-utilised, as were the services and collections, and operations were not integrated. Planning had begun ('modelled on a market plan'), and included a 'comprehensive facts base, identification of problems and opportunities, priorities, strategies, and costings of these.' (Again, the 'comprehensive' facts base was drawn from national aggregated statistics, rather than specifically collected internal ones.) External change agents were identified as award restructuring, equal opportunity and affirmative action legislation; internal change agents as 'services costing more than the library could afford'. (Costings were also done on broad budgetary totals, rather than an analysis of unit costs.) Weaknesses discovered were: departmentalised work flow priorities ; weak links between planning, evaluation, and budget;

costing of future plans was difficult in line-item budgeting; inter-unit communication was not effective enough; skills/competencies were too highly specialised; structure (old) emphasised supervision, rather than leadership; teamwork was not results oriented; there seemed to be a conflict of library service goals between academics and library staff (directed vs. self-directed learning).

From the library's planning documents, productivity, innovation, and **structure** were seen to be interrelated, and the change in structure (new) was an attempt to increase productivity and innovation (defined by them as 'creating purposeful, focused change', rather than 'excellence'), without extra costs, through a redeployment of staff in a flattened structure, with flexible teams and multiskilling. A **user orientation and integration of all operations to this end, with interdependence between units, was seen as the way to develop a client-centred service, and a productive work environment 'fostering individual growth and quality performance.'** Traditional library departments (Reader Services, Technical Services) were dismantled, and the two top senior staff redeployed to planning roles - i.e. planning for all services, systems, staffing. Middle management consisted of seven senior managers covering operational level planning in acquisitions, cataloguing, reference, systems, equipment, counter services, and training, with two of these also providing academic planning support ('to redefine the library's role and establish professional/client relationships'). This change was made to bring out **'new orientations to service and receptiveness to change'**, and **'leadership roles based on subject authority'** (though the nature of 'subject' was not clarified from the structure or documents - was it curricular subjects, or the subject areas of information science/librarianship?). Each of these areas had a manager and work supervisor, with back up for each. **The decision-making environment within the new structure was seen as:** Across boundary communication, planning, and teamwork was encouraged. Decision-making was to be made at these three levels, by all ten senior managers, in a 'participative' manner - 'policy decisions about broad goals, external relations and budget by senior management; planning decisions about new services, policies for existing services by senior management with academic planning support librarians; operational decisions by all three levels'. Therefore, the **university library saw itself in a milieu of uncertainty** which their planning and new structure could best deal with; reducing hierarchy; introducing innovative new services, while retaining concern for financial control and rationalisation, with attempts to increase its income-generation through entrepreneurial activities (taken from the productivity, innovation and structure document). It is of interest here to compare this to the appropriate methodology choice recommendations of Rockart, Gibson & Nolan, and Davis, together with my assumptions about academic libraries (see Chapter 3). Organisational factors came to light during the application of the CSF methodology which are discussed more fully in Chapter 6. These could well prove useful in future applications of the methodology.

Figure 16. Site library : old organisational structure

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SERVICE STRATEGY

POLICY FORMULATION AND PRIORITY SETTING WITH THE UNIVERSITY MANAGEMENT AND WITH CLIENTS

STRATEGIC PLANNING, PERFORMANCE EVALUATION AND FINANCIAL MANAGEMENT FOR SYSTEMS, SERVICES, STAFFING AND FACILITIES

COMMUNICATIONS, INTERNAL AND EXTERNAL

ACADEMIC PLANNING SUPPORT

- Policy Advice
- Financial Advice
- Marketing
- Collection Development

- Identifying Client Needs
- Developing Ideas for Services/Products
- Planning for Services/Products Development
- Trialling and Evaluating Services/Products and Policies
- Pricing, Placing and Promoting Services/Products

OPERATIONS MANAGEMENT

- Forecasting Demand
- Scheduling Priorities
- Co-ordinating Staff Deployment
- Co-ordinating Staff Development
- Giving Feedback on Policy, Strategy & Budget

OPERATIONS

ADMINISTRATION

Secretarial, W/P, Accounts, Budget, Personnel, Rostering, Building Security and Maintenance, Stores

DAY-TO-DAY PLANNING, SCHEDULING, STAFFING, TRAINING, COSTING, BUDGETING AND EVALUATION FOR EACH OPERATION

- Acquisitions Services Management
- Cataloguing Services Management
- Lending Services Management
- Information Services Management
- Information Technology Management
- Equipment Services Management

DOCUMENT SUPPLY SERVICES

- . Orders including Bibliographic Verification, Placement and Processing of Orders and Receipt of Materials.
- . Inter-library Loans Orders and Film Bookings.
  . Publication Sales.
  . "Packages" of Photocopied Articles.
- . Cataloguing.
  . Indexing.
- . Loans including General, Short, Lecture Tapes and Equipment.
  . First-line Equipment Maintenance including Photocopiers.
  . Room Bookings.
- . Collection Management including Weeding, Shelving, Searches for Missing Items, Binding and Collection Usage.

INFORMATION SERVICES

- . Staffing Information Desk.
- . Assisting Clients with All Collections.
- . Teaching Skills in Using Services and Facilities.
- . Online and CD Rom Searching.
- . Assisting with Marketing & Collection Development.

EQUIPMENT SERVICES

- . Maintenance and Servicing of Category A Class Rooms and Library Equipment including Photocopiers.
- . Selecting, Installing and Repairing Equipment.
- . Computer Support.
- . Equipment Training.
- . Lecture Recording.
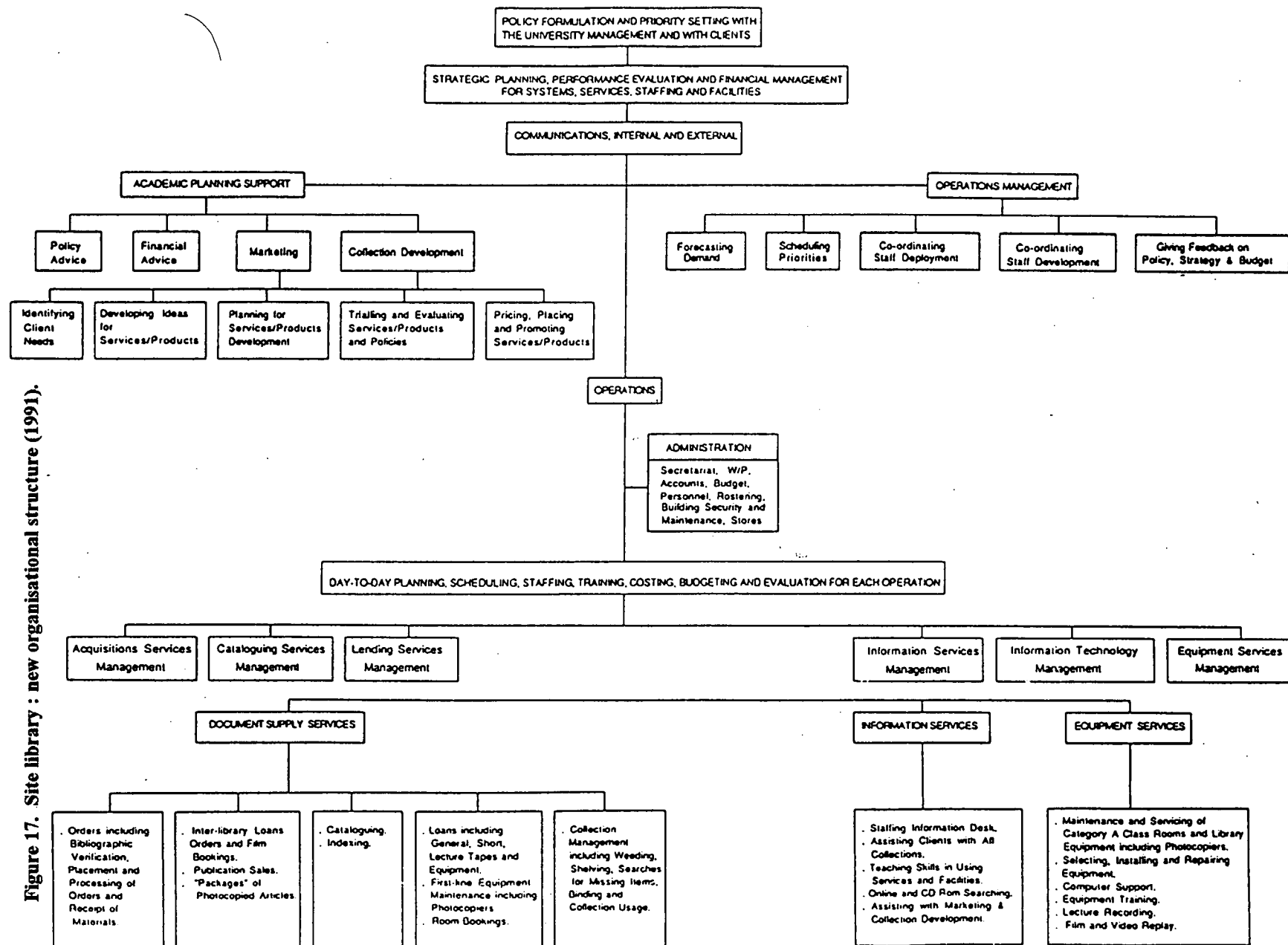- . Film and Video Replay.

Figure 17. Site library : new organisational structure (1991).

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Site library's mission and goals:

The library's mission states: ' The library's business is to identify, acquire, organise, and locate information relevant to the academic programme and of benefit to the development of staff and students.' This will be done through 'collection support planning assistance, availability support services, wider access to materials services, and skilled library and technical staff, including teaching of information skills and independent learning/problem-solving.'

The library's organisational goals (1991) were: - 'to deliver products in correct quantities, when required, at locations desired, in usable condition, at the lowest total cost; -to shape the information-gathering behaviour of clients, evaluate library/client communications, and to be responsive to their needs; - to provide collection development/planning support for new courses, evaluate and develop collections, encourage access to collections, and establish an academic policy for serials; - to develop a reference and research service to support the university's research profile; - to install the new ILS, and network within the campus to provide better access to it; - to widen access through networking, co-operation, and formal access agreements with other libraries; - establish resource allocation controls; - establish full cost-recovery for user-pays services.'

Goals were also established for different planning levels: *Executive group goals* (1991) were to: - identify strategic directions for library services; determine priorities for resource allocation; monitor performance vs. budget; provide a formal channel of communication between university librarian and associate librarians; foster a team approach to the management of the library. *Planning group goals* (1991) were: - 'to identify client needs and formulate goals and policies for responsive services within the framework established by the executive group for strategic, financial, human resources, collection, and physical environment management.' *Operational group goals* (1991) were: - 'to manage day-to-day operations of the library within the framework established by the executive group...'. Each operational division had also formulated their individual subunit goals (e.g. Reference and Research goals, Counter Services goals, etc.). The library saw its next stage of planning growth as the setting of performance goals, and this was one reason the CSF application was welcomed.

(2) Results of individual CSF interviews:

A. Manager, Training Services.
(i) Mission and role : To act as a resource, consultant, catalyst, for training overall for library staff and library users. To assist with the planning for and implementation of a training plan, which will be proactive and in accord with the library service goals, the skills audit, and the staff development policies. To evaluate training programmes, congruent with adult learning principles.
(ii) Goals : Long-term: (a) To analyse training needs, and maintain the training data base, in order

to develop a training plan for library staff, within library goals; (b) To develop, and cost, a training plan, providing initial, refresher, and advanced training, according to priorities established through consultation with library management and library staff, and the skills audit; (c) To train trainers, and assist with the design, implementation, and evaluation of their particular training programmes; (d) To assist with the assessment of user needs, and acknowledging user information-seeking behaviour to advise on the development, evaluation, and monitoring of reader education programmes.

Short-term: (a) initial library staff training in systems use; (b) publicity and training in the use of the system and OPAC (i.e. library staff and users); (c) evaluating currently-given reader education tutorials; (d) Information Desk training - tasks, skills, knowledge, responsibilities for ASOs / Research skills for librarians / Client service principles for all library staff. **Note:** "Goals are affected by reactivity, flexibility, adaptability, given the state of organisational change, and individual learning differences."

(iii) Critical Success Factors : Training must turn out -(a) library staff who are more effective on the job, -(b) library users who are more effective information seekers, consumers, producers. (c) Training programmes must be at an acceptable standard, properly prepared, properly run, relevant, and adequate (i.e. necessary and sufficient).Training must be timely, given in an appropriate medium, and pertinent to staff and library needs. (d) Library must have the resources available for effective training - sufficient staff to act as trainers, sufficient equipment, materials, time and money.

(iv) Possible measures: - well-designed evaluation for feedback; evaluation of a measurable increase in efficiency and effectiveness (both quantitative and qualitative, through interviews on group and one-to-one basis, etc.); information/statistics from the training database and skills audit (training must relate to these); data on users is necessary - hard measures are desirable, but difficult, and must be aimed for - start with sampling, perhaps pre-training and after training in reader education; working on what is an "acceptable standard" in training programmes.

B. Manager, Equipment Services :

(i) Mission and role: (a) To support lecturers' audio-visual (A/ V) needs in lecture rooms; (b) To maintain the video, A/ V facilities in the various sections on a cost-recovery basis;(c) To maintain the library equipment. (d) To provide the best service, including a constant review and upgrading of equipment, the identification of problems, the planning, costing, ordering equipment, and being aware of the compatibility and networking requirements within the campus and beyond it.

(ii) Goals : **Long-term:** (a) To continue a planned replacement of unsatisfactory equipment in lecture rooms, and in the library; (b) To encourage staff through staff development courses to provide a knowledgeable and customer-related service; through technical courses to update their skills; to provide on-the-job training for new tasks and technologies; (c) To upgrade and analyse work practices to ensure the safest and most efficient approach to tasks; (d) monitor new technology and cost savings; (e) plan the resiting of Equipment Services within the library building.

Short-term: (a) Complete extensions of one of the building's video and recording facilities; (b) Continue publicity of new materials and equipment; (c) Provide precise and accurate documentation,

and procedure manuals to ensure a competent and user-friendly service.

Note: Working environment is fairly predictable, and constraints, e.g. staff numbers, are acceptable.

(3) Critical Success Factors: (a) Error-free service within teaching areas (central control room for broadcasts, video production especially); (b) Efficient maintenance service, with spare back-up and faulty equipment/parts quickly replaced/repaired; (c) Maintain efficient networking of individual P.C.s to library's integrated system and external systems (E-mail, etc.); (d) Ensure staff numbers are adequate for demands.

(4) Measures: Central Control Room has data/statistics necessary (e.g. lectures recorded, number of video replays, maintenance done, etc., equipment loans on semester by semester comparison, orders, etc., equipment loans on semester basis, orders, spare parts, costs). Data can be recorded (job-card approach) and manipulated using Microsoft Works.

C. Manager, Information Technology Services:

(i) Mission and role : Principally a supportive role to senior management, in implementing their decisions in relation to broad technological planning, with emphasis on specialist advice on the evaluation of new technology and technological directions, and dealing with outside suppliers. Essentially a futures orientation.

(ii) Goals: Long-term: None within this position, contract limited. Fluid and volatile external environment. Position to be reviewed mid-1992.

Short-term: Implement the library system, with all modules in place, and staff trained to appropriate performance levels, as deemed by senior management.

(iii) Critical Success Factors : (a) Provide support in evaluating each library systems module implementation, checking all flaws, parameters, etc. A reiterative process until operational acceptability and acceptance of the system is in place; (b) Networking across campus; (c) Access to other libraries and information sources.

(iv) Possible measures : - Measure system-user satisfaction. Has it met all their job requirements? Does it create electronic dependency? Developmental measures from observations, degree of user self-reliance.

D. Manager, Document and Data Management (i.e. Acquisitions):

(i) Mission and role (a) Identifying, acquiring, and initial processing of library materials for clients to satisfy their needs. (These are received concretely, and in prioritised order, indicating to which collections they should belong). (b) Ensuring the utility and preservation of the collections (i.e. physical storage).

(ii) Goals : (a) To acquire and process by the most efficient means available all formats of material required to support the learning and research programs of the university within the constraints of the library's budget; (b) To communicate clearly to library clients the progress of all orders placed, and the impact of this commitment on the faculty's book vote; (c) To provide an in-house information service

and backup to library staff and clients in relation to the bibliographic organisation of library materials; (d) To provide a well-designed physical arrangement for clients to use the library's services and facilities; (e) To provide secure, adequate housing for all the library's collections, ensuring that they are fully accessible to clients; (f) To maintain and preserve library materials, ensuring the utility of library stock.

(iii) Critical Success Factors : (a) Keep academic staff advised of the progress of their orders, linked to their budget allocations; (b) Try to meet their time-frame of requirements; (c) Concern with the state of the collection: (1) availability and turnaround of stock- accuracy and timing of reshelving; (2) fast processing of current serials; (3) binding of loose serials quickly for efficient retrieval; (d) Informal SDI in relation to collection development; keep profiles of academic requirements with materials suppliers.

(iv) Possible measures : fortnightly financial reports against budget divisions for ordered items - look at patterns developing; unordered items file, with no financial allocation, must be tracked; binding statistics for serials availability; shelving timeliness from observation, feedback from supervisors; shelving accuracy from evaluation of training, and appropriate pattern of staffing - feedback from clients.

Note: Requirement that circulation module should be able to indicate number of returned items each day, for planning of reshelving rosters. Rely now on feedback from Counter Services staff.

Problems and ILS requirements: Current serials availability required as a measure from the ILS. Now assessed from backlog or build-up on entry shelves, or size of current display, or size of mail sort. Until the acquisitions module is in place, can't measure many things, unless something is raised as a problem (e.g. complaints), this is the only signal of something wrong. Serials claims are difficult, therefore don't accurately know what delay there is in receipt of current material, or the reliability of the supplier. Similar problem with efficiency of book suppliers meeting lecturers' time frames, and supplier reliability . Processing time between acquisitions and cataloguing not so important, because can always locate item if needed urgently, and make it available. Our cataloguing backlog is not great. In-house use is not measured yet, but could prove interesting.

E. Manager, Document and Data Management (i.e. Cataloguing)

(i) Mission and role : (a) To acquire and process by the most efficient means available the bibliographic data for all formats of material; (b) To organise the bibliographic data for effective retrieval by library clients and other library staff.

(ii) Goals: Long-term: (a) Ensure that OPAC clearly indicates the library's holdings, location, availability of all materials in library collections; (b) Where applicable, train staff from other areas in ABN and ILS enquiry, and inputting data for bibliographic and holdings maintenance; (c) Where applicable, train staff from other areas in cataloguing, classification, and authority control, using the latest standards.

Short-term: (a) With the acquisitions module in place, redesign work flows, procedures, and their documentation/ design training programs; (b) Design and implement an ergonomically safe and efficient

working environment; (c) Ensure retrospective conversion is completed and loaded onto the ILS.

(iii) Critical Success Factors : (a) No systems failure - internal and external; availability of local system, and national database; bug-free database loads (ILS supplier); bug-free computer programs, ensuring efficient input, and effective retrieval of data. (b) Adequate trained staff for bibliographic and holdings data management; (c) Accurate documentation : up-to-date library and network policy and procedural manuals. (d) Ergonomic work environment .

(iv) Possible measures: In relation to cataloguing backlog, "efficiency" assessed if user can find item at any stage, with availability within 24 hours; efficiency also assessed through feedback- If no request, item is not in high demand; Effectiveness in retrieval is achieved by providing as many access points as possible. Possibility of keywords providing the best access?

F. Academic Planning Support Librarian/ Manager, Reference and Research Services:

(i) Mission and role : To be aware (a) of all library services and their impact on library clients; (b) of the university's educational and research profile; (c) of the external information environments and their impacts on library services; (d) To encourage duty librarians to think critically about library services and the needs of the clients; (e) To alert all staff of new developments in Reference and Research Services; (f)To liaise with the Counter Services Manager to ensure that the ASO staff on the information desk are familiar with the tasks undertaken by the duty librarians; (g) To ensure accurate and up-to-date information guides and pathfinders are available; (h) To encourage a professional attitude among duty librarians; (i)To ensure that reader education programs are relevant to the client groups, and delivered according to established library guidelines; (j) To have input to the Operations and Planning Group.

(ii) Goals : (a) To fulfil an intermediary role between the library's clients, the library's services, and the external sources of information; (b) To foster and maintain well informed staff who have the knowledge of the library services and collections, and a professional awareness of the external information environment; (c)To provide a useful reference collection and range of data bases supporting the university's educational profile and research management plan; (d)To develop and maintain an efficient, client-centred, culturally-aware approach to service, with staff who have the confidence to provide a competent, critical, interpretive, accurate, and user-friendly service to support the learning and research programmes of the university; (e) To encourage all staff to provide ideas on improving the Reference and Research Services, the delivery of library services in general and to make the library's policies responsive to client needs.

(iii) Critical Success Factors :   (No priorities, all equally important.)

(a) Communication: Flat structure, dependent on input to and feedback from others; especially important in "one-off" situations, e.g. teamwork projects (i.e. situations other than traditionally functional ones.); (b) Professional attitudes for all staff, including duty librarians (e.g. awareness of developments in the world of librarianship, also punctuality, thinking beyond the problem, policies, impact on library as a whole of their actions, etc.) (c) Librarians as educators/intermediaries : (e.g.

using technology to exploit resources; how to get items once found, if outside the library, etc.); (d) Relevant library instruction : (Currently, a directional, orienteering introduction to library, then moving on to OPAC and CD-ROM sessions. Not given within any specific course, until this becomes university policy.); (e) Computer-literacy for staff : (Confident use of computers, and a future vision.) (f) Relevant library collections :

(Note: after the group discussions, the following were added:) (g) Ergonomic environment for staff and users: (h) User needs met; (i) Extent of physical use of other libraries.

(iv) Possible measures: - In-house random sample of reference questions, looking at where they came from, not answers; evaluation of on-line searches, through an evaluation form, and an analysis of users re-using the service; evaluation of reader education - evaluation form to both students and teachers; creation of a collegial atmosphere and creative criticism, through teamwork and rapport; need statistics to indicate how OPAC is used, e.g. by title, keyword, etc.; need loans data manipulation, e.g. borrower, by course, etc.; measure of CD-ROM use - heavily used, hard to measure; relevance of reference collection, need surveys, reshelving counts, and user surveys verbally.

Comments: Need to be aware of statistics available from the library system modules, once all are in place. Professional development - some time is available in workplace for some reading, but much has to be done in one's own time.

G. Academic Planning Support Librarian/ Manager Counter Services:

(i) Mission and role : Manage the dissemination of information, through my role as an academic support person in collection development and academic liaison; through ensuring book availability through the various collections, formats, coverage, loan systems; through facilitation and assistance to users via correct policies, use of technology, and material formats; through ensuring the architectural layout and other architectural planning factors encourages the best use of the collections.

(ii) Goals: 1. To assist clients with locating materials in the library's catalogue and collections and with using services and equipment. 2. To foster and maintain well informed staff who have the knowledge of the library services, collections and policies and the confidence to provide a competent, accurate, and user-friendly service. 3. To establish and maintain a range of lending services, that fully supports the learning and research programmes of the university and that promotes and encourages optimal library use by all library clients. 4. Consistent with the integrity of university property, to lend library materials of all types and formats to all qualified users under equitable policies that do not jeopardise the availability of material to others. 5. To develop and maintain an efficient, client-centred, culturally aware approach to service among Counter Services staff. 6. To have clients well-informed about the library's policies and services and able to provide feedback to Counter Services staff on these. 7. To encourage staff to provide ideas on improving Counter Services and the delivery of library services in general.

(iii) Critical Success Factors: (a) Are the students able to access current information, as defined by their lecturers, in time for their assessment (from the library collections or elsewhere) ? (b) Are clients

getting the right answers from the information/reference desk ? (c) From the architectural planning and collection development viewpoints, do we have the most efficient distribution of resources for (1) the students to find and make use of? (2) the library staff to find and process?

(iv) Possible measures : - Survey of users: How are library staff occupied? What are the peaks and troughs? What is the affect of automation on rostering, duties, book availability? Who wants what coverage? (number of students/course) : How to store/package non-book materials? How to assess the correct number of library staff, correct number of library forms? How do we serve graphics-based users with non-borrowable serials? How can we have debarred borrowers without fines, and avoid cost in staff time to produce lists ? How to deal with the problem of materials availability in relation to teaching methods, material formats? How does one differentiate reference queries into different categories? What are the real costs of binding, claiming, etc. of traditional journal formats against microform? (Problems with academics use preference.)

H. Associate Librarian (II) :

(i) Mission and role : Contribute to the management of the library, through strategic planning : i.e., fitting the library's IT use for information delivery within the IT plan for the university as a whole; evaluation of services; systems implementation as campus wide service for teaching and research; management of operations - technical processing/ systems/ rostering/ human/ financial/ physical resources. Provide leadership and guidance to library and university staff. Perform as a team member in planning innovative services. Represent the Library and the Librarian within the university and in interaction with other institutions and suppliers.

(ii)Goals:- discuss application of Monash indicators with staff; respond to ABN on draft functional specs. ; issues paper on use of ABN; issues paper on staffing options for IT support within library and across campus; revise and obtain feedback on microcomputer policy; discussions on acquisitions module implementation; discuss Document and Data Management restructuring and impact on work flow of automation; write specs. for loans policies implementation, and seek advice from ILS supplier; liaise with Administration on corporate data management across the university; organise specialist training for staff working with specific modules; organise new ID card system and software installation.

(iii) Critical Success Factors: (a) Concern with the effectiveness of the library - to library system users on campus, including library staff, in its (OPAC) link to other libraries, especially currently in the state and region through our tertiary network. (This involves ironing out remaining implementation and use problems, e.g. sanctions, and following our tertiary network's time-frame for 1991. Affected by external developments and directions for change from within the university, and in co-operative arrangements.) (b) Sufficiently developed systems skills of library staff - to maximise staff benefits from the system; devise a way they can test the system to see that it is performing as well as it should. (c) Evaluation of the impact of the library's strategic plan for IT.

(iv) Possible measures: - ask users how they find the ILS ; need for OPAC use study; need for assessment of loans system from view of both user and library staff, test overall quality of working life

improvements after acquisitions module implementation, including work flows; test improvements to performance, and improved financial control in acquisitions area; test improvement to user of availability information (e.g. orders status); evaluate effectiveness of ABN strategy.

L Associate Librarian (I):

(i) Mission and role : Support the library in whatever is required to provide a service to the client . Ensure the library is organised in such a way as to provide the best service possible, given the resources available, and that we have already identified client needs. (Most of this manager's time is involved in planning for the library's direction overall, c. 90%. Significant portion spent in communication-marketing, documentation, dissemination of information to academic staff and to library staff , 10%. The support role is more upwards than down.)

(ii) Goals : Long-term: (a) Develop more effective communication, to reduce staff time in meetings (50 %). (b) Ensure overview of day-to-day operations is more effective.

Short-term: These are identified by others, therefore can't prioritize, or predict what will come from each area, e.g. Operations Group, Planning Group, Executive Group meetings.

Examples of recent projects: - Services to postgraduates, arising from the University Postgraduate Committee meeting. Led to report on what other Australian libraries do, and costing for these services : Interlibrary loan policy to incorporate new situations of interlibrary loans for students : Weeding policy.

(iii) Critical Success Factors: None, due to the varying nature of the projects, and their directional origin.

(iv) Possible measures: (a) Integrated data across all areas would suit ad hoc requirements of overall planning, including external data. Would it be cost-effective? Multiskilling adds to ad hoc nature of problems to solve, and whose data requirements are hard to predict. (b) Client needs - Repeat the user priority study, but on a wider and more controlled basis. Data from the system is desirable, but not yet available. (c) Weeding policy - Reliable circulation statistics, preferably archival, would help in an accurate weeding policy, and help resolve the problems of multiple copies. (d) Interlibrary Loan Policy - Effect of new policy not predictable (students, external borrowers), or its influence on academic book votes. Sources of interlibrary loans are necessary as data, within closer disciplinary divisions (e.g. 2,000 from 'Applied Science", but no further subdivided detail). (e) Collection development - Where responsibility has devolved to the faculty, it results in a problem of balance. This Library is not following Conspectus, and gaps are identified by observation by the Academic Support Librarians, and covered by discretionary funds, also through student comment, staff comment, and use of the university profile. More interested in how many books each lecturer has ordered for each course, some get by with one textbook, (e.g. macroeconomics).

J. University Librarian:

(i) Mission and role: - To manage an effective, efficient, productive library service, responsive to and shaping client behaviour; Demonstrate within the university that I can perform well as a manager, not just within the library, but within the university as a whole, when participating in university projects and on university committees.

(ii) Goals: (a) To integrate all operations and services so as to provide (b) client-oriented services, and (c) an environment for quality performance by library staff.

Time-frame: (a) done; (b) doing; (c) started . Both (b) and (c) should be completed over the next three years.

(iii) Critical Success Factors : (a) Responsiveness of client services: Philosophy of academic planning support should extend to all library staff. Going well, work being integrated and library staff responding; knowledge of product, and interpersonal skills being developed. (b) Quality working environment: Training an integral part of every operation, linked to the staff development program.

(iv) Possible measures: Client satisfaction: that clients are getting what they want, in the form, time, place and quantity required; don't have data on above, rely on complaints and 'thank you's'. Can we assess how many times a lecturer tells students how good the library is? User patterns: no loans statistics yet to indicate user patterns, or sources of loans to indicate target groups; no data on which other libraries students are using (often directed there by their lecturers). Productivity: need data showing library impact on academic progress of academic staff, postgraduates, and undergraduates.

(3) AGGREGATION AND ANALYSIS OF INDIVIDUAL CSF RESULTS:

Organisational analysis using the *Primer's* five primary sources for CSFs:

All ten interviewees were aware of **industry factors**, especially in the area of networking and information technology, even at the operational level. The site library's current **competitive strategy** and **industry position** is to undertake all activities and services with the clients' benefit foremost. Therefore the current aim is to make the best use of recent IT at the earliest opportunity, to provide the best access and availability of required materials from network connections and co-operative arrangements. Clients are encouraged to make use of IT as understanding endusers. An attempt to understand their information gathering patterns, both within the site library, and outside it, is of importance.

Environmental factors and opportunities: The library sees itself geographically within the wider state, rather than within its very localised region, and this is achieved through its information technology and networking links.

Constraints and opportunities are as above , with constraints caused by industrial legislative requirements. with opportunities developed through restructuring the library organisation, multiskilling and staff development.

Temporal factors: as above, these are with human resources and systems.

Internal, monitoring factors were of concern to the operational managers, while **external, building-adapting factors** were more emphasised by the top three managers. The systems manager had the highest building factor emphasis, which is not surprising, even going to the extent of saying that librarians would be obsolete in the very near future.

Attitude to data: All managers stated there was an insufficient information/data base on which to make decisions for planning, costing, or forecasting. Operational managers wanted archival data, (reflecting Willers' (1989) findings), while integrated and external data was wanted by the top managers. Potential for management information from the new ILS was unknown, (again indicating the lack of management information specification in RFPs), but expectations were high, while there was some concern for costs of collecting vast amounts of data. Identifying their own selective data/information requirements seemed a new notion. These findings confirm some of the reasons for lack of MIS/DSS design and use. Library managers must realise MIS/DSS design (starting with the identification of specific and selective information) and use rests with them.

Strategic stance: All ten interviewees had a close match between CSFs and goals, and all were working towards the main corporate goal of client service. Integration of operations to this end was agreed as necessary. The planning process was being followed, but there was not always a clear distinction between mission, role, objectives and goals, nor a strict completion of each of the strategic planning phases in a complete and sequential way (see again Figure 1). Strategies to achieve goals were not really evident, and most goals were abstract rather than actionable and precise. Objectives (derived from goals) "must be stated in such a manner that the degree of attainment may be measured", and as usually given "is too abstract for inclusion in an information system. Objectives must be reduced to simple Boolean relations by statements of prognostications and statements of policy" (Hodge 1984,115).

(3a) Overlap analysis of individual CSFs: Constructing the matrix:

The *Primer* suggests an overlap analysis by constructing a matrix, with the two axes representing (a) individual managers' CSFs, against (b) dimensions incorporating tasks, decision areas, programs, etc. Choosing headings for dimension (b) seemed at first a problem, allowing the plotting of the CSFs without scewing the results (i.e. making the individual CSFs fit into a dimension that was either more or less inclusive, or where, as was common, the CSF fitted into more than one dimension). This problem did not present itself to Broadbent & Lofgren (1991).

The *Primer's* approach (Figure 15) gave a lead, but was not altogether adequate for an academic library. Initially, the decision tasks of an academic library as tabled by Bommer & Chorba (1982, 26-27) were tried, but these were too tied to departmentalised structures, and did not allow for planning decisions, especially strategic ones. Finally, adapting Brown's sources of planning data (1981, 191 et seq.) (Figure 18), the dimensions became:

Figure 18. Sources of planning data for CSF matrix I (adapted from Brown 1981) :

Information serves four functions in answering planning questions:

(1) reduces ambiguity/ provides an empirical base for decision making;

(2) provides intelligence about the environment (environmental niche/ opportunities);

(3) assesses historical, current, and future states;

(4) evaluates processes and monitors progress.

Cost can best be aligned initially against rudimentary relationships and the most significant variables.

The four information areas necessary for planning purposes are:

(1) **Environment:** including environment of the parent organisation, economy (resource costs, local labour market), political climate, technical innovation, philosophy, law, social attitudes, parallel or competitive services, competitors, clientele and market (non-immediate clients), funding outlook, co-operative arrangements, strategic alliances or alignments. Environmental impact depends on mission, e.g. intellectual development, cultural preservation, aesthetic awareness, economic contribution, social activism, etc.

(2) **Target group/market (immediate clients):** market profile, density, distribution, transportation, age, sex, language, FTE's, P/Ts, degrees conferred, staff profiles, etc. Barriers to use may include: information needs, information-seeking behaviour, library image, competing information sources (including IT), collection weaknesses, service deficits, external changes impacting on demand, etc.

(3) **Resources:** availability (capacity to match goals consistent with opportunities), extent of information resources; budget, financial liability and capacity, financial assets; space/facilities/equipment and future requirements, space limitations, conditions, use and type of use, allocation, growth; personnel - number, status, skills, experience, education, tenure, duties, work documentation, communication.

(4) **Programs:** e.g. Technical Services, Reader Services, Administration, etc.

(5) **Outcomes:** Resources used (income, personnel, facilities): Activities generated (numbers, transactions, duration, lag time, activity rate, person time, labour cost): Usage -type, level, time, recurrence: Demand, visible and potential: Policy effectiveness, operations effectiveness/ user satisfaction, productivity, accuracy, timeliness, resource acquisition vs. allocation, budgetary control, work environment and morale, staff competence.

(6) **Measures must relate to policies:** e.g. if policy is to reduce user frustration, measures must assess: -reduced time from acquisition to shelving (including cataloguing), -improved goodwill of user towards library personnel, - reduced waiting lists for popular items, - improved user success at catalogues (OPACs), shelf, IT use, etc., -improved library success in acquiring or accessing/acquiring copies of of demanded material, -increased recurrence of use.

(1)Environment (including IT), (2) Target group/ Market (i.e. immediate clients), (3) Resources (Personnel), (4) Resources (Product), (5) Resources (Physical). Thus the **Aggregation of individual CSFs: Matrix I** (Figure 19) plotted the individual manager's CSFs (managers A - J) against the dimensions (1) - (5), . These headings better reflected the elements in the site library's group goals for 1991, as well as the individual CSFs.

In order to use the CSFs productively during second individual interviews, and **as an aid in arriving at performance measures against actionable objectives**, the individual CSFs were translated into actionable phrases, using verb plus object, noting that the choice of verb is an indication of the strategic progress of a CSF (the use of 'initiate an assessment of ...', 'continue to assess ...', etc.). These are listed below, together with codes indicating manager and planning dimension (e.g. J/2 = the university librarian's first CSF relating to target/market). These follow the prioritised order indicated by each interviewee, with the exception of F (for whom all CSFs had equal value), and for I (who had no CSFs):

J/2: Continue to assess the responsiveness of client services.

J/3: Continue to assess the quality of the working environment and development of staff.

I/- - -

H/1: Assess the effectiveness of the library, especially in its use of technology, and IT links, internally and externally.

H/3: Develop and assess the systems skills of library staff to maximise the benefits of IT.

H/1: Evaluate the impact of the library's strategic plan for IT.

G/2: Assess the timeliness of provision of required student materials.

G/2: Identify and ensure the 'rightness' of answers provided by the information/reference services.

G/4: Continue to assess the most effective distribution and format of library resources, for clients and for library staff in carrying out client services.

F/3: Improve communication across functional boundaries, especially in teamwork projects.

F/3: Develop and encourage professional attitudes in library staff.

F/3: Encourage and evaluate library staff skills as educators/intermediaries in the use of IT to exploit access to information resources.

F/3: Develop and assess computer literacy skills of library staff.

F/4: Assess the relevance of reference collections.

F/2: Implement relevant library instruction, targeted to client course and research needs.

F/5: Ensure an ergonomic work environment.

F/2: Meet user needs in reference/information requirements.

F/2: Assess the extent of use of other libraries by our immediate clients.

E/1: Ensure no systems failure (locally and nationally).

E/3: Ensure adequate and trained library staff with data management skills.

E/3: Ensure accurate work documentation.

E/5: Ensure an ergonomic work environment.

D/2: Advise academics of progress of their orders. linked to budget.

D/2: Meet the time frames of academic requirements for library materials.

D/4: Ensure timely availability of the collection (through correct reshelving programs, serials availability, binding programs.)

D/2: Inform academics of materials published in their field of interest.

C/1: Evaluate and ensure successful implementation of each ILS module.

C/1: Facilitate and ensure library and campus IT networking.

C/1: Ensure access to other libraries and information sources through IT networking.

B/2: Ensure error-free service to clients in teaching areas.

B/5: Continue efficient maintenance service of equipment.

B/1: Maintain efficient IT networking, internally and externally.

B/3: Ensure staff are adequate and trained in IT equipment servicing skills.

A/3: Ensure training programs result in effective library staff.

A/2: Ensure training results in users effective as information seekers/consumers/producers.

A/3: Ensure professionalism of training programs.

A/3: Ensure adequate resources (time, money, staff) are available for training programs.

TOTALS: (Reproduced graphically in Figure 19A.)

(1)Environment (including IT) = 7;

(2)Target group/market (immediate clients) = 11;

(3)Resources (Personnel) = 12 ;

(4) Resources (Product) = 3 ;

(5)Resources (Physical) = 3.

CSF focus arising from the overlap analysis:

In a complex organisation, it is difficult to categorise a particular CSF as only applying to one dimension, when in fact in many cases it would apply to more than one dimension, or would by inference also include an end purpose of leading to client satisfaction, e.g. timely availability of the collection, or relevance of the reference collection could be totalled as product or target market (satisfying the client). It is of interest to compare these results with those of Borbely (1981), and of Broadbent & Lofgren (1991).

Keeping in mind that these results may well change if the CSF method was applied in the following year, **focus for the site library in 1991** certainly was on the **overriding corporate goal of meeting client needs.** However, a greater focus (albeit tied in part at least to client needs) is placed on **staff skills and professionalism, especially in relation to IT,** and not necessarily just on the internal ILS implementation (a temporal CSF source), but on external IT alignments and use, even more so than co-operative or reciprocal arrangements (although for this site library many of these CSFs may have been influenced by their existence within a tertiary IT network). Again, totals in both (1) and (3) would have been slightly boosted by the presence of two interviewees having specialist roles (a trainer, and an information systems specialist). Interestingly, **little emphasis is placed directly on the product.** (Is this a reflection of the site library's attitude to RLG Conspectus (see Is comments), or to a shift of interest to IT and external sources of information? Would there be a change of emphasis if performance measures were in place?). These results - (with the exception of G/4: concern with the most effective physical format and distribution of the collection, G/2 , D/2, D/4: timeliness of provision/availability ... , and F/4: relevance of reference collections) - do not altogether support the site library's pre-study findings (see p. 46-47) in the area of collections, which were found to have insufficient research depth (how was this measured? certainly RLG Prospectus or similar was not used) and were under-utilised (based on aggregate comparisons?)

In the 'face-to-face' area of **reference/research services,** the focus is on library staff skills and professionalism. **Counter services** is currently more interested in the client than the product, with product emphasis only in as much as its location and format suits the client, and staff ability to provide reliable and accurate information services. **Cataloguing** reflects very generic concerns, with emphasis on accessing standardised bibliographic data and fault-free on-line access to this data, with the ergonomic issue a temporal one. Usefulness to clients of such data is not a prime concern, though awareness of OPAC checks for this exist. There is a welcome focus in **acquisitions** on the client, (reflecting a closer involvement with the client, or a more direct accountability for provision of the product to meet client needs?). A, B, and C's foci would seem the obvious results of their specific purposes. It may be that the Resources (Personnel) area may need more attention to ensure the focus on systems skills is directed to the satisfaction of the client, understanding specific client needs and evaluation of these, though it would seem the clients' interests are certainly involved in this current focus.

Second individual interviews/ preparation for group sessions: Results:

Matrix I was drawn up prior to the second round of individual interviews, based on clarified and agreed on individual CSFs, and presented to each interviewee during second individual interviews for discussion, and in preparation for the group sessions. The facilitating documents were reviewed for the various approaches to performance measures they contained. It was planned to interview managers in the same order (bottom up). However, because of internal roster and meetings commitments on the

day, the order of interviewing was partly changed, with senior managers interspersed with middle managers, which actually had an interesting influence on the discussions, and an unexpected extension to the CSF methodology. The dimensions were discussed, and the problems with choice of dimension heading and plotting pointed out. These were understood, but, overall, interviewees were quite satisfied with the choice presented, and with their location of CSFs on the resulting matrix. It was also seen that any attempt to plot individual CSFs that might cover supplementary dimensions in secondary slots would cause the matrix to lose clarity, and not reflect the true direction of their CSFs, therefore it was agreed, by all but two interviewees, to leave the matrix the way it was.

Therefore, from this first CSF matrix, **areas of importance to individual managers and needing attention (and hence initial performance measures and required data/information for a MIS/DSS)** would be as follows:

(1) Environment (including IT):

- Assess the effectiveness of the library, especially in the use of technology and IT links, internally and externally;
- Evaluate the impact of the library's strategic plan for IT;
- Ensure there are no systems failures (for bibliographic data collection), locally and nationally;
- Evaluate and ensure successful implementation of each ILS module;
- Facilitate and ensure library and campus IT networking;
- Ensure access to other libraries and information sources through IT networking;
- Maintain efficient networking (of A/V equipment with other IT equipment) internally and externally;

(2) Target group/market (immediate clients):

- Continue to assess the responsiveness of client services;
- Assess the timeliness of provision of required student materials;
- Identify and ensure the 'rightness' of answers provided by information/reference services;
- Implement relevant library instruction, targeted to client needs (at all levels);
- Meet user needs in reference/information requirements;
- Assess the extent of use of other libraries by our immediate clients;
- Advise academics of the progress of their orders, linked to budget;
- Meet the time frames of academics requirements for library materials;
- Inform academics of materials published in their field of interest;
- Ensure error-free (A/V) service to clients in teaching areas;
- Ensure training results in users effective as information seeker/consumers/producers.

(3) Resources (Personnel):

- Continue to assess the quality of the working environment and development of staff;

- Develop and assess the systems skills of library staff to maximise the benefits of IT;

- Improve communication across functional boundaries, especially in teamwork projects;

- Develop and encourage professional attitudes in library staff;

- Encourage and evaluate library staff skills as educators/intermediaries in the use of IT to exploit access to information sources;

- Develop and assess computer literacy skills of library staff;

- Ensure adequate and trained library staff with (bibliographic) data management skills;

- Ensure accurate work documentation;

- Ensure (A/V) staff are adequate and trained in IT equipment servicing skills;

- Ensure training programs result in effective library staff;

-Ensure the professionalism of training programs;

- Ensure adequate resources (time, money, staff) are available for training programs.

(4) Resource (Product):
- Continue to assess the most effective distribution and format of library resources for clients, and for library staff in carrying out client services;
- Assess the relevance of reference collections;
-Ensure the timely availability of the collection (through correct reshelving programs, serials availability, binding programs).

(5) Resource (Physical):
- Ensure an ergonomic work environment;
- Continue efficient maintenance service of equipment.

(Obviously, a number of these overlap, or essentially are the same. This could provide beneficial actions across functional boundaries to resolve problems or monitor progress, if this is not already in place.)

The altered interview pattern showed two senior staff were unhappy with Matrix I. This could indicate that a top-down approach or even a mixed approach as recommended in the literature (see Chapter 3 and 4) may be beneficial, and that varying approaches to interview order may influence CSF results. The university librarian, looking at the matrix, requested that the dimension headings should be altered to better reflect the "essence" of the CSFs, "What is it we are really trying to measure?", "What actions are needed?" and "How do we know that what appears on the matrix really reflects what the corporate goals are trying to achieve?" This meant extending the matrix, and reassessing the listed CSFs, which could well affect the completion of steps (4) and (5) from the *Primer*, due to the time limitations on the study. It was agreed to try to extend the matrix, or approach the analysis from a different direction, as the results could have been interesting from the research viewpoint, and enable the site library's senior management to achieve what seemed to be desired. The 'quality' terms chosen (although abstract)

should provide a directional approach to their evolving strategies and performance measures, and fitted in to currently emerging total quality approaches for service organisations (though these were not mentioned by any staff during the study). On the recommendation of the university librarian, therefore, the **terms tried as substitute dimensions were**:

- quality staff,
- satisfied clients,
- quality information interpretation and instruction,
- quality information provision (product),
- quality information identification, etc.

Discussions with remaining interviewees on this change produced (a) a concern that their individual CSFs would be lost within corporate ones,- "From whose viewpoint will the final matrix be drawn up?" and (b) concern that what they understood as the CSF procedure was losing clarity.

(3b) Group discussions, 1st session: Results:

The first CSF matrix was put aside for the moment, and a white board was used as an aid to brainstorming in order to achieve a clarification of the new approach. There was much heated discussion, removals, additions, clarifications, arguments on definition of terms (to make sure these were understood and agreed on). The analyst/researcher tried to make sure everyone present had equal input to the process. The individual CSFs were grouped under each of the 'quality' phrases above, with ownership identification of each CSF for ease of tracking, and to reassure participants that none was lost. At the end of a very tiring first session the individual CSFs were reduced to 'essences' and listed under the 'quality' phrases. The **final list of corporate CSF results appeared as Figure 20.**

Thus, there was no lack of ideas generated, but an agreement on a workable connection from these results to actions to be taken, performance measures, and required data was still wanting. An evaluation and synthesis phase was needed, together with a facilitating approach ('straw man') to help the group structure their ideas into organised sets and reduce the complexity of the corporate lists for ensuing action to take place. A form of consensus mapping was seen as possibly helpful, where the presentation of a schematic map to structure the decision problem might aid in allowing a creative solution. Hence, the **Corporate CSFs : Matrix II** (Figure 21) was drawn up, clustering the results of the first group session into common sets, and allowing planning for prioritised actions to be taken, ownership responsibilities for actions, and sources for selective data needed. Individual managers could refer back to their original CSFs and apply them within the second matrix, while at the same time being aware of corporate needs and interrelating variables. Rockart & Crescnezi (1984,12) indicate that this **focusing stage for a group is one of the most difficult and significant steps in the CSF process.**

Group discussions, 2nd session: Results:

The **Corporate CSFs: Matrix II** was presented for discussion at the second group session, and results consolidated to the group's satisfaction. This then paved the way for the future choice of relevant performance measures, and hence links to required data from the ILS and externally, which unfortunately, because of inexperience with the CSF process for academic libraries, and the unexpected extension to the group sessions, could not be achieved in the limited time available in this study (see Chapter 6 for discussion of these results). However the matrix as a resultant integrated planning tool could help direct the choice of relevant measures. Areas requiring attention in terms of data collection, and measuring/monitoring were ticked, those not of prime importance at that time were crossed. The university librarian was happy with this result, and all interviewees agreed this matrix would be used to derive performance measures relevant to their individual CSFs, individual mission, objectives and goals - while at the same time linked to corporate CSFs. The matrix was to be used in future approaches to the planning, delivery, and evaluation of library services. Some examples of how the matrix could be used in locating (and examining intercausal effect of) prime measures are given by the researcher at the end of this chapter. However, because the setting of performance measures is embedded in policy formation and the strategic planning process, it would be out of place to go further with this here, as each organization and individual manager must devise measures most appropriate to them. (See also discussions in Chapter 7.)

The **structured CSF process itself and the resulting matrices** should allow a more focused approach to the choice and use of selective, relevant management information, within a strategic planning framework. **Both matrices are equally important.** (See also organisational elements discussed in Chapter 7 which may impinge on the CSF process in academic libraries, especially in relation to individual vs corporate approaches.) **Matrix I** pinpoints areas of strategic significance to individual managers, and concentrations of their CSFs (e.g. firstly on personnel, secondly on the target market/clients) indicate areas needing action and monitoring through management information. Performance measures and data links must be made for both matrices, i.e. those relevant to individual managers and those relevant corporately, with data and measures collected and analysed often being reused according to the report formats from lower to higher management levels. As an actionable planning framework, **Matrix II** can allow a holistic approach , both for individual managers in relating their prioritised actions with other managers and the organisation overall, and especially for decision-making at a more strategic level, especially in checking that corporate CSF, correctly derived from environmental scanning, ensure a match with individual CSFs. Both matrices should help prioritise data collection initially. Data links, measures, and reports will have to be designed from these prioritised actions, and this will form the first MIS/DSS. Because of the complex nature of libraries as organisations, prototyping the initial MSS/DSS on a smaller scale (e.g. meeting immediate client needs with primary products) may be the most rewarding way of setting up the MIS/DSS initially, with future

extensions when experience and ease of use is achieved. Ease and success of the CSF application, as with the strategic planning process, improves with repetition.

Matrix II, once the above has been achieved (i.e. prioritised actions, performance measures, and data links), can be used as a planning tool and link to the MIS/DSS, allowing a view of possible boundary spanning roles and activities, and interrelated planning problems and possible solutions, perhaps locating intercausal factors, where performance in one area affects achievement of goals and performance in another, giving a richer interpretation of service quality or service problems, as well as being a source of information for trends and forecasting.

Theoretical examples of prime measures using Matrix II as a planning guide:

Using **3A** (Service responsiveness to changing needs in the area of Interlibrary loans (ILL)) *against* **5A** (Appropriate resources / collections, collection use or non-use patterns, in relation to ILLs):

Given the current **ILL policy or goal** is, e.g., to "meet all reasonable research requests, at (a) 'X' cost to the library, and (b) 'Y' cost to the user", a **data base on ILL activity** (using a correctly designed ILL request form and transferring data to ILS) would match:

-The ILL user ID (status / undergraduate, postgraduate,academic, etc.; course /department/ faculty) = external data from university administration;

- Product requests made, say over one year (i.e. total number of ILL requests) broken down by subject area, format, date of publication = ILL form;

- Time frame of user need in relation to user purpose = ILL form;

-Time taken to obtain ILL, and its source = ILL form;

- Itemised costs (including all hidden costs) to (a) library, (b) user = ILL form;

- Successful/ unsuccessful location of item requested = ILL form;

- Availability, if successful, within time frame requested by user?

- Availability within cost agreed to by both (a) and (b)?

Data in the ILLs data base would be matched against a **collections data base,**and the relevant section of the Collections Development Policy, (e.g. "to hold 80% of all materials for research needs, as delineated by the university profile") (= external data from university research office). ILL requests would be matched against held collections in subject areas and/or format (from ILS bibliographic data base, using subject headings and/or classification number or class range, and date of publication within these same class ranges or numbers). Data, having been linked with relevant items in the **ILSs' system file specifications**, can be used to design monotoring **reports**.

Does the match indicate the policy goals are being met? If not, which class ranges are indicated as not being strong enough in the collection? Do either of the policies or goals need revision? Do users' time frames fall outside exiting policies?

Figure 19: Aggregation of individual CSFs : Matrix I

		CSF DIMENSIONS				
		Environment/IT	Target group/ clients	Resources (Personnel)	Resources (Product)	Resources (Physical)
Executive/ Planning Group						
	H	2	-	1	-	-
	I					
	J	-	1	1	-	-
Customer Services						
(Ref.)	F	-	3	4	1	1
(Counter)	G					
Biblio- graphic Services						
(Acqns.)	D	-	3	-	1	-
(Cat.)	E	1	-	2	-	1
IT Services						
	C	3	-	-	-	-
Equipment Services						
	B	1	1	1	-	1
Training Services						
	A	-	1	3	-	-
TOTALS		7	11	12	3	3

Figure 19A. Aggregate of individual CSFs: Matrix I (Column graph).

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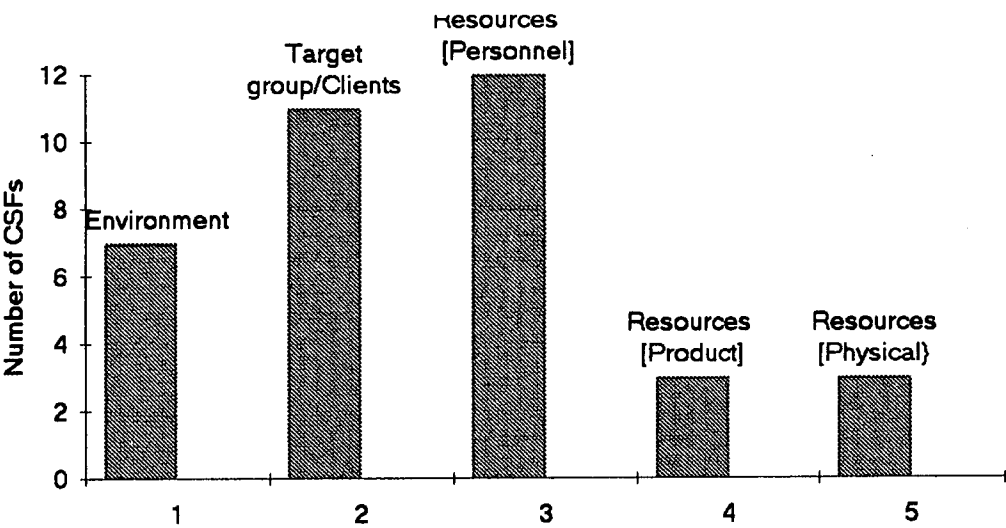
Figure 20. Results : Group session I (Corporate CSFs) :

Corporate CSFs

Quality Staff	Quality Services	Quality Physical environment
(1) Sufficient quantity	(1) Operational effectiveness of equipment and systems	(1) Health and Safety-ergonomics
(2) Effective- thinking planning evaluating communicating skilled knowledgeable helpful client-oriented flexible	(2) Client education (3) Responsiveness (4) Relevant resources (5) Timeliness (6) Sufficiency	(2) Site management
(3) Productive	(7) Relationships with other agencies	
(4) Efficient		
(5) Appropriate		

Figure 21   Corporate CSFs: Matrix II

FUNCTIONAL AREAS

.QUALITY CORPORATE .CSFs	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
(1) Operational reliability of equipment/services	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(2) Effective client education services	✓	✗	✗	✗	✗	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓
(3) Service responsiveness to changing needs	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
.(4) Timeliness of service provision	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(5) Appropriate resources and equipment (Product)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(6) Sufficient Quantity (Product)	✓	✗	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓	✓	✓	✓	✓
(7) Productive relations with other libraries, agencies, networks	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
(8) Quality staff *	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(9) Quality physical environment *	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(10) Quality Site management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note :   * (A) Quality staff should be:- (1) (of) Sufficient Quantity,   (2) Effective= thinking, planning, evaluating, communicating, skilled, knowledgeable, helpful, client oriented, flexible, (3)productive, (4) efficient, (5) appropriate.
   *(B) Physical Environment should be:- (1) Healthy, (2) safe, (3) ergonomically sound.

Key to Matrix

A- Interlibrary loans, Circulation, Use patterns of collection by users:

B- Acquisitions and Bibliographic checking;

C- MARC records capture;

D- Orders placement;

E- Accessioning

F- Copy cataloguing

G- Original cataloguing

H- Accurate shelving

I- Appropriate stock relegating

J- Availability of loans

K-Information desk

L- OPAC use and assistance

M- Reference queries

N- On-line searching

O- CD-ROM use

P- Collection development

CHAPTER 6

DISCUSSION OF THE RESULTS : RECOMMENDATIONS.

(a) Achievement of the study:

In investigating the background to the **research question**, namely, why MIS/DSSs in academic libraries were not designed and used, it would seem that certain impediments were in place to their design and use. The **major impediment was seen to be the identification of relevant and selective managerial information requirements,** and this would best be achieved through the **identification of an appropriate information requirements analysis, which would successfully elicit the most critical information needs of both individual managers, and of the organisation as a whole. Other impediments, which may also affect information requirements analyses, were felt to be organisational influences on the decision-making of academic library managers, and hence their recognition of and need for management information.** *The actual design of a MIS/DSS was not the purpose of the study.* It is hoped that the groundwork laid down by the study's testing of the chosen information requirements analysis methodology may pave the way for future studies in this area, either through the extension and improvement of the CSF methodology for application in the library environment, or in testing in libraries other methodologies reviewed in Chapter 3. Further, through a case study and exploratory approach, it was hoped that the milieu of information requirements (i.e. the decision-making environment of academic libraries) could be preliminarily assessed, and any influences which may affect information requirements analysis noted for future studies to investigate further.

The study successfully identified an information requirements analysis methodology (the Critical Success Factors method) from the non-library literature, applied it in its strict structured form (using Bullen & Rockart' *Primer* (1981)) in a case study site, and arrived at both individual and corporate Critical Success Factors for senior academic library managers, (i.e. identified areas of prime or critical concern for the success of both the individual managers and their organisation, in order to achieve specified goals and objectives, and requiring for this purpose selective data for decision-making and monitoring, which will form the basis of a MIS/DSS).

The chosen methodology's application, if taken through all the *Primer's* steps, would allow both the identification of Critical Success Factors, or areas requiring prime attention for information requirements, and subsequently the location of relevant performance measures, and reports to monitor progress in these. The link to data (data elements in the ILS and to external data) would follow, and all these together would form the MIS/DSS. Bullen & Rockart (1981) indicate that often **two investigations are necessary to arrive at all of these**: the **first investigation** completes the study of the organisation, the individual interviews to achieve individual CSFs, and the derivation from these of

corporate CSFs, either with or without group sessions. The achievement of subsequent performance measures, reports, and data links often forms the matter of a **second investigation**. This study completed the matter of the recommended first investigation, although, since the methodology was not previously rigidly tested in libraries and hence no reports on timing or difficulties were reported, it was initially hoped that performance measures, even preliminary ones, would be arrived at.

(b) Factors which may have influenced this application of the CSF methodology:

Given a structured tested methodology, reputedly easy to apply and understand, and with many reports of successful applications in both for-profit and non-profit organisations (see Chapter 3), why was its application in this case study reasonably difficult, and taking up the full amount of time allocated to field work, thus only achieving the matter of the first investigation? A number of possible reasons are outlined:

(1)The time factor:

Indications of the average time required for a CSF methodology's application varies in the literature, from an interview time for each manager of 3 - 6 hours (Rockart 1979); to 1 - 3 hours for each manager, and one person-month's effort overall to complete (Bullen & Rockart 1981); to a month or two for the organisation overall (Forster & Rockart 1989). Due to study funding constraints, and the staff time available to the researcher-as-consultant from the case study site, a period of one month prior to interviews was spent by the researcher on the pre-interview study of the organisation, preparation by the researcher and examination by the interviewees of the pre-interview package, followed by face-to-face time of 1 1/2 to 2 hours per each of ten managers, and 8 hours for the group sessions. That is, one person month's effort was spent prior to interviews, and about 28 face-to-face hours of interviews and discussion.

Since the application of the CSF methodology is new to libraries, more time may be needed initially. The literature indicates this time is reduced on subsequent applications.

Recommendation: That future applications of the CSF methodology make allowance for the newness of this technique, and allow sufficient time for the matter of the second part of the investigation (i.e. performance measures, report formats, and data links).

(2) The state of information systems technology:

During the application of the CSF methodology, the site library was in process of installing its first ILS. Although this generated a great deal of interest in the ILS and its capabilities, unfamiliarity with the ILS modules, and with the data available from the relational databases, may have affected the managers'

conceptualisation of management information, and of the entire MIS/DSS design process. Cooper (1982) comments that the success of the CSF methodology for the purpose of MIS/DSS design is dependent on information system diffusion and infusion in the organisation (diffusion being the degree to which information technology has been disseminated throughout the organisation, and infusion the degree to which information technology has penetrated the organisation in terms of importance, impact or significance).

Recommendation: That any future CSF applications in relation to MIS/DSS design take into account the information systems infusion/diffusion existing in the organisation at that time.

(3) Decision-making environment of academic libraries:

Academic libraries are complex professional bureaucracies, and therefore the decision-making environment of libraries is complex. Organisational structures are traditionally hierarchical, aligned to routine processes and standard procedures, which may not be conducive to a strategic stance or creative decision-making. **Choice of appropriate structures by academic libraries to suit current and future strategies may improve the decision-making environment, and hence use and design of MIS/DSSs.** As Dubey (1985, 119) points out decisions are based on (1) the creation of a desired state of affairs, (2) the apparent state of actual conditions, and (3) the kinds of action to close the discrepancy. This description of the decision-making process is similar to the strategic planning approach, and both are only successful if each element is properly undertaken. The management literature indicates that a responsive and adaptive organisation devises its strategy first, and then its structure. The structure will directly influence lines of responsibility, and hence decision-making.

Strategic planning and management techniques currently used elsewhere are relatively new to libraries (although ARL's first strategic planning publications date from the mid-1980s, many libraries in Australia are only working on their first strategic plans). Goals for, and assessment of, overall service success tend to be described in libraries in abstract, non-actionable terms. Broadbent & Lofgren (1991, 40) admit the **identification of CSFs in libraries may be difficult, not directly evident, and of a fairly abstract nature, making subsequent action, and the monitoring of those actions, also difficult.** Cooper (1988) and Davis (1982) both see problems in human information processing bias, with Cooper seeing these as possible degradations of the CSF method (see Chapter 3). Although Davis sees that the CSF method requires "relatively little effort to arrive at the critical factors" (1982,17), he also sees that in a **complex environment with a moderately high degree of uncertainty as to information requirements determination, the setting up of a prototype MIS/DSS** based on an initial set of more limited requirements may be the most successful approach. This would also seem to be the conclusion of Redfern (in Harris 1987) (see above, p. 20). The presence and use of management information affects decisions made, especially the effectiveness of decision-making at strategic levels

(Belohlav & Raho 1987). The strategic planning process demands management information to complete all stages. Therefore, the **progress towards MIS/DSS design and use would seem to be cyclical.** The greater the expertise in strategic planning (together with the correct choice of appropriate strategic planning approaches) the greater the need for management information/data and hence use of a MIS/DSS, and vice versa. These influences are further discussed in Chapter 7.

Recommendation: The next most appropriate stage in achieving a MIS/DSS for the **case study library** - once its ILS modules were in place and a proper environmental assessment (including the specific identification of target markets and their needs) is made, - could be the initial design of a prototype MIS/DSS for their most important CSFs, e.g. the 'timeliness and relevance of information services and products to primary clients across all functions'.

Recommendation: That, until MIS/DSSs are established in academic libraries, future CSF applications for the purpose of MIS/DSS design attempt to arrive at a prototype MIS/DSS, covering initially a limited set of information requirements, performance measures and reports, and data links.

Recommendation: That more studies are designed to investigate the decision-making environment of the academic library, and specifically its influence on the design and use of MIS/DSSs.

Recommendation: That academic libraries report on their use of the strategic planning method, the approaches chosen, and the management information that they found necessary during the process.

As libraries become more familiar with **strategic planning,** all phases of the strategic planning process will be in place (see Figure 1). Many, including the site library, now have an inadequate environmental assessment phase: including the complete identification of user needs, identification of existing resource strengths and weaknesses, identification of opportunities and threats, and hence the predicted resource and technology needs, and the specific strategies required, to attain organisational mission and goals. A greater emphasis on **client satisfaction,** especially for service organisations, is being attained in the non-library world (e.g. in law, engineering, manufacturing, etc.). through the use of TQM and quality standards ,both based in some measure on market measurement and analysis techniques. These approaches could well provide a **stronger directional focus to self-evaluation, assessment of client needs, and choice of strategies,** making the choice of CSFs (and their subsequent performance measures, reports, links for data to provide management information) easier to attain, more focused, actionable, and appropriate to academic libraries as service organisations. The use of the **quality service standards** may in fact be a better approach to achieving performance measures for libraries than any so far advocated. Inadequately assessed market factors (e.g. manifest demand for library service and current status of collections and services) may well produce inappropriate goals, and hence inappropriate performance measures, and will not make the library more effective or client-oriented.

That is, with greater expertise in strategic planning approaches and evaluation techniques, the easier the application of the CSF methodology will be (see also Chapter 7). A stronger training in management techniques (as recommended by many library professionals, see Chapter 2), is subsumed in all of the above, and would also make the design and use of MIS/DSSs more successful.

Although the **site library** had undergone many planning exercises, a complete and correctly sequenced strategic planning approach had not been undertaken (see Chapter 4, part (1)). Data used in planning documents was broad and based on national aggregates for libraries (with their acknowledged problems of standardisation, etc.), and the user needs study was not comprehensive or detailed enough. The organisational structure was new, and although the planned communicative mechanisms and responsibility lines were in place, it was rather early for these to be fully effective. The prepared individual missions and goals were, in many cases, imprecise and too abstract. Strategies, deriving from goals and objectives, especially in terms of specific actions to be taken within definite time frames, were either not given or not fully worked through. Despite the pre-interview package, the CSF method and purpose were found to be difficult conceptually on this first round, but the site library admitted that repeat rounds might be easier. Some wondered "why is this management technique better than any other?" Although all managers wanted data for decisions, attitude to data was variable, some feeling that selective choice of management information still involved 'too much' data at too high a cost, others not being able to distinguish when 'soft' data would be applicable, and when 'hard' data would, or that both may be used, depending on what was being measured. Interestingly, although a client-centred approach emerged in both individual interviews and in their planning documents, the 'satisfied client' component of the university librarian's suggested 'quality' corporate CSFs did not reappear in the group sessions or the final Matrix (although, as mentioned in the discussion of the construction of the matrix, many CSFs would **assume** that client satisfaction would derive from quality services and quality staff). Similarly, Broadbent & Lofgren's ranked CSFs (Figure 11) only indicate four direct assessments of client satisfaction, viz. nos. 11, 21, 27, 38, (although here, also, client satisfaction may be **assumed** as a component of many other CSFs listed).

Borbely (1981) found, after his first practical attempt at an application of the CSF methodology, that the objectives his staff derived from their CSFs were insufficiently clarified or specific. Borbely succeeded in achieving actionable objectives through the **addition of MbO techniques** during subsequent CSF applications. Davis (1982) had suggested the possible **addition of a form of socio-technical analysis** to the CSF methodology to aid in information requirements determination (see Chapter 3).

Recommendation: That future studies or practical applications (hopefully reporting their results) using the CSF methodology in academic libraries may consider extending the methodology either by the addition of the MbO technique, or some form of socio-technical analysis.

Recommendation: That academic libraries consider using, and reporting on the use of, TQM techniques, and especially in their application of the quality service standards, and the influence these applications have on the need for management information and choice of performance measures.

Recommendation: That ALIA (Australian Libraries and Information Association) consider investigating the translation of the quality service standards for use in Australian libraries (as is currently being done by other professional associations, e.g. law, engineering), and undertaking input to the Standards Australia committees, viz. the Quality of Service Committee and Quality Assurance/ Management Standards Committee. Accreditation of libraries for adopting, using, and meeting these quality standards could follow.

Recommendation: That library educators include in the curriculum a greater emphasis on current management techniques (including the various approaches to strategic planning, especially training in goal formulation and objective setting for non-profit service organisations, and an understanding of organisational behaviour and organisational structure, the use of client-oriented techniques, e.g. market measurement and analysis, and TQM) to allow libraries to retain a cutting edge on information services provision through a more effective and market-centred approach to users, and a more effective decision-making environment making better use of management information. Distance education degrees (possibly most suitable to middle managers due to their flexibility, ease of access, and portability) through approved providers could be co-ordinated by ALIA to offer library-specific management courses as already set up by other professional bodies (e.g. RACI/APESA in their MBA (Technology Management)) to produce, for example, a MBA (Library and Information Studies Management). ALIA accreditation and workplace recognition for these degrees would also improve the quality of management in Australian libraries.

(4) The effect of interview order on the CSF outcomes:

Although the order of interviews is not specified as one-way only in the *Primer*, and in fact mixed approaches are encouraged (see Chapter 4), influences were noticed in the change of order in this study prior to group sessions. It is not known whether this enhanced or degraded the method's success in arriving at corporate CSFs, but it certainly extended the time given to this section of the application. Repeat applications using variable interview order would be necessary to assess this, although given the multiple attendant variables involved, may not be precise.

Recommendation: That future CSF studies experiment with, and report influences on, the use of varying order of managerial interviewing, i.e. top-down, bottom-up, and mixed.

(5) The role of the researcher as consultant:

Under normal circumstances, i.e. in a 'real-life' situation, a management consultant would be called in by an organisation wishing to improve its efficiency, effectiveness, and competitive stance (due to its concern for profit share in a for-profit area, or in a non-profit area, its accountability and concern for resource share, and service competitiveness to its immediate clients), and in many cases to enhance these through design or improvement to its management information base through its MIS/DSS. The CSF methodology would be applied, and the length of time needed to complete the entire process would be determined by the consultant in conjunction with executive management, and dependent on the planning sophistication and current problems of the organisation. Sufficiently assessed environmental influences would be essential, and management focus (in setting goals, objectives, strategies, and following performance measures, reports, and data links) would be arrived at through face-to-face interviews, taking as long as was necessary to achieve the desired results. Critical methods to arrive at these may have to be included.

The use of an obliging case study site for a higher degree research project, limited by time and funding, and a desire to be observant but not too invasive, does not allow of all these conditions, and must, of necessity, affect results.

Recommendation: That future applications in 'real-life' situations of the CSF methodology be carefully reported, especially in relation to methods used to conclude all its components.

(6) The effect of the site library's organisational structure on the CSF methodology:

The site library had recently changed its structure from a traditional hierarchy to a flatter structure, to achieve greater responsiveness and productivity (see Chapter 5). These new arrangements and involvement in planning decisions may not yet have taken effect, with middle managers still being fairly inexperienced with planning techniques. Although 'team-work' was encouraged 'to get results'. no autonomous teams, or matrix teams were in evidence, except for 'executive group', 'planning group', and 'operational group'. It would seem the flatter structure still displayed hierarchical approahces to lines of responsibility and decision-making. The managers' attitudes to the CSF process, in both wanting to co-operate with each other to achieve corporate goals while retaining independence of individual goals and CSFs reflect the views of Frederickson (see Chapter 7).

CHAPTER 7

ORGANISATIONAL INFLUENCES ON INFORMATION REQUIREMENTS IN ACADEMIC LIBRARIES.

The last research question of this study (based on a review of the background to the research problem, which indicated that organisational influences may affect the decision-making of academic library managers, and hence their recognition of and need for management information) was to see whether the application of the CSF methodology as an information requirements analysis tool, and an analysis of the results, would indicate any organisational influences, especially on decision-making and planning which (a) might affect the CSF methodology's use, or (b) suggest improvements or beneficial extensions to the methodology for future applications in academic libraries. Recommendations for some of these, arising from the results, were made in Chapter 6. The reasonable difficulty this study had in establishing clearly focused CSFs, and arriving at performance measures for these (and subsequent report formats, and links to data) would indicate that a closer investigation is needed into the decision-making environment of academic libraries. Since these possible organisational influences emerged during and at the conclusion of the application of the CSF methodology, they will be briefly reviewed in this chapter, and may aid in future applications of the methodology in library environments.

Looking back to the literature review, both Brophy (1986) and Brindley (1987) saw that a successful MIS/DSS was dependent on many organisational factors such as information flow, organisational structure, and hence centralisation or decentralisation of decision-making, levels of responsibility of decision-making, management styles and use of management techniques (e.g. strategic planning). Brophy (1986) saw MIS/DSSs as having "profound effects upon the organisation, its structure and its modus operandi" , requiring a "detailed reappraisal of organisational structure" (p. 75), but "there is little agreement as to either the desirable or actual effects on organisational structure of the introduction of management information systems" (p. 76). He sees a MIS/DSS providing the opportunity for any one of many different kinds of structure to be implemented, and that decision-making processes will occur close to the place of implementation, therefore organisational structure and MIS/DSSs are very closely linked. Because a MIS/DSS brings different levels of management closer together, older structural forms will give way to new designs. The contrary may well be also true, that existing traditional organisational structures, (usually not following strategy), influence the perception of and need for management information, and hence of a MIS/DSS.

Cox (1987, 6) sees innovative organisational structures as "a tested means ... of achieving the goals of the enterprise ... enterprises have been and are reorganising in such a way that innovation is encouraged and made more effective". He sees effective power as equalling formal power x knowledge competence, i.e. appropriate knowledge, reducing uncertainty, which is the purpose of a MIS/DSS.

Woodman (in Cronin 1985) saw organisational constraints to information management development as including lack of accessibility, misinterpretation, association between information, politics and power, organisational inertia, ambiguous ownership of information, etc. Davis (1982) saw that the application and evaluation of an information requirements analysis methodology was dependent on important non data issues such as context, organisational policy, and roles. Scott Morton (1983) recognised that a greater understanding of the rich sense of context and nuance of organisations was necessary for the successful application, and improvement, of information requirements analyses.

Information systems technology : its impact on organisational structure in academic libraries:

Organisational structure is "the set of work roles and administrative arrangements that determine the pattern of relationships among tasks, activities, and employees. It is represented by the division and specialisation of work, as well as the methods of co-ordination and control" (Middlemist & Hitt 1988, 429). Snyder (in Bundy & Wasserman 1970) suggests "all units will be organisational in the sense that activities and relationships will be the outcome of the operation of formal rules governing the allocation of power and responsibility, motivation, communication, performance of function,, problem solving, and so on" (p. 110).

Automation originally was implemented in academic libraries to perform, and allow control of, operational procedures, and may have contributed to, or extended the existence of "an organisational structure most consonant with the performance of the operational system" which, in fact, "may be in direct conflict with the type of organisational structure best suited for the organisation's (strategic) survival" (Tricker 1982, 19). Centralisation was appropriate to the pre-1950 environment. Early computers reinforced standard procedures, controls for consistency and classical hierarchical accountability, suitable for stable environments with predictable futures. Continuing these trends within a changed environment leads to organisational inertia. Advances in the technology of distributive processing and communications have made data available across the organisation, allowing most organisations the flexibility of more centralised administrative operations, while allowing more decentralised decision-making, with appropriate strategic planning approaches allowing corporate mission and objectives to guide managerial decision-making at all levels. Information systems technology, properly applied, has the ability to strengthen the strategic stance and market position of the organisation which applies it. (Best in Cronin 1982, and Keen 1991).

Patterns of authority, task allocation, and degrees of centralisation or decentralisation of decisions affect the collection, processing, and flow of data. Centralisation and hierarchical structures "tend to create 'information pathologies' (e.g. secrecy, blockage, withholding information, leaks, distortion, etc.)" (Hodge 1984, 19). Even an alternative pattern in the hierarchy, e.g. autonomous work groups/teams or participative management, can affect the organisation's information system. Functional

organisation affects information collection and use. Current IT facilitates access to a wide range of information, allowing entrepreneurialism in organisations. "Information systems can offer multiple reporting and multi-directional controls ... facilitate management and the creative search for alternatives. Different structures and styles can be combined in one enterprise. The stability to withstand pressure and the flexibility to respond to rapidly emerging opportunities or threats can be combined" (Tricker 1982, 106). This led, in the business world, to transient organisations and the use of matrix management (identification of groupings for a specific purpose and therefore with decision-making authority), with increasingly transient and flexible boundaries. **Structures consistent with organisational strategies were able to be adopted.** Management information systems become of strategic significance, even effecting the existence or survival of the organisation, and closely related to strategies on manpower, management and organisational development. (Tricker 1982, 112).

Broadbent & Koenig (1988) discuss the effect of IT on organisational structure, and indicate the literature makes recommendations to flatter structures, but find that no consistent patterns are yet emerging towards these, with technology forming a secondary influence on structure after the primary influence of management's' aims (what they want to accomplish).

How have libraries responded to change through their organisational structures?

Booz, Allen and Hamilton (1980) indicated that, over time, **new forms of library organisational design would be the most productive change agent for greater outputs and benefits,** more so than professional productivity improvement, or effective planning and decision-making (Figure 22).
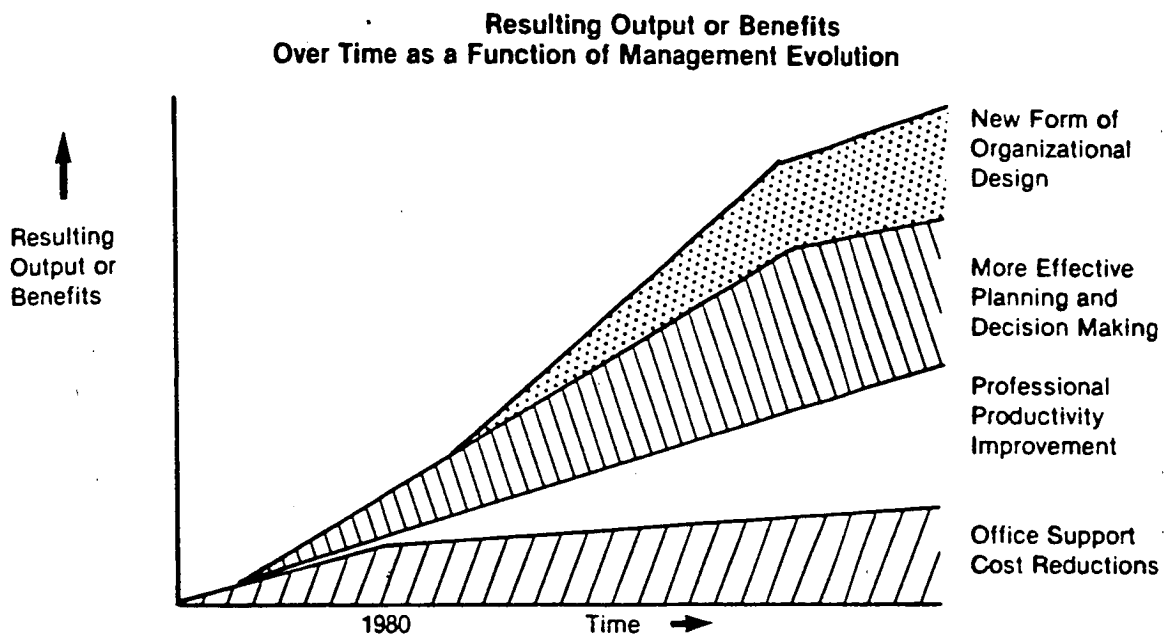
Martin (1983) compared the organisational effects of automation to those which had occurred in business, with changes in the decision-making process, resulting in changes in style, shifts in levels of authority and control, possibilities of rigidity because of the requirements of computerisation, with the most serious result being the abdication of responsibility for IT planning to the systems staff, leading to dichotomies in goals. **Decision-making takes a key role in the organisation, and becomes increasingly complex because of interdependency of relationships within the information system.** Traditional vertical structures for middle management will become more lateral, with greater need for innovation and leadership. Old pyramid structures, characterised by executing decisions, will have to change to allow **greater information gathering,** with the communication network determined by "who needs what kind of information and from whom, not by who tells whom what to do" (Martin 1983, 71). Cost displacement as the value of information is inappropriate in a complex organisation. Therefore, in libraries, automation brings requirements for new procedures, new staffing patterns, new budget and program priorities, shifts in authority and decision-making, and changes in expenditure patterns, with the most important change that of organisational structure. Both task differentiation and loss of flexibility, and **value adherence to codes and standards above service needs,** can occur when

machine-dependency takes over. Automation allows much more in-depth study of planning questions, due to the wealth of data as evidence. Ad hoc decision-making will become more common, and IT specialists will have the advantage. Old key questions of location and control will give way to best access and service through IT. Subject specialisation and independence becomes more important as information is reshaped and custom-tailored.

Cline & Sinnott (1983) examined through case studies the effect of automation on the structure and functioning of university libraries. They see authority in a complex organisation as delegated and distributed throughout the whole structure, with ultimate authority "derived from the consent and co-operation of the supervised rather than from managers" (1983, 109). Authority becomes complicated with the introduction of specialised knowledge, not shared by all organisation members. Greater and greater disparity will be seen between administrative and executive generalists (for co-ordination, integration, and overall management) and staff specialists. (How will this accord with contemporary external requirements for multiskilling, seen as both an opportunity and a constraint by the site library of this study.)

They found that automation could result in either greater centralisation of control (e.g. with a central bibliographic data file, requiring data with division-wide standards), or greater decentralisation (with more individuals sharing authority, and access to shared data information). Some institutions experienced a lateral shift, especially those relying on outside agencies for services and expertise (e.g. networks and co-operatives), with procedures and policies directed or influenced externally. Cline & Sinnott claim these will lead to structural shifts and functional reorganisations. They see authority as the day to day manifestation of structure in complex organisations, with changes in structure always lagging behind changes in authority. They also found that changing patterns of communication reflect organisational changes after automation. Stable patterns of communication within manual systems are lost, with **automation introducing constant change requiring a more fluid structure.** Toffler's 'adhocracy' (a flexible format with individuals assigned permanently to an administrative department and temporarily to specific projects - matrix management) was cited. They saw evidence that the team approach with boundary spanning roles was necessary , and most staff capacity being given over to influential developments. (In the site library, the university librarian claimed all staff belonged to her, and were only 'on loan' to other departments, to be recalled for special projects or team work as necessary). In 1983, Martell also recommended multi-functioning, boundary spanning work groups in a restructured academic library for more effective user-orientation. Of interest here is the literature of organisational development, particularly that of Golembiewski & Kiepper (1988).

Figure 22. Organisational design : output and benefit (From Booz, Allen & Hamilton 1980.
In Bommer & Chorba 1982, 5).

Resulting Output or Benefits
Over Time as a Function of Management Evolution

Resulting
Output or
Benefits

New Form of
Organizational
Design

More Effective
Planning and
Decision Making

Professional
Productivity
Improvement

Office Support
Cost Reductions

1980   Time

Source: Booz, Allen & Hamilton Inc.

Cline & Sinnott (1983) further found that automation led to more closely connecting sub-structures and activities throughout the organisation, with **greater unit interdependence**. Subject specialisation was more pronounced than ever, with subject groups controlling substantive areas of collection development, collection use, selection, ordering, and cataloguing, and this specialisation would be extended. Automation caused interaction between public and technical service units, with distinctions eroding, and many separate units being disbanded. Again, expertise for the highest managerial roles is examined, with questions as to whether librarians should serve as directors in periods of change.

McClure & Samuels (1985) found a significant relationship between a democratic management style with information dissemination for decision-making, and that **existing library management styles** were restrictive, therefore limiting information dissemination, and **existing library organisational structures,** being 'closed', retarded effective information acquisition and dissemination especially from external sources. They recommend extended research skills and use of MIS rather than informed opinion, and see an information rich organisation being able to change from a 'closed' to an 'open' innovative organisation. (It must be noted that a management style (in conflict with structure) can impede decision-making, even in a horizontal structure, although it is more common for democratic, open, encouraging management styles, for example following OD techniques, to be associated with open, horizontal and creative structures.)

Prince & Burton (1988) found that IT in libraries produced either fluid, organic structures, with team working and service orientations, or it reinforced the status quo, thereby losing status in staff and users' eyes. They see a **problem of goal displacement in the old functional structure (where function often overrides service).** Libraries retaining traditional structures were found to evidence inertia and a reluctance to take up opportunities for decentralisation, innovation, and responsiveness to user needs. They found that organisations with subject divisionalism, or some kind of hybrid structure, had staff with higher job satisfaction, closer contact with users, flexibility, adaptability, a positive attitude to innovation, and a higher involvement with decision-making. Centralisation, formalisation, and stratification correlated negatively with innovation, nor were these changed by automation, which actually further reinforced their existing patterns. In receptive organisations, automation led to reskilling of all staff, with professionals giving more attention to service-oriented goals.

In 1985, the Association of Research Libraries (ARL) looked at *Automation and the reorganisation of technical and public services,* and in 1986, surveyed *Organisation charts in ARL libraries.* At that time, no real changes were found in the context of automation. There were expectations that major changes were imminent, (staff savings, capabilities for improved service, etc.) but little actual integration had occurred. In 1991, ARL in its *Training of technical services staff in the automated environment* found the traditional Technical/Public services split still the norm, with work rotation for cataloguers to public service still minimal, and questioned whether librarians were changing or changes

were being forced upon them. Some, however, were experimenting with matrix structures, with staff learning new skills, or with matrices based on subject rather than function in an attempt to orient services and programs to the user.

In 1989, De Klerk and Euster asked 53 library directors whether automation had been a catalyst for organisational change. Some experimentation was found, but no single pattern emerged, with a number of forms to increase co-ordination and flexibility. Over the period 1985-1990, organisational structures remained mainly traditional, with the long-standing divisional structure still much accepted, although some changes were being made in order to better integrate functions.

In 1992, McCombs, in examining technical services, found automation was reducing the dividing lines between departments, but organisational charts were slow to reflect these changes. However, work flow patterns are showing more reliance on matrix organisational theories than on traditional hierarchies, and new information needs and changing library environments are revitalising and restructuring internal relationships.

Organisational structure - which is the most appropriate for academic libraries currently?

Each organisation is theoretically unique, and its structure is dependent on its task environment (e.g. clients, suppliers, competitors, unions, government agencies, networks, etc.), and to a lesser extent on its general environment (technological, economic, political, internal influences). These set the **degree of certainty/uncertainty** and likely change scenarios which will **determine structural type**, especially in relation to the market and technology of the organisation. Studies in this field (e.g. see Middlemist & Hitt 1988, 429) have shown that effective organisations with highly perceived environmental uncertainty were highly differentiated (with specialised units to track environmental influences) and highly integrated, while those with low perceived environmental uncertainty had low differentiation, but were still highly integrated. Organisations with low differentiation and high integration found an effective structure not difficult to achieve, while those with a high differentiation and high integration (high uncertainty) found an effective structure important, but difficult to achieve. It would seem that currently, academic libraries should be reasonably differentiated and highly integrated. Organisational designs to handle uncertainty range from rules and goal-setting at the least uncertain point to self-contained tasks, vertical information systems, and lateral relations at the highest point of uncertainty - leading to work groups based on mutual interdependence, boundary spanning and liaison roles, task forces, and problem-solving teams (for continuous interdepartmental problems), that is, integrating roles within matrix designs.

Other studies have isolated **environmental characteristics impacting on organisational structure** as being:

- munificence (amount of resources and opportunities in the environment);

- complexity (degree of heterogeneity in environmental components);

- dynamism (degree of change, turbulence, and unpredictability of the environment).

Dynamism would seem to have the "strongest effect on structure and strategy, whereas complexity and munificence have stronger effects on the size of the organisation" (Middlemist & Hitt 1988, 430). Academic libraries are now in an environment of constant change, due in part to IT developments, therefore this dynamism must effect their structure. However, the size of an organisation is relevant, with some academic libraries being very large, and with many locations, (branches and/or campuses). Keen (1991) shows how this affects organisational structure, and the possible eventual disintegration of leadership, understanding, project and team work. He shows how the early promoters of the 'excellence' concept (Peters & Waterman) later retracted their earlier theories that large organisations could be creative, flexible, and responsive. The importance of IT and a MIS/DSS (i.e. the corporate information resource) becomes even more imperative in larger organisations.

An **organisation's diversification strategy** to deal with markets also effects structure. With information sources and accessibility coming from a dynamic environment, and being offered in many instances to clients directly, academic libraries should concentrate efforts on their target markets, using market analysis techniques to thoroughly analyse their needs (see Kotler 1982). Functional structures suit single or dominant products, while the provision of many or related products suit a multidivisional structure, and unrelated products best suit a holding company. Academic libraries therefore would seem to require a multidivisional structure.

An **organisation's 'technology' (the knowledge and processes required to accomplish tasks) affects structure.** For an organisation, it involves the techniques required to transform input (raw materials) into output (products, services) (Middlemist & Hitt 1988, 453). Technology also includes the number of problems that must be solved using standard methods. Of the four types of technology (after Perrow, in Middlemist & Hitt 1988, 453), where do academic libraries best fit? A mismatch between organisational structure and technology will lead to conflict and ambiguity with respect to tasks performed.

(1) Routine - few, but similar, tasks, with few problems. Problems that do occur can be solved using standard methods, (e.g. mass-production, assembly line).

(2) Craft - few tasks with few problems, but those occurring require unique methods for solution, (e.g. public school).

(3) Engineering - many varied tasks with multiple problems that may be solved using standardised methods, (e.g. specialised consulting firm).

(4) Non-routine - many varied tasks with multiple problems that require unique methods for solution, (e.g. R & D firm).

	Routine	Craft
Rigid	Routine (1)	Craft (2)
Flexible	Engineering (3)	Non-routine (4)
	Centralised	Decentralised

My assumption is that most academic libraries fall into (3), and the more innovative may fall into (4), noting that for some it may be more appropriate for centralisation to only occur in areas of administration and general roles, with decentralisation for specialised roles (e.g. subject specialisation, branch services, etc., as discussed above).

McDonald (1986, 11) asks "Who makes management decisions in academic libraries, how are they made, and with what information?" He feels this is a different question to that tackled by McClure's studies. He sees academic libraries as fitting into the 'professional bureaucracy' category of Mintzberg's organisational typologies, with decision-making (information flow?) flowing from the bottom up, the key being the operating core, with significant informal information flow. He quotes results of Olevnik's unpublished report (1984) surveying 205 academic libraries in the US, with "participation in nine major decision making areas ... achieved in most libraries (64.4%) by individual consultations with the library director" (McDonald 1986, 11).

Therefore, only a comprehensive assessment of a library's environment (degree of certainty/uncertainty) and setting of ensuing strategies, will allow a correct choice of organisational structure. This structure in turn controls the decision-making environment, and access to management information. These factors are of great importance in influencing the ease with which the CSF methodology can be applied, and the successful achievements of all possible results.

Effect of structure on strategic planning and decision-making :

Frederickson (1986) synthesised findings from areas of strategic decision processing and organisational structure. He then discusses patterns of strategic process characteristics associated with different types of organisational structures, as well as the appropriate unit of analysis for studying that process, and concludes with reasons why different structures are typically more successful in different contexts. He places **universities (and therefore, surely academic libraries) into the complex category, a professional bureaucracy.** There are three potential sources of complexity - horizontal differentiation,

vertical differentiation, and spatial dispersion. "Therefore, an organisation that simultaneously has numerous levels, broad spans of control, and multiple geographic locations would be considered highly complex" and "a high level of complexity makes it difficult to co-ordinate and control decision activities" (Frederickson 1986, 284). He sees a complex organisation's appropriate structure as **very decentralised and informal, with highly trained professionals who control their own work**, with detailed knowledge of specialised topic areas making the resulting structure horizontally complex and differentiated: vertical differentiation is very limited. (The implications of status and task/decision independence of the librarian as a professional, especially in the academic library, has been argued ad infinitum, and must be resolved before such structural changes can effectively take place.) Of interest to academic libraries' strategic planning is his finding that the notion of strategy - a single, integrated pattern of decisions common to the entire organisation - loses a good deal of its meaning in a professional bureaucracy. **(How effective, then, is an insistence that corporate CSFs drive other CSFs and performance measures?)** Skills required are only available through advanced training, and stability is necessary to develop performance standards. However, the strength and divergence of members' goals make such an organisation highly political. Solutions may lie in differential resource allocation policies (incorporating rewards?), or lateral organisational development. Different structures, therefore, require different approaches to strategic planning and performance measurement and evaluation. Frederickson finds the best unit for analysis in these areas is the small group.

He compares each of the three dimensions of structure (centralisation, formalisation, complexity) for their effect on (1) response to decision stimuli, (2) decisions relating to organisational goals, (3) strategic actions ensuing, and (4) biases and constraints on these. As the level of complexity increases in an organisation, so does the probability that:

- members initially exposed to the decision stimulus will not recognise it as being strategic, or will ignore it because of parochial preferences;

- a decision must satisfy a large number of constraint sets, which decreases the likelihood that decisions will be made to achieve organisational level goals;

- strategic action will be the result of an internal process of political bargaining, and moves will be incremental;

- biases induced by members' parochial perception will be the primary constraint on comprehensiveness of the strategic decision process. Integration of decisions will generally be low (Frederickson 1986, 284).

Each one of the above will affect the application of the CSF methodology in complex organisations, and should be noted.

Golembiewski & Kiepper (1988) examined policies and structures appropriate for high performing organisations (i.e. in the application of OD), and recommended teams, rather than departments, as providing purpose-oriented structures, with multilateral (vertical and horizontal) relationships, with

control by an employee of the total sequence of operations (tasks), and decentralising of decision-making in regard to these operations (with few hierarchical levels and few supervisors). The information system in such an organisation has open, multilateral, multi-channel features, carries a broad range of data re many topics and many jobs, deliberately seeks to stimulate upwards as well as downwards communication. Reward systems are based on skills possessed rather than tasks performed. The authority system emphasises a move from monitoring behaviour to facilitating performance.

Golembiewski (in Rabin 1989) discusses **strategies related to organisational structure** in the public sector, and develops arguments along seven interaction themes - including adjusting structures to strategies for growth; adjusting structures to differences in technologies; encompassing differences in the environment to structure. Each requires different solutions as different problems are presented. For example, growth impacts structure through - addition of volume (no or little challenge to organisational principles); addition of field units, e.g. branch libraries (raises major theoretical and practical challenges to one-line authority); addition of functions internally, or contracting these out (exacerbates issues related to command vs. specialisation); addition of products or services (leads to greater tension with the principles determining structure). **All these are applicable to academic libraries today. and present management problems that must be accounted for in CSF applications.**

Golembiewski (in Rabin 1989) sees divisional structures (a direct forbear to matrix structures) reducing communication problems, with economic and competitive advantages. Team building is now seen as a socio-emotive overlay to fill gaps induced by classical structures no longer being appropriate, with periodic reinforcement necessary, while the **autonomous team** is a fundamental structural change, directly controlling broad ranges of activities involved in some 'whole task'. Integration rather than differentiation is stressed. Matrix organisations deliberately violate unity of command, therefore the diamond matrix model is suggested as a solution. Universities, (and academic libraries?), with their predominance of independent professionals, operate in dynamic environments, and therefore should choose a diamond matrix structure, since they are classed as 'organisedanarchies'.

I suggest a **structural solution for many academic libraries** may be the use of **specialised autonomous teams** across current departmental divisions linked to client evaluation, using current staff skills (and recognising professional status for independent team-work and problem solving) but achieving subject specialisation through interest and experience. For example, an autonomous team directed to the sciences (or further science subdivisions depending on the size of the organisation) could consist of a collection development person for science subjects, a science cataloguer/s, a science reference person/s, a loans person/s dealing solely with sciences, together with an undergraduate science student/s, a post-graduate science student/s, and a number of science academics. Location of each library staff member is irrelevant (e.g. central or branch libraries) since IT makes any of the above members able to access and share information and work input, and together evaluate output, with branch libraries providing many user-oriented benefits. Centralised units should be retained for

administrative and policy overview units (e.g. authority control in cataloguing, related to policy and incorporating client needs). Planning and decision-making would become relevant, immediate, and appropriate, with motivation for effective client-oriented decision-making (and hence need for and use of management information) through directional interaction with user (completed task satisfaction) across all library staff within the autonomous team.

Strategic planning approaches for non-profit organisations : Affects on CSF methodology:

Toft (in Rabin 1989) surveys seven approaches to strategic planning/ strategic management applicable to public sector organisations, and relates these to the **elements of strategy** (with some approaches contributing more to one strategy element):

(a) Vision (what should the organisation look like in the future?)

(b) Mission (general scope of work, product line, market)

(c) Comparative advantage (competitor analysis; assessment of resources, strengths, vulnerabilities)

(d) Goals and objectives

(e) Critical success factors (CSFs)

(f) Shared values (corporate culture and ideology)

(g) Action orientation.

His seven approaches are:

(1) strategic audit, concentrating on detailed fact finding for (c);

(2) formal strategic planning, (the 'linear' or traditional model), providing a rational strategy formulation for (b) and (d), to the detriment of action learning;

(3) adaptive planning and implementation strategy emphasising action orientation.

(4) management training, or preparing management for strategic thinking;

(5) team building and corporate culture development implies individual training is insufficient, 'group think' is necessary to mobilise resources to specific ends, i.e. a systematic development of organisational climate using organisational development (OD) methods and transformational techniques;

(6) stakeholder approaches;

(7) self-organising systems.

(1) to (3) emphasise the "manipulation of economic and technical variables using analytical expertise, via a structured, sequential approach", while (4) and (5) "address the human side ... with a view to contributing to the shared vision and shared values elements" (p. 4). **Both (6) and (7) contribute to the CSF element** whilst also reviewing organisational structure as being the appropriate mix of hierarchies, markets, and hybrid structures.

Toft emphasises that **strategic thinking** is "basically creative and intuitive, although up-front

rationality for problem description and analysis is essential. Because of a bias toward imagination, invention, and design, strategic thinking is difficult to bring to pass by artificial means". Therefore, "rational thinking dominates the early intelligence stages and the end implementation and monitoring stages, while intuitive thinking and subjective judgement are crucial to idea generating and choice making." (Toft in Rabin 1989, 5-6). **(Could this apply to the application of the CSF methodology?)**

Strategic management has superseded strategic planning, in that it now incorporates other critical (strategic) administrative systems such as management control, communication and information systems, motivation and rewards, organisational structure, and organisational culture. **Performance measurement** is very much part of these elements. To encourage strategic thinking, structure must encourage creativity, informality, and flexibility, not on a one-off planning exercise basis, but permanently. Public strategy is largely accomplished, Toft says, through OD exercises, and budgeting and financial controls. **Approach (1)** has little involvement of organisational participants, and results in a technical report. **Approach (2)** takes place through prearranged planning workshops in a 'war room', and often fails to result in consensus, commitment, and action, with public sector goals more difficult to define, and traditionally less thought has been given to products, markets, or competitors. Time and discussion are needed to develop a common view of the organisation and its future. Toft sees disadvantages of approach (2) to the public organisation, being best suited to organisations with precisely defined 'bottom lines' of profit and productivity. It drives short-range plans well, is not suited to a dynamic environment, has heavy reliance on planning staff, difficulty linking the formal planning process with budget and financial controls, and there is lack of real staff participation except by top management. **Approach (3)** is suited to a clearly-defined constituency, with specific legislative directives, able to make continuous incremental adaptations to improved efficiency, in response to a constantly changing environment. It heightens sensitivity to the market/end users, improving performance and creating value for the customer. The emphasis is on change management, and has moved to strategic management rather than strategic planning. Advantages are that it is more suited to an 'open' organisation, with sensitivity to stakeholders, handles greater complexity, imposes greater rigor on plan execution, uses line and middle managers, uses facilitating planning staff, incorporating near-term strategies. However, it may produce a reactive style, submissive to the environment, with a lack of focus, less goals and results oriented, and less attention to internal R & D fostering innovation. **(Is this applicable to academic libraries? If so, implications for the use of the CSF methodology should be noted.)** **Approach (4)** involves training in analytical methods, process and facilitation, and strategic leadership development. Workshops instruct on how to conduct a strategic audit. Attitudes to value and culture are variable, as is the resulting use of OD, and group process and facilitation. Advantages include a sense of corporate identity and access to outside experts. However, disadvantages are that classroom learning may not translate to reality, learning material is generalised, not organisation-specific. (Middlemist & Hitt (1988, 508) also indicate studies have shown leadership

training does not necessarily result in greater productivity or effectiveness. **Approach (5)** assumes that successful strategy must be congruent with organisational culture, with cultural considerations used in the strategic planning process (e.g. Goodstein, Pfeiffer & Nolan model, in Pfeiffer 1986). The process is still basically sequential and rational-analytic, with more attention paid to values in the audit stage ('values audit'). Stakeholder attitudes to the organisation are seen as more important than output. Although this approach attempts to internalise organisational goals, and to bring organisational culture and strategy into harmony, it may not be sufficiently realistic about technical and economic considerations. Other results could be corporate cultism, verbose, impenetrable language, intrusions on individual privacy (Middlemist & Hitt 1988, 498). Results obtained at retreats may not endure. Radical breakthroughs may not be as meritorious as the Japanese incremental improvements to administration and operations. **Approach (6)** assumes that external groups and institutions largely affect the accomplishment of organisational response. Systematic approaches are required for dealing with multiple stakeholders and multiple issues. This approach is especially useful for environmental scanning for strategic alliances and joint venture partnerships, or the R & D organisation. Advantages are that real-time data and trends must be taken into account, it reduces worker resistance to change, encourages boundary spanning, blurs boundaries but also brings to the surface conflicts of interest. **Approach (7)** also suits the entrepreneurial organisation, where economic rather than administrative forces dominate, and innovation, creativity, risk-taking are encouraged. A departure from a strict hierarchy in structure is necessary, and bottom-up, trial-and-error, hybrid structures more suitable, with strong collegial/professional work ties across teams. **A focus on critical, core activities that foster uniqueness and competitiveness is essential.** Advantages are that it "focuses attention on strategically managing the forward and backward linkages of the total value added (economic) chain. This ensures that the **'best' in price, quality and availability for all support services, resources, and so on is provided to meet the core mission"** (Toft in Rabin 1989, 24). This has recently been translated into the TQM approach to strategic planning. Toft says the later approaches have grown to live with multiple and conflicting objectives (e.g. multicriteria analysis, multiple goal programming), and pay greater attention to integrating implementation with planning (a failure in many earlier methods).

Approaches (6) and (7) are most suited to organisations in a dynamic environment, with changing economic and social conditions and vocal constituencies. They most suit organisations with a service mission, and wishing to apply quality service standards. It would seem that the application of the CSF methodology would be most successful in organisations applying (or wishing to apply) these strategic management approaches.

TQM, strategic planning, and performance measures:

TQM grew originally from quality control methods in manufacturing industries. Market analysis (especially consumer analysis) techniques are widely employed. Emphasis is now on the satisfaction of the customer, or the customer's perception of what constitutes quality. "An effective management system should be designed to satisfy customer needs and expectations while serving to protect the company's interests. A well-structured quality system is a valuable management resource in the optimisation and control of quality in relation to risk, cost and benefit considerations" (AS 3904.1-1987,5).

Commitment to quality is through **continuing improvement** of all processes, services, and products of the organisation. Standards have been produced for both contract and non-contract situations, with one specifically for service organisations (AS 3904.2 - 1992).(Keen (1991) mentions work by various researchers who indicate all customers and service suppliers should undertake a contract in the form of a Proposal/ Acceptance/ Performance/ Satisfaction.) The application of the service standard should allow improved productivity, efficiency, cost reduction, and improved market share, with customer satisfaction and improved service performance through constant feedback of the customer's perception of the service provided . This is illustrated in its **service quality loop** (Figure 23). **Service performance analysis and improvement** is indicated through the establishment and maintenance of an information system for the collection and dissemination of data from all relevant sources (p. 17). Data will be available from measures of the service through supplier assessment (including internal suppliers within an organisation, one to the other), customer assessment (customer reaction, customer complaints, requested feedback, etc.), and quality audits. Data collection and analysis is to be a purposeful planned operation, to locate errors, their cause and prevention. Continuous improvement should be achieved by **"the characteristic which, if improved, would most benefit the customer and the service organisation"** (p. 18). Relevant data should be collected, with priority to those activities having the greatest adverse impact on service quality. In many ways, this approach reflects many of the CSF methodology's elements.

AS 1057-1985 *Quality assurance and quality control -Glossary of terms* gives definitions for basic quality terms. 'Accreditation' is the certification by a duly recognised body of the facilities, capability, objectivity, competence and integrity of an agency, service or operational group or individual to provide the specified service and/or required operation. 'Reliability' is the ability of an item to perform a required function under stated conditions for a stated period of time or at a given point in time. Quantitatively, reliability is the probability of success.

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Figure 23. AS 3904.2 / 1992. Service quality loop.
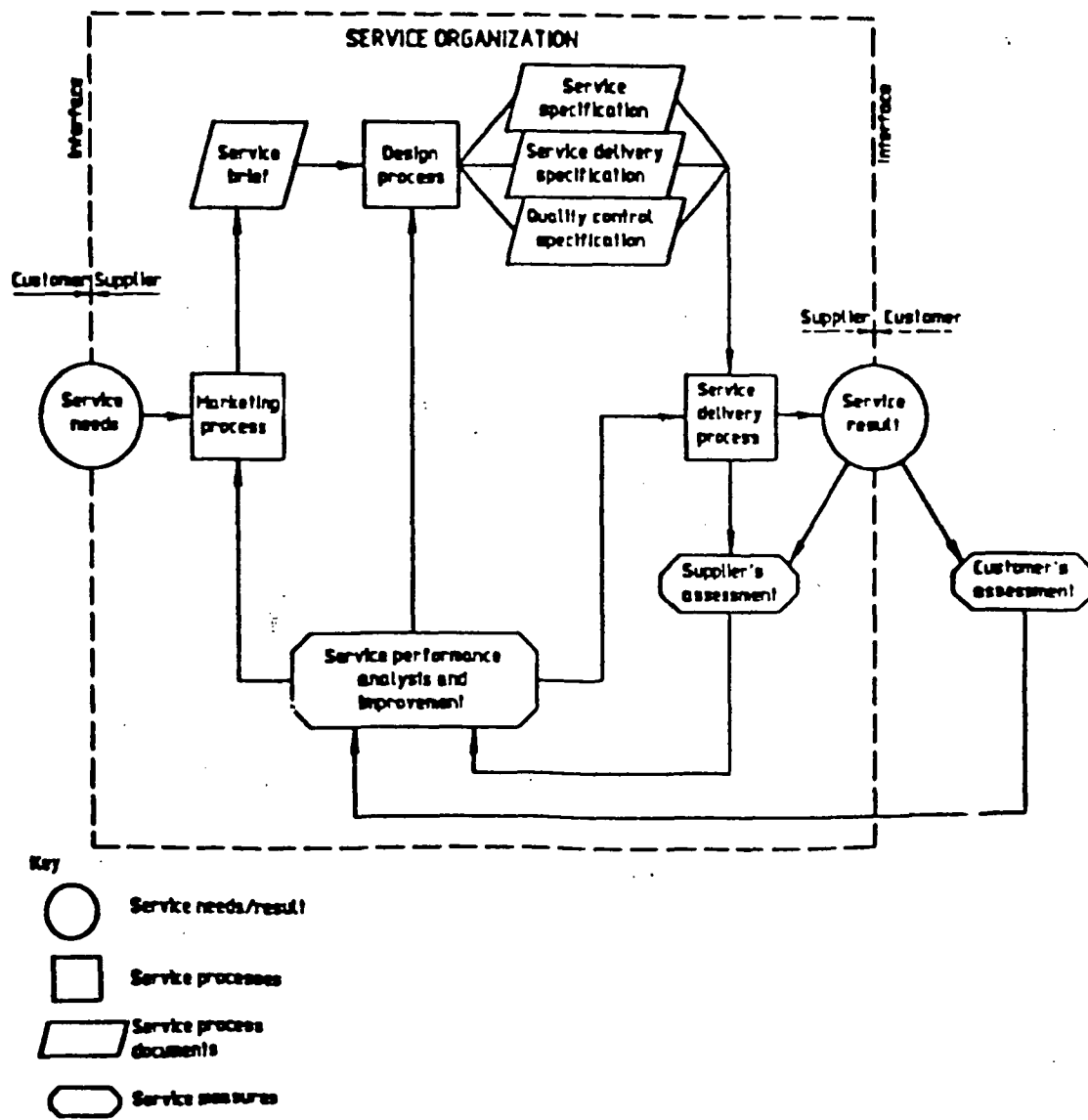
Service quality loop

The Australian Quality Awards Foundation encourages the application of quality systems. Its evaluation criteria are: leadership (170 points), policy and planning (80 points), information and analysis (130 points) which includes competitive comparisons and bench marking, people (200 points) including performance management, customer focus (220 points), quality of process/ product/ service (200 points) including improving their performance. The greatest emphasis in granting awards is in **improvement of quality** of products, services, management.

Current research into service quality includes work by Leonard Berry, Valerie Zeithaml, and A. Parasuraman, all based on previous marketing research. Berry's (1993) **model of service quality** includes five dimensions, rated for their importance, viz. (1) Reliability (ability to perform the promised service dependably and accurately) (32%), (2) Responsiveness (willingness to help customers and provide prompt service) (22%), (3) Assurance (knowledge and courtesy of employees, their ability to convey trust and confidence) (19%), (4) Empathy (individualised customer attention) (16%), (5) Tangibles (physical facilities, equipment, personnel and communication materials) (11%) - of which reliability is an **outcome dimension**, and the remaining are **process dimensions**, which are **critical in exceeding customer expectations. (Compare these with the dimensions arrived at in the Corporate CSFs in Matrix II of this study, and Broadbent & Lofgren's CSFs.)**

He lists various factors of interest for performance measures in a service organisation, e.g. his customer 'zone of tolerance', where a high price service has a low zone tolerance, while a low price service has a high zone tolerance. (What are the implications for non-profit academic libraries, mostly with no formal mechanisms encouraging customer feedback in place.) Berry says that because, generally, performance measures very often measure non-critical factors, wrong improvement steps are taken, often in resource areas, rather than areas of more importance to the customer, with the most critical falling into areas of fundamental service.

Performance measures in the library field:

To be effective, performance measures must be designed by each organisation in relation to its strategic position and aims. Approaches to performance measurement (e.g. Cronin 1985, Kantor 1984) and actual examples of performance measures (e.g. Van House 1987) can be helpful, but in no way should these be applied outwith the individual organisation's strategic planning context. Prime measures in general terms are meaningless without this relationship.

Library performance measures are still mainly tied to either the evaluative standards (ACRL 1989 - whose nine categories list few criteria indicating a measure of customer satisfaction or expectation, and no separate category exists with a specific customer focus), or deriving from existing service provision and manifest use, with little measurement of customer evaluation or feedback (e.g. Van House's measures). There is, however, currently a growing interest in client-centred approaches, using TQM

methods.

Comprehensive descriptions of methods for library performance measurement are given by both Kantor (1984) and Cronin (1985). Kantor deals with statistics, measurement of effort, measurement of availability using patron requests, measurement of delay by flow analysis, etc. No measures are given for assessing both manifest and potential customer requirements. Cronin (1985) acknowledges the need for extensive data collection and analysis, and the framework for measures within strategic planning. She bases categories of measures on a model with mission, budget, and programs as inputs and objectives and standards as outputs. For each service program, she lists possible measures, user expectations, standards, and objectives. She suggests that user expectations (e.g. almost all (95%) reference questions should be answered correctly) can be derived from surveys, previous evaluation studies, interactions with library staff, or a one-to-one basis. No further suggestions from market research techniques are made (e.g. exchange analysis, product analysis, market measurement and forecasting, consumer analysis, etc.).

Van House (1987) includes many measures of use made during sampled visits to an academic library (e.g. materials availability, facilities use, reference transactions, on-line search evaluation). This only measures manifest use. The only direct client-oriented measures are the General User Satisfaction Survey sheet, which she claims measures customer expectations, but no such questions on the form would seem to indicate this, other than answers to questions such as - What did you do in the library today? Were you successful? How satisfied overall were you with today's library visit?

The Ross report to the Higher Education Council (1990) (see Chapter 2) advises that performance measures be firmly placed within the strategic planning process, but the analysis of client/market needs is not discussed.

Bommer & Chorba (1982) see benefit in evaluating three attributes of service: (1) quality from a user's viewpoint; (2) value to the organisation; (3) effectiveness from a performance standpoint. These attributes are then divided into factors such as accessibility, applicability, technical quality, timeliness, recall ratio (turnaround), and precision ratio. These are really extensions of Hamburg's(1974) earlier recommendations, and incorporate subjectively derived value, e.g. Oldman & Wills' study (1977).

Recent research still being undertaken by Browne & Edwards (1991), using the consumer literature to investigate how users assess the quality of information services in university libraries, indicate a dichotomy between service criteria critical for academics and for library staff, thus supporting findings in the second part of Broadbent & Lofgren's (1992) study. Browne & Edwards find the Van House measures do not give a basis for action where a problem is identified, nor explore the user's view of what a good service might be, still measuring what **librarians** think is critical in information services

(although not pointed out as such by Broadbent & Lofgren, this is also reflected in their derived list of 43 CSFs, see Chapter 3).

Bullen & Rockart (1981) clearly put performance measurement within the strategic planning sequences. They are to be "specific standards which allow the calibration of performance for each critical success factor, goal, or objective" (p. 8). That is, calibration or bench marking arrived at for that particular organisation in its particular planning stage, to monitor the achievement of goals, objectives, and mission of that organisation. In order that these be appropriate for a **service organisation** to successfully achieve its mission, etc., they must be correctly derived from the needs of the first cause for that service organisation, namely its clients. Benchmarking of performance can be achieved in individual organisations to meet their needs, but also compared on a wider (national) basis to attain "best practice".

Therefore, it is suggested that a much more realistic customer-focused approach to service evaluation and performance measures for academic libraries, or libraries in general, will be made through using the quality service standards and total quality management approaches to achieve customer satisfaction, at a crucial time for libraries in view of their competitive IT environment. The use of the CSF methodology fits well into these approaches, and it is hoped that future studies or reports on CSF applications will be made, and that the outcomes, recommendations, and observations of possible organisational influences of this study may be helpful to them.

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APPENDIX L Criteria for high-performing organisations.

(Golembiewski & Klepper 1988, 3):

(1) They are performing excellently against a known external standard. The clearest example is a team that does more of something, such as manufacturing automobiles, in a given time period.

(2) They are performing excellently against what is assumed to be their potential level of performance.

(3) They are performing excellently in relation to where they were at some earlier point in time. (This is a developmental criterion.)

(4) They are judged by informed observers to be doing substantially better qualitatively that other comparative systems.

(5) They are doing whatever they do with significantly less resources that it is assumed are needed to do what they do.

(6) They are perceived as exemplars of the way to do whatever they do, and thus they become a source of ideas and inspiration for others. (This is a style criterion).

(7) They are perceived to fulfil at a high level the ideas of the culture within which they exist - - that is, they have 'nobility'.

(8) They are the only organisations that have been able to do what they do at all, even though it might seem that what they do is not that difficult or mysterious a thing.

CSF study note: An attempt to establish measures against key areas (CSFs) gives the opportunity to (a) improve performance against ones own previous measures, (b) assess the impact of resource allocation vs. performance, (c) refine the desired levels and types of performance in those areas.

A COMPARISON OF TRADITIONAL AND

INFORMATION SUPPORT DATA BASES

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	Traditional Transaction Data Base	✱ Information Support Data Base
Purpose and use	● support transaction processing systems	● data repository
Data attributes	● up-to-date ● accurate ● consistent ● complete	● timeliness not critical ● "hard" and "soft" data ● consistent ● completeness not always possible
Storage method	● optimized for efficiency of computer resources	● tables of data designed for easy access & chang
Ability to change the data base	● difficult ● only after much consideration of "downstream" effects	● easy to accomplish ● data base designed for change and evolution

Appendix III. Evaluative criteria for academic libraries. (ACRL University Library Standards Review Committee 1989, 686-687)

The questions that follow are suggested means of reaching a proper assessment of a library. There may be other questions that are more appropriate for any individual university library and all libraries should use any measures that are available locally.

(1) Planning:
(A) Does the institution include library participation in its planning process?
(B) Are there plans for future library development? (C) Is the mechanism for making these adequate?
(D) Do the plans show appropriate consultation within the university?
(E) Is the library staff properly involved in planning and decision-making?
(F) Are there appropriate strategies for reaching stated goals? (G) Are the goals and timetables realistic?

(2) Adequacy of Budget:
(A) Are the budgetary resources sufficient to support current activities and to provide for future development?
(B) Does the budget support the purchase and provision of access to the necessary range of library materials?
(C) Does the budget support the appropriate number and kinds of staff for the programs offered?
(D) Is the salary and benefits program adequate and designed to foster retention and recognise achievement?
(E) Does the budget provide adequate support for other operating expenses, including automation services?
(F) Does the budget provide adequate support for new programs and innovations?
(G) Does the process by which the budget is developed allow for appropriate consultation?
(H) Does the library director have the appropriate level of discretion and control over the expenditure of the allocated budget?

(3) Adequacy of Human Resources:
(A) Are the numbers of staff adequate for the services provided? (B) Is the distribution of staff among programs appropriate?
(C) Are the proportions of professional and support staff appropriate to the functions served?
(D) Is there an established staff development program for maintaining and improving education and skills of library staff?
(E) Are staffing needs properly taken into account in planning new ventures or expansions of existing programs?
(F) Are the policies and procedures for handling staff matters properly formulated and available to staff members? Are they in written form? Do they facilitate performance or hinder it?
(G) Is there a means of staff utilisation/job analysis to assure that positions are properly assigned by level and that the staff are performing work appropriate to the level?

(4) Adequacy of the Collection:
(A) Is there a written policy for managing the collection?
(B) Does the policy address issues of user satisfaction? (C) Is there provision for considering change in academic needs?
(D) What basis is used for determining collection levels and sizes?
(E) Is there evidence of areas of under supply? (F) Is there evidence of areas of oversupply?
(G) Does current collecting reflect an appropriate level of program support?
(H) Is there appropriate provision for the review of the current collections?
(I) Is there provision for the transfer and relocation of collections or portions of collections if and when appropriate?
(J) Is there provision for the consideration of consortial and other relationships?

(5) Adequacy of Buildings and Equipment:
(A) Are the buildings sufficient to house staff and collections?
(B) Are the buildings adequately maintained? (C) Are there appropriate space plans?
(D) Is there appropriate provision for use by the handicapped?
(E) Is the range, quantity and location of equipment adequate to the programs offered?
(F) Is the equipment adequately maintained?
(G) Is there budgetary provision for upgrading, repair, or replacement?
(H) Is there evidence of planning for the use of new and improved technologies?

(6) Access and Availability of the Collections:
(A) Are the policies governing access to and use of the collections clearly stated and readily available?
(B) Are the collections properly housed? (C) Are the collections actually accessible and available?
(D) Are the bibliographical records appropriate?
(E) Is staff that is provided for automation, technical services, and other collection-related functions sufficient for the task?
(F) How readily can the library provide materials not owned? (G) What kinds of co-operative programs are in place?
(H) Is the level of staff support adequate?

(7) Preservation and Conservation:
(A) Does the library have proper environmental controls? (B) Does the library have an emergency plan?
(C) Does the library budget have adequate provision for the preservation and repair of damaged, aged, and brittle books?
(D) Does the library have adequate safeguards against loss, mutilation, and theft?

(8) Resource Usage:
(A) What are the library policies for resource use?
(B) How much is the collection used? (C) How well is the collection used? (D) What is the fulfilment ratio?
(E) What is the relationship between collection size, collection growth rate, and collection use?

(9) Adequacy of Services:
(A) What range of services is offered? Over what range of time?
(B) Are these services appropriate to the mission of the library?
(C) Are the locations where the services are offered adequate to the purpose?
(D) What statistics and other measures of quality and quantity are maintained?
(E) Are the size and distribution of public service staff adequate for the numbers and kind of users?

Appendix IV. The output measures. (Van House 1987, 5)

General user-satisfaction:
(1) General satisfaction.
Users' self-reports of success during this library visit on each of several library activities, ease of use of the library, overall satisfaction with today's library visit.

Materials availability and use:
(2) Circulation.
Number of items charged out for use, usually (though not always) outside the library. Includes initial charges & renewals, general collection & reserves.
(3) In library materials use.
Number of items used in the library but not charged out.
(4) Total materials use.
Total number of uses of library materials, the sum of circulation and in-library materials use.
(5) Materials availability.
Proportion of user searches for library materials that are successful at the time of the user's visit.
(6) Requested materials delay.
Time users must wait for requested material. This may be computed as the proportion of materials requested that are available within x number of days, or as a median number of days required to receive requested materials.

Facilities and Library Use:
(7) Attendance.
Number of user visits to library.
(8) Remote use.
Number of library uses for which user does not come to the library, such as use of document delivery services, access to library catalogues or other on-line databases maintained by the library from terminals outside the library, or telephone, e-mail, or fax requests for materials or services.
(9) Total uses.
Total uses of the library in person and remote, sum of attendance and remote users.
(10) Facilities use rate.
Proportion of time, on average, that a facility is busy. Facilities include user seating and workstations and user equipment such as photocopy machines.
(11) Service point use.
Average number of users at a service point. Service points are staffed public service sites, e.g. circulation, reference, information desks.
(12) Building use.
Average number of people in library at any one time.

Information services:
(13) Reference transactions.
Number of. A reference transaction is an information contact that involves the knowledge, use, recommendation, interpretation, or instruction of one or more information sources by a member of library staff.
(14) Reference satisfaction.
Users evaluation of the outcome of reference transactions, the service experience, & overall satisfaction with the reference service.
(15) On-line search evaluation.
Users' reports of satisfaction with performance of the search intermediary and the search product, & overall satisfaction with the on-line search.

Appendix V. Borbely's CSFs for the IRC (Borbely 1981, 207) :

1979 Critical Success Factors for the IRC:

(1) **Relevance & Quality of IRC Services** - IRC services effectively provide timely and responsive information service in support of priority objectives and activities.

(2) **Customer Image** - Image of IRC as a professional and highly capable research & information service organisation with a strong service orientation.

(3) **Management Image** - The IRC is regarded as a cost-beneficial operation making significant contributions to corporate activities.

(4) **Staff Satisfaction** - Morale of IRC staff is maintained at an acceptable level.

(5) **Promotion of IRC Services** - Promotion of an instruction in IRC services to all levels of management of all Long Lines locations.

(6) **Sensitivity to Changes in Communications Technology** - IRC understands the developments in communications technology and their significance for IRC information services and IRC clients.

1980 Critical Success Factors for the IRC:

(1) **Meeting Increasing Demand for Service** - Increase staff &/or develop necessary information systems to provide timely response to the growing number of complex research requests.

(2) **Management Image** - IRC recognised as a service-oriented organisation which enhances management performance in key corporate activities and objectives and which enhances IRC client productivity.

(3) **Corporate Wide Information Support** - Expand IRC services to executives of all Long Lines Department and increase IRC services to non-marketing/sales management personnel.

(4) **Staff Satisfaction** - Continue to attract and maintain a staff of highly qualified information specialists.

(5) **Information Technology and Industries** - Understand changes in information technology and in the information industries and integrate these in IRC information services, as appropriate.

Indicators for IRC Critical Success Factors: The IRC monitors the following indicators to determine satisfaction of its critical success factors:

(A) Service Performance & Relevance:

(1) Percentage of successful research transactions. (2) Percentage unsuccessful requests.

(3) Percentage significant requests. (4) Client feedback (testimonials, awards, etc.)

(5) Percentage increase in service use (current/previous years). (6) Degree of complexity of research requests.

(7) Repeat use of IRC services.

(B) Customer Image:

(1) Percentage increase in requests. (2) Level of requestors. (3) IRC participation in client project design and development.

(4) IRC participation in client seminars. (5) Customer feedback.

(C) Management Image:

(1) Expansion &/or maintenance of IRC budget and staff.

(2) Management concurrence on principal IRC services and activities. (3) Management feedback.

(D) Staff Image:

(1) Client-staff exchange. (2) Productivity figures for IRC staff. (3) Volume of client complaints.

(4) Transfer requests by IRC staff. (5) Staff complaints. (6) Tardiness/ absenteeism. (7) Decrease in IRC search requests.

(E) Promotion of IRC Services:

(1) Number of presentations to management (at all locations). (2) Distribution of descriptive literature concerning IRC services.

(3) Customer/ management feedback. (4) Audio-visual materials describing IRC services and activities.

(F) Sensitivity to Change in Communications and Information Technology:

(1) Implementation of new technology and systems in advance of widespread implementation by information centres. Technology and systems in question include: computer retrieval systems, computerised internal databases, automated technical processing, 'office of the future' technology. (2) Professional recognition of IRC as a leader in this area.

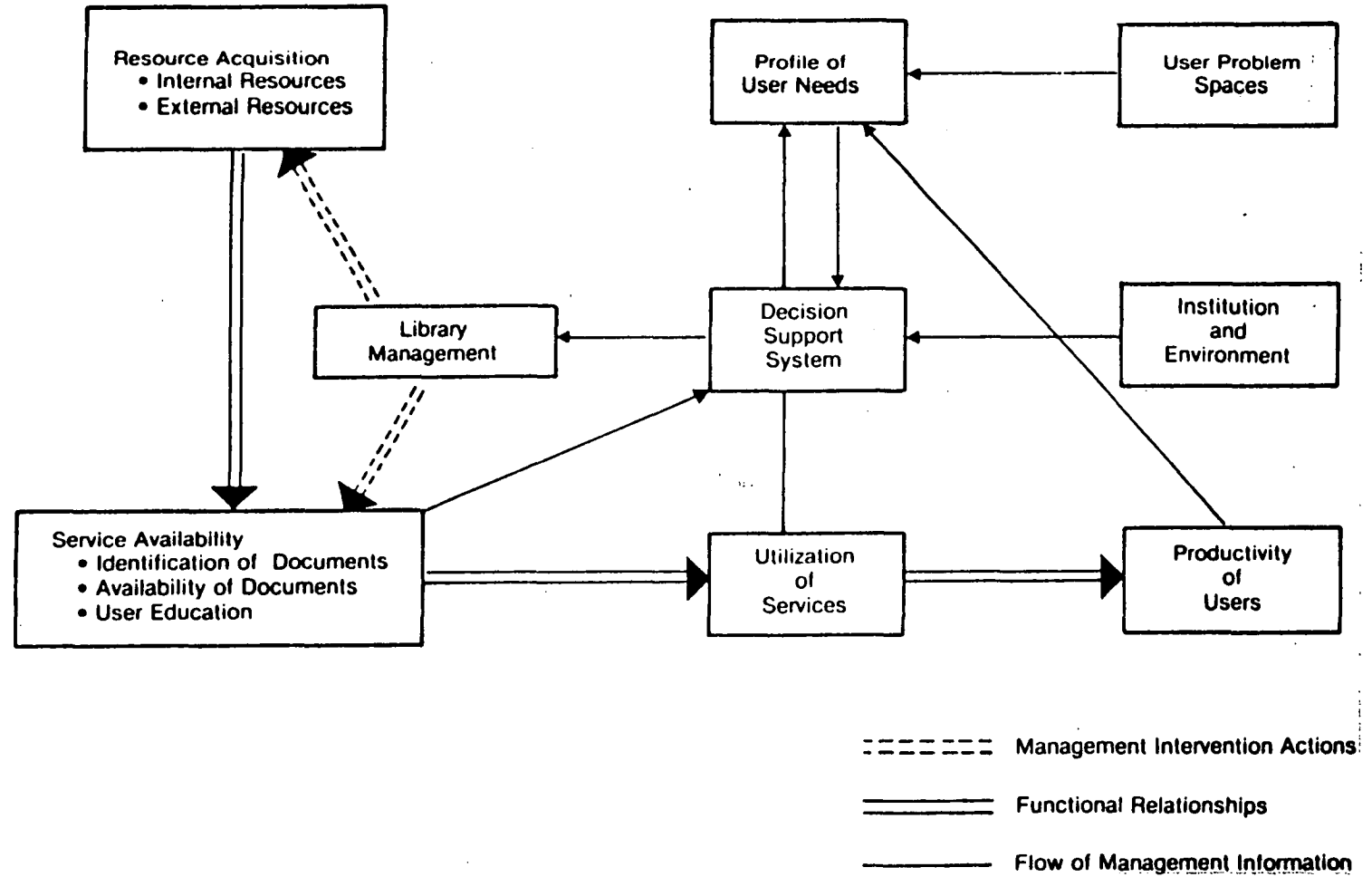(3) Level of proficiency of IRC staff in use of computer technology.

Appendix VIa. Decision tasks of academic libraries (Bommer & Chorba 1982, 26).

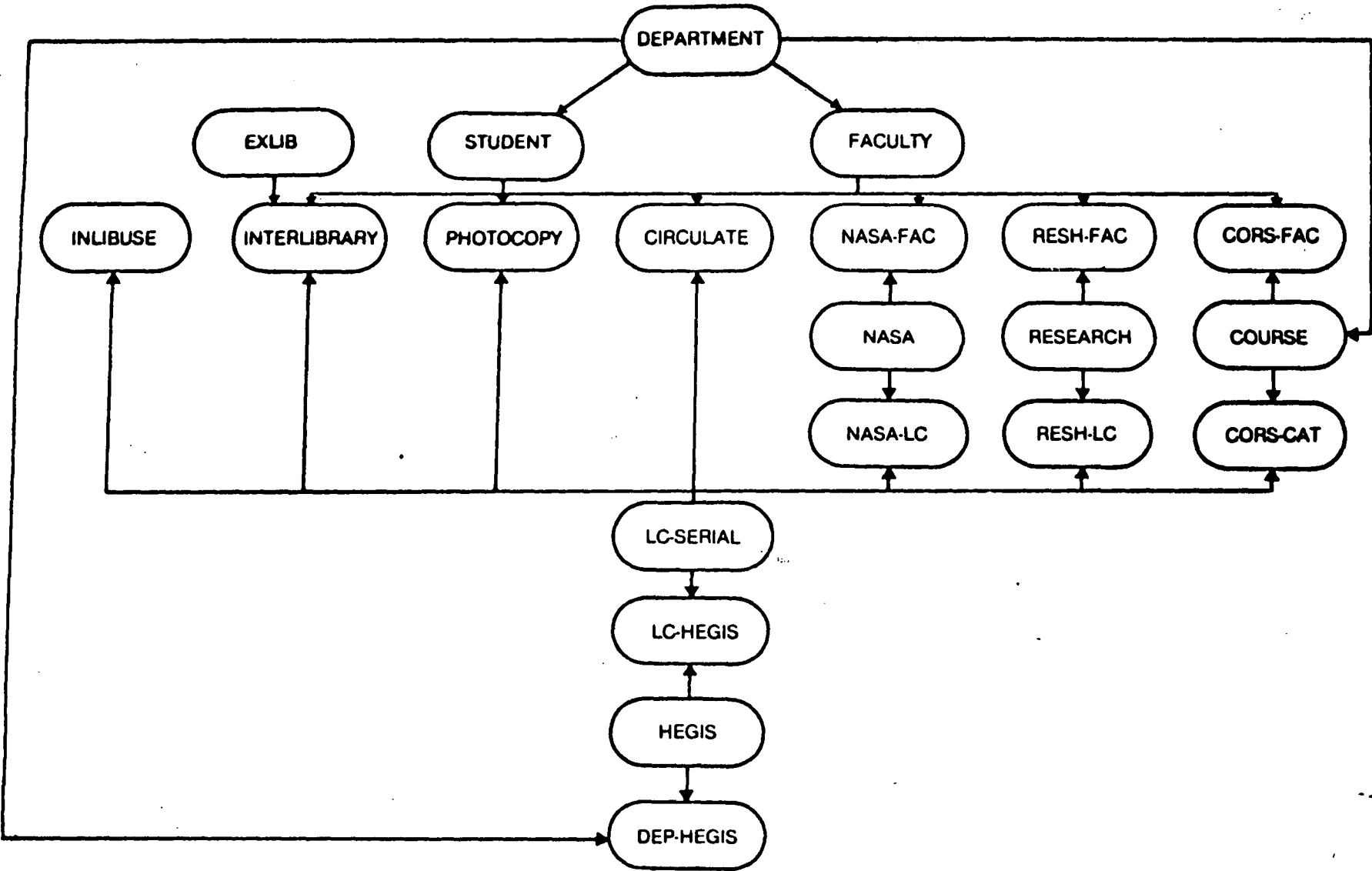|		Decision Tasks	
Key Functional Objective Area	Strategic Planning Decisions	Management Control Decisions	Performance or Effectiveness Measures
Collection Development	Determining collection development goals.	Allocation of funds to subject areas; Funds allocated for books, serials and reports; Types of books and serials to be acquired; Degree of duplication; Weeding policy and procedures; Current vs. retrospective acquisitions; Replacement of lost, damaged or worn documents; Selection process.	Percent held of sample bibliographies; Patron complaints; Number of reserves for books; Circulation/subject area/document; Circulation/user group; Citation distribution analysis; Selection cost/document; Minimum standards; Ratio of documents selected/documents published; Document retrieval time for local/interlibrary loan; Percent demands satisfied.
Technical Services	Level of cataloging; Timeliness and cost efficiency of document processing.	Acquisition process; Cataloging data source; Type of public bibliographic record; Maintenance of public bibliographic records; Physical preparation and maintenance of documents.	Request-receipt time; Receipt-shelf time; Cost/document processed; Entry points in catalog per document; Patron complaints; Public service staff complaints.
Reference and Bibliographic Service	Level, coverage and quality of reference assistance; Level, comprehensiveness and quality of document identification service.	Ready reference; Bibliographic search; Current awareness; Public relations.	Bibliographies prepared; Searches conducted; Search time; Percent relevant citations obtained; Patrons served; Cost per search; Cost per relevant citation; Sample recall ratio; Response time; Relevant bibliographies services/subject area; Number served by SDI; Requests per SDI. Reference questions received: Directional Informational Reference; Percent questions answered; Cost per question; Test score for sample questions; Percent time staff providing reference service; Percent telephone requests; Number patron orientation programs; Number patrons contacted; Number of class presentations; Complaints.

Appendix VIb. Decision tasks of academic libraries (Bommer & Chorba 1982, 27).

Key Functional Objective Area	Strategic Planning Decisions	Management Control Decisions	Performance or Effectiveness Measures
Collection Access	Ease of access to collection.	Hours of library service; Arrangement and location of collection; Level of collection security; Reshelving and shelfreading activities; Circulation control policy and procedures; Quantity and type of AV equipment; Reserve collection policies and procedures.	Reshelving time; Percent documents misshelved; Percent requests in remote storage; Storage cost/document; Percent documents lost; Half-life/periodical subject area; Percent documents in correct location; User access time; Document retrieval time; Percent demands satisfied; Number of patrons; Number of user hours; Percent collection in open stacks; Circulation/user group; Circulation cost/documents circulated; Circulation/document in open stacks; Circulation/document in closed stacks.
Access by Interlibrary Loan	Interlibrary loan cooperative arrangements.	Accessing documents held by other libraries; Supplying documents to other institutions.	Retrieval time; Percent documents obtained; Cost per document; Number of documents borrowed.
Physical Facilities	Quality and adequacy of user area and furnishings.	Allocation of area; Number and type of user furnishings.	Number of users; User hours; Seating/student; Staff area/staff member; Density of document storage.

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Appendix VII. Model of functional components of an academic library (Bommer & Chorba 1982, 78):

Resource Acquisition
- Internal Resources
- External Resources

Profile of
User Needs

User Problem
Spaces

Library
Management

Decision
Support
System

Institution
and
Environment

Service Availability
- Identification of Documents
- Availability of Documents
- User Education

Utilization
of
Services

Productivity
of
Users

= = = = = = =   Management Intervention Actions

━━━━━━━   Functional Relationships

─────────   Flow of Management Information

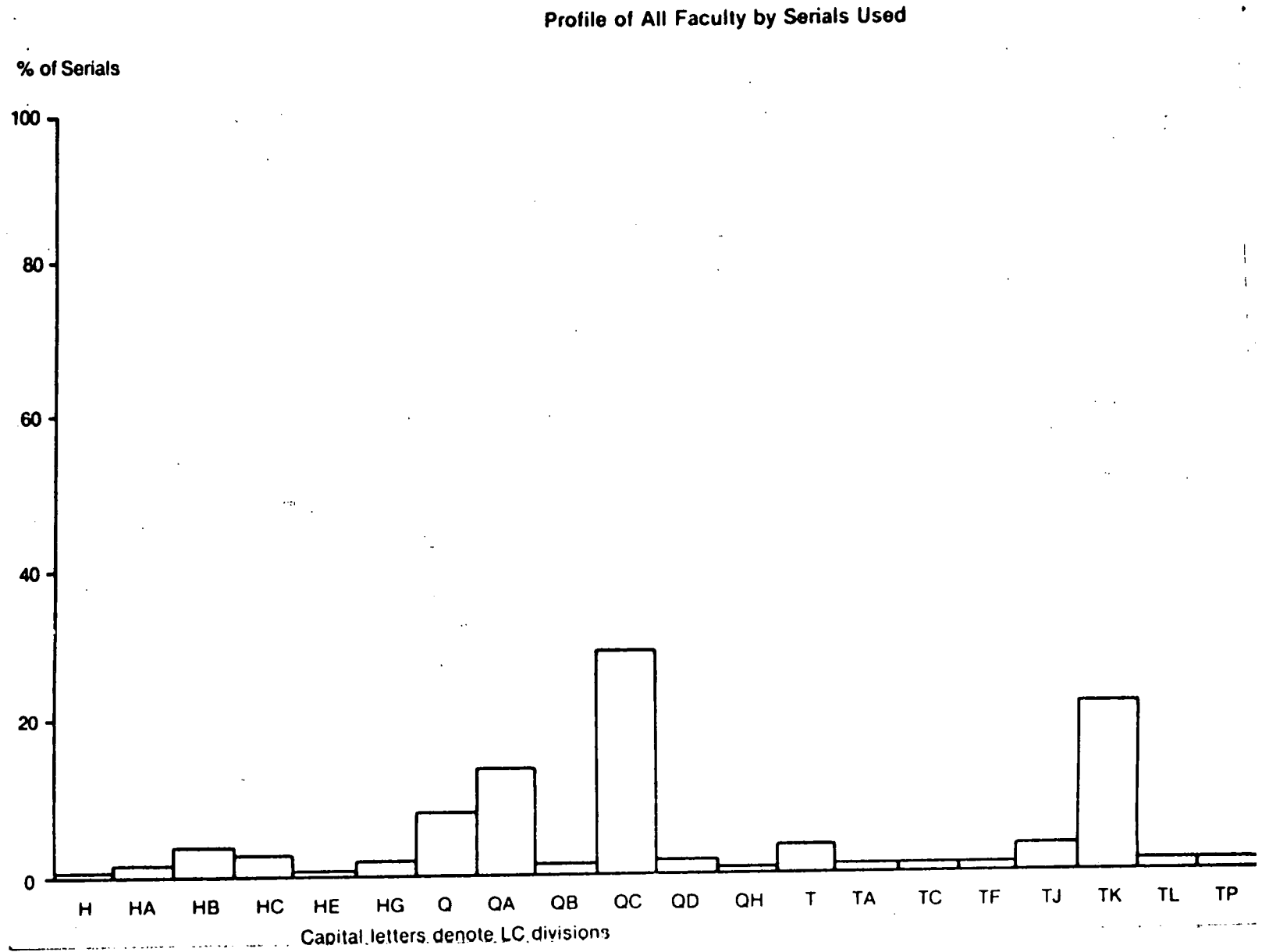Appendix VIII. Complete data base schema - academic library (Bommer & Chorba 1982, 126):

Appendix IXa. Profile of all faculty by publications authored (Bommer & Chorba 1982, 105) :

Profile of All Faculty by Publications Authored

% of Documents

Capital letters denote LC divisions
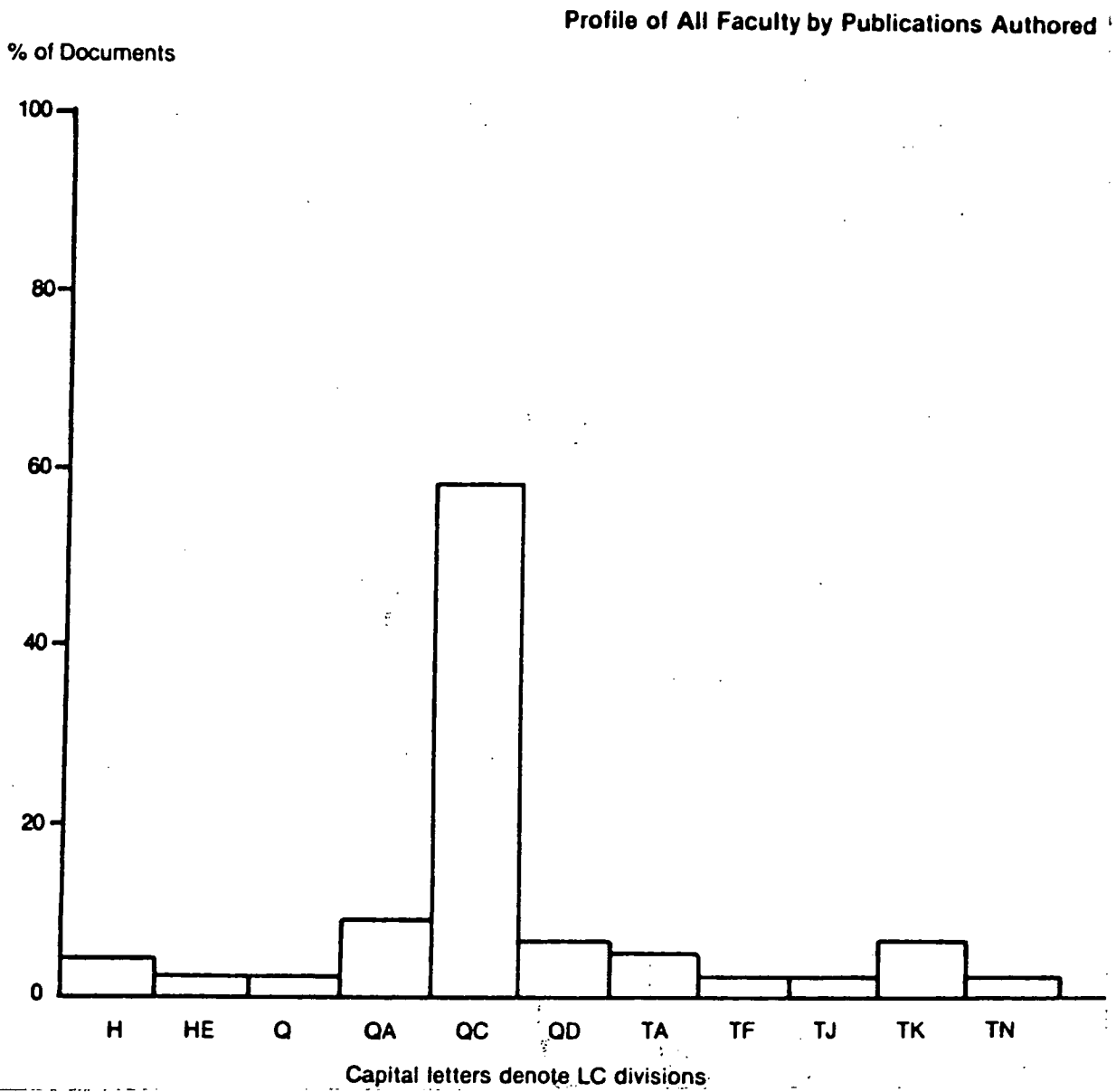
Appendix IXb. Profile of all faculty by research survey (Bommer & Chorba 1982, 107):

Profile of All Faculty by Research Survey

% of Activities

Capital letters denote LC divisions—
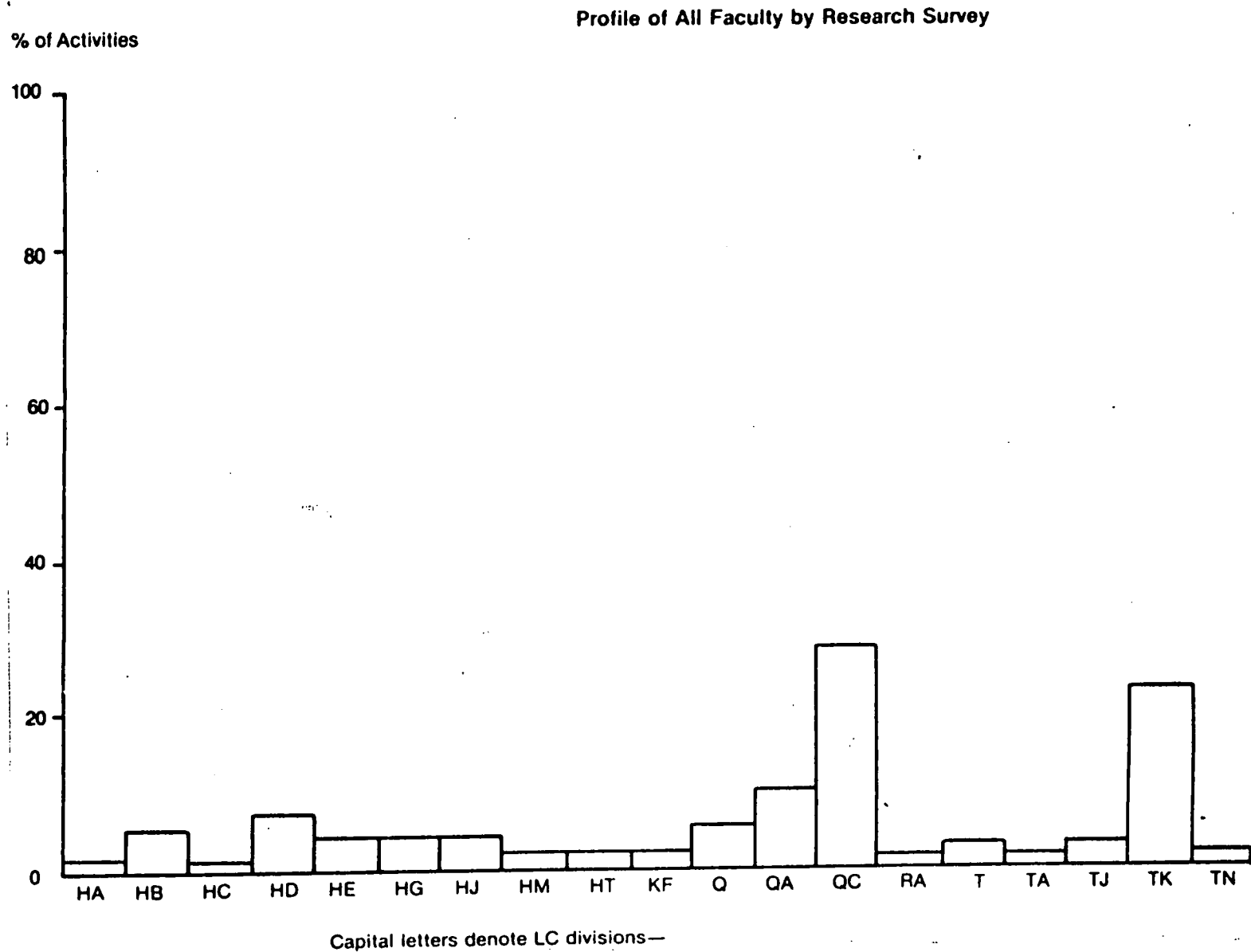
Appendix IXc. Profile of all faculty by serials used (Bommer & Chorba 1982, 108):

Profile of All Faculty by Serials Used

% of Serials

Capital letters denote LC divisions

% of Productivity Scores

Profile of All Faculty by Combined Score from Research Projects and Publications Authored

100 —

80 —

60 —

40 —

20 —

0 —

HA HB HC HD HE HG HJ Q QA QC QD T TA TJ TK TN
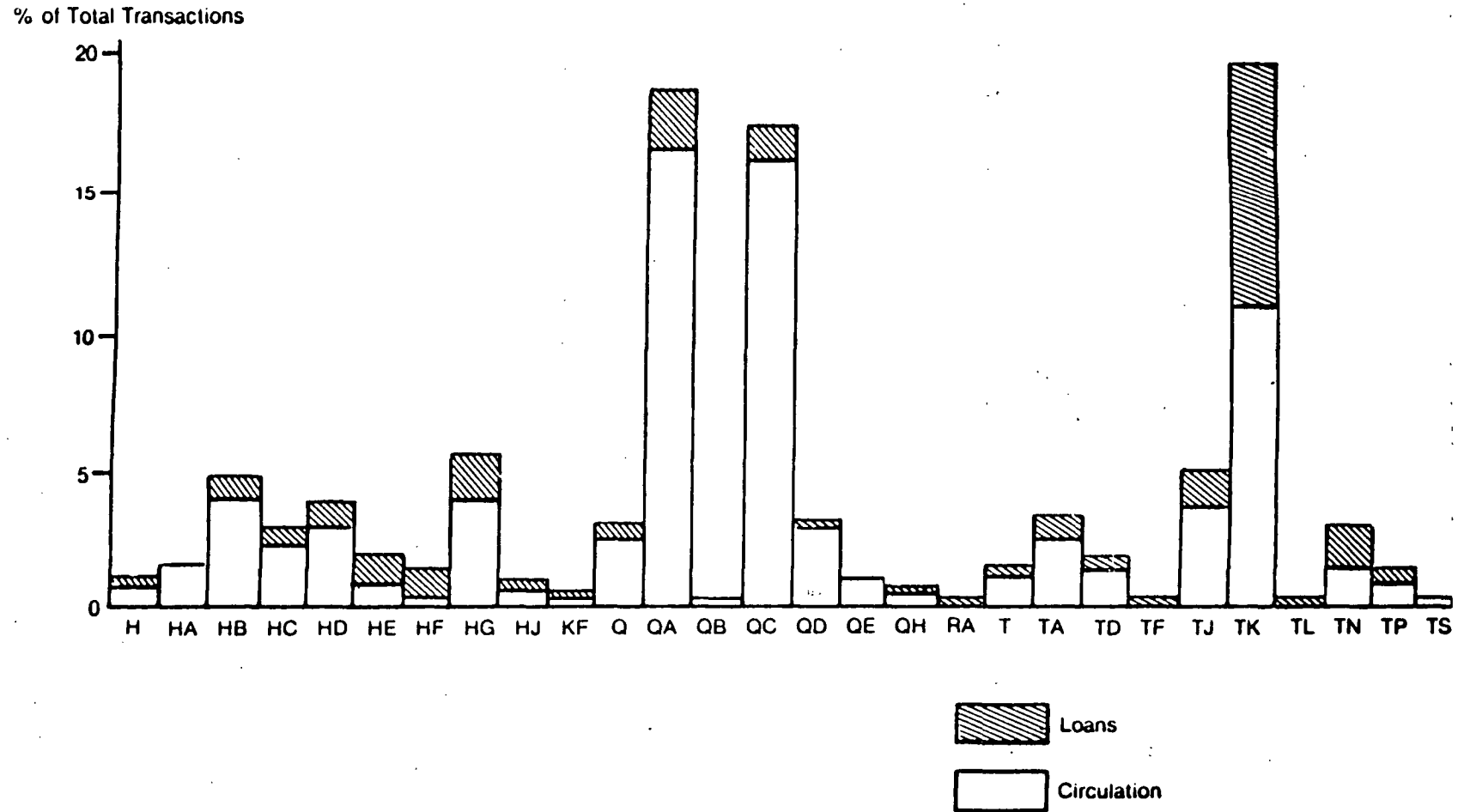
Capital letters denote LC divisions

Appendix IXd. Profile of all faculty by combined score from research projects and publications authored (Bommer & Chorba 1982, 110) :
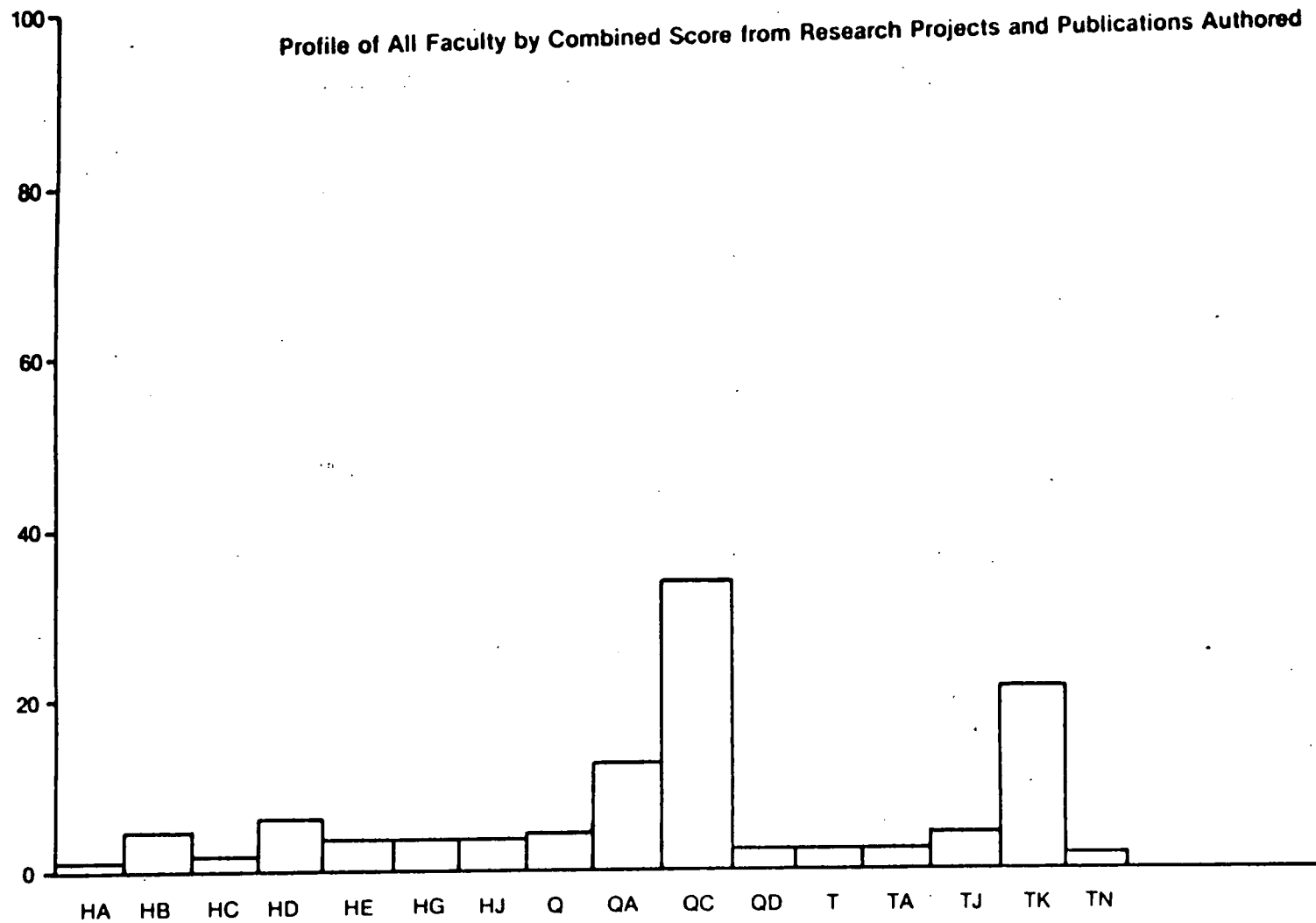
135

% of Total Transactions

Capital letters denote LC divisions

Appendix IXe. Circulation and interlibrary loan transactions - summary report (Bommer & Chorba 1982, 118):

% Within Each Category

Distribution of Teaching, Research, Interlibrary Loan and Circulation Activity

- Teaching
- Research
- Interlibrary Loans
- Circulation

Capital letters denote LC divisions

Appendix IXf. Distribution of teaching, research, interlibrary loan, and circulation activity (Bommer & Chorba 1982, 121)

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