UNIVERSITY OF TASMANIA

Department of Political Science

UNIVERSITY LIBRARY ADMINISTRATION, WITH SPECIAL REFERENCE TO NEW TECHNOLOGY: A TASMANIAN CASE STUDY

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of the Master of Arts Degree

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This thesis contains no material which has been accepted for the award of any other degree or diploma in any university, and to the best of my knowledge and belief the thesis contains no copy or paraphrase of material previously published or written by any other person, except where duly acknowledged in the text.

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ABSTRACT

This thesis examines the impacts of new technology on university library administration as reflected in a case study. The institution chosen for the study is the University of Tasmania Library, which has recently adopted a totally integrated automated library system based on the Library's own mini-computer. The opening chapter introduces the topic, and puts forward five propositions. These include propositions about the use of new technology to reinforce the organization's niche within the parent institution; the role of technology in environmental turbulence and uncertainty; the effects of new technology on routineness, standardization, formalization and flexibility; the structural impacts of new technology; and the human and social impacts upon organization members. The chapter continues with a review of relevant literature, and concludes with a description of the methodology employed. Subsequent chapters consider the University Library in the light of each of the propositions. Two chapters are devoted to the background and particular circumstances of the organization - one on its history, nature and technology, and another on its task environment. The nature of the technology employed by the University Library is then examined in more detail in an attempt to classify it. Perrow's scale of routineness is chosen as a suitable classification scheme, and the effects of automation on the level of routineness of the organization's technology are considered. A tendency towards increased routineness, standardization and formalization is observed, but there is little corresponding loss of flexibility. Rather, new opportunities for creativity and flexible services are noted. Structural impacts of the introduction of automated systems are examined. While the formal structure remains virtually unchanged, there are changes occurring in the informal organization. The results of a survey of organization members indicate that the human impacts of automation generally have been minor, although a small group of employees experiencing loss of job satisfaction and deteriorating social relationships is identified. Finally, the impacts observed in the case study are considered in the context of the particular circumstances of the University of Tasmania Library - its history, nature, technology, environment and management, as described in the earlier chapters - and concludes that these are all contributing factors to the nature of the impacts of the introduction of new automated systems in the particular organization.

Chapter 1

INTRODUCTION

Purpose of this study:

Against a background of rapidly changing technology affecting organizations of most kinds, the major purpose of this study is to attempt to show how an organization of a particular kind, and the people who work in it, have been impacted by the introduction of new technology. It is suggested that the university library, as a relatively traditional and stable organization, slow to change and sheltered from much of the environmental turbulence experienced by less protected organizations, presents a particularly interesting subject for study as it copes with the rather sudden impacts of new technology upon its systems and its members. In order to achieve some depth in the pursuance of these themes, a case study of an individual university library is the method chosen for the study. Consideration is given to the background of the chosen organization. One chapter is devoted to an examination of the particular nature and history of the University of Tasmania Library, and to the technology it has employed. A further chapter examines the nature of the task environment within which Australian university libraries operate, with particular attention to the roles of technological factors within that environment. Subsequent chapters study the impacts of new technology on organizational and human aspects of the University of Tasmania Library. In this introductory chapter, five propositions are presented, and the very considerable literature of the organizational impacts of technology, with special emphasis on the literature dealing with automation and libraries, is reviewed. Finally, the methodology and the delimitations of the study are discussed.

New technology is one of the more important elements in the task environments of many organizations in modern society. The impact of rapidly changing technology upon organizations is a topic increasingly discussed and of very considerable implications for society at large, including such issues as redundancy and unemployment, work satisfaction, the availability and cost of products and services, the structure of organizations and the survival of social institutions, and of many types of enterprise both commercial and publicly funded. Kast and Rozenzweig (1979) assert

> 'Technology will continue to be one of the most vital forces affecting organizations and their management in the future. It should be re-emphasised that technology is not just mechanical or electronic hardware but relates to the knowledge required for task performance. Not only will the organization of the future be influenced by advancing knowledge, it will be the primary social vehicle creating change.' (p.596)

Libraries are no exception to this phenomenon. Information technology in particular is undergoing rapid changes due to dramatic developments in computing and telecommunications and this is proving to be a source of new opportunities and new constraints for libraries. The basic library functions of ordering, storing and retrieving information lend themselves well to automation (Presthus, 1970) and the automated library offers opportunities for services far beyond those of the traditional library. At the same time, new methods of information transfer offer challenges to the role of the library. Libraries and librariansare undergoing a crisis of confidence in their uncertainty about the future role of libraries in the information society.

Libraries, and university libraries in particular have traditional values, established procedures and a long standing view of their position and role within their parent organizations. The university library generally has enjoyed a comparatively stable task environment, with few competitors, small and homogeneous supplier and client groups, and relatively benign regulatory bodies. If there has been uncertainty it has usually been in the area of scarce financial and staff resources. The new technology, however, has not only challenged traditionalism in library operations but also gives rise to uncertainty about the library's ability to survive in a new world of automated information transfer. For example, there is uncertainty about whether new facilities such as videotex, cable television and satellite communication are competitors for the library, or whether they are tools to be used by a revitalized modern library service. It is by no means clear that the university library's traditional stock-in-trade - books and other printed materials - has an assured future; just as the traditional library, and indeed the librarian, might not continue to exist in any recognizable form.

Jenkins (1982) suggests that despite applying new technology to its operations as a strategy for survival, the academic/research library is limited in its ability to adjust to meeting the new information needs of its clients. There are new competitors in the task environment, of which the library must take note. Rather than allowing itself to be swept along by the torrent of new technology, the library must both determine and articulate its role in a changing information environment.

Lancaster (1978), among others, forecasts a paperless information system in which academics and scholars are all linked by an electronic system, and not only communicate with each other via a personal computer terminal, but also use it for publishing and accessing scholarly papers. Such a system would seem to usurp the traditional role of the academic library. In the meantime, a bewildering array of computing and communications technology is already with us, and university libraries are grappling with decisions about which technologies to employ, how to introduce them to library workers and to library users accustomed to the traditional university library environment. It is a natural reaction to resist change and to cling to existing structures and methods but it is becoming increasingly difficult for the university library to ignore the challenges of new technology.

Epstein (1983) notes that

> 'As with other areas of the computer industry, library automation is growing at an accelerating pace ... the decisions will become harder as the options become more complex. The growing range of available products at both the larger and the smaller library ends of the spectrum means that no library can routinely dismiss automation because it is either too large or too small.'

These challenges arise at a time of general financial stringency for Australian university libraries. Scarcity of funds and increased demands for efficiency and accountability add to the turbulence of the task environment. New technology is likely to affect the structure and the productivity of organizations, and the attitudes and behaviours of their members.

Taylor (1971) in a review of studies of organizational change says:

> 'It seems clear that there is a systemic interdependence among the subsystems of an organization. Changes cannot be effected in the technical system without repercussions in the social system ... Systemic change involves changed inputs from the environment which create internal strain and imbalance among system subunits.' (p.13)

As the university library reacts to the new turbulence, threats and opportunities in its task environment, grapples with new technology and undergoes 'systemic change', it likely that it will experience the strain referred to by Taylor. Assessing the extent of this strain, or disruption for the organization and its members, is a major purpose of this study.

Clearly the amount of restructuring, social system change, individual stress and disruption will vary according to particular circumstances. Taylor suggests that the history of the organization, its flexibility, the extent of mutual trust and openness in the relationships of workers and management, the pre-existing levels of job satisfaction, and the strategies used by management to introduce new systems are some of the important factors affecting the extent of this disruption. It seems likely that impacts and changes will not be uniform throughout each level and section of the organization. Taylor also suggests that organizations with a high ratio of professionals may have less need to 'engineer' behaviour change, and can concentrate more on the co-ordination and integration of activities. The university library is an organization in which many of the 'line' employees are professionals. The introduction of a prestigious and influential new group of systems experts, or 'staff' employees, could lead to resentment and conflict. The possible dysfunctional effects of such phenomena as emergence of a technological elite, role displacement, loss of job satisfaction and self-esteem and changed social distances within the organization are important to administrators. It may be that flexible and adaptive management strategies can minimize organizational strain. In any case, management awareness of human and social implications of technological change is a basic requirement.

This study will examine a particular institution and attempt to assess the impacts - organizational, human and social - of the introduction of automated systems. The University of Tasmania Library has been chosen for the case study because it is a leader amongst Australian university libraries in the adoption of a total integrated on-line library system based on the Library's own mini-computer. The nature and history of the particular organization will be considered, as well as the nature of the task environment within which the Australian university library must operate.

Organizational impacts to be looked at will include changes in the nature of work, with particular reference to levels of routineness, standardization, formalization and flexibility; and changes to the organizational structure - both formal and informal.

Human and social aspects to be looked at include the perceptions of individuals about the system's effects on their job satisfaction, self-esteem, prestige, and social relationships, and their reaction to any changes.

Some propositions:

1. The University Library will attempt to reinforce its niche within the parent organization through adoption of new technology.

2. Turbulence and uncertainty are increasing in the University Library's task environment, and much of this turbulence and uncertainty is due to technological factors.

3. The level of routineness of the University Library's technology will be increased by automated systems. Standardization and formalization will increase, possibly with some loss of flexibility.

4. Adoption of new technolgy by the University Library is likely to affect various aspects of its structure, including departmentation, lines of authority, relative size of the administrative staff component, specialization, and the informal organization.

5. The introduction of new technology will have impacts on levels of job satisfaction, prestige, self-esteem, and on the social relationships of University Library employees.

Impact of automation on organizations and on libraries: a review of the Literature

The literature of the effects of automation upon organizations is extensive. The first section of this review will examine a selection of writings on the impact of new technology, with special emphasis on automation, in organizations in general. The second section will examine a selection of writings on the impact of automation on libraries. In each case, papers dealing with organizational impacts will be looked at first, followed by those which deal with human impacts. However, it must be recognized that this is a somewhat artificial division as any impact on the organization is also significant for its members, and vice versa. The two kinds of impact are closely intertwined, and many writers do not separate them.

Automation and organizations: organizational impacts:

Whilst most would agree that technology, and drastic changes in technology such as from a manual to an automated system, have a profound influence on organizations, the findings of various studies have been somewhat inconsistent. Variables such as the degree of standardization, formalization, work-flow rigidity, impersonality and the level of autonomy of workers and supervisors, seem to increase in some situations, and decrease in others.

Mann (1962) drew attention to anomalies in predictions of the effects of technological change. For example, on the one hand, it is predicted that technology will eliminate tedious, repetitive work, and worker discretion will be increased, as in the production-line where mundane tasks are automated, and the worker becomes a supervisor of the machines. On the other hand, there are predictions that the increased standardization of routines, and the formal procedures of technological innovations like the computer, reduce variation and levels of interest and discretion for the worker. Each prediction seems to be true for certain situations. For example, the discretion of workers in the automated factory is likely to be increased (though their numbers will inevitably be fewer) while automation in the office is likely to reduce worker discretion, and the interest and variety of office work. Coffey and Dunphy (1981) noted a loss of job-satisfaction and deskilling of some tasks for administrative secretaries, upon the introduction of a new word-processing system into the offices of IBM Australia, whereas the operators of the new equipment experienced an improvement in pay and status, relative to the administrative secretaries.

Several writers have noted the inconsistency of reports and predictions of the impacts of technology on different organizations and within organizations. Woodward (1970) suggests that the particular set of constraints and opportunities produced by a production technology at different levels and in different sub-units of an organization will influence behaviour in those areas. Woodward (1965) also argues that certain types of organizational structures are more suitable than others, according to the type of technology employed by the organization. (This is discussed in more detail in Chapter 4.) Hickson, Pugh and Pheysey (1969) attempted to relate the organization's workflow integration, or the degree of automated, continuous, fixed sequence operations in its technology, to organizational structures, but found few consistent correlations. They concluded that only the job-count variables at the shop-floor level - such as the number of workers per supervisor - were consistently related to workflow integration. Khandwalla (1977) suggests that large organizations use several technologies and that the computer has less impact on top management than on the operating levels which make heavy use of quantifiable data.

It seems clear that we may expect the results of increased technological sophistication or automation to vary from one organization to another and from one sub-unit to another. If there is not unanimity on just what the impact will be, there is no lack of comment on the importance of the impacts. A quotation from Lansbury and Spillane (1983) is typical of recent writings in this area:

> '... technology has at least two important effects, albeit indirect, on the design of jobs. First, technology affects the evolution of organisational structure which, in turn, influences patterns of interpersonal relationships, the authority structure and the overall climate of the organization. Ultimately, technology indirectly determines what types of jobs are appropriate and viable in various organisational contexts.' (p.176)

More specifically, the Technological Change Committee of the Australian Science and Technology Council (1983) comments:

> 'Computers are ... impinging on the nature of professional and semi-professional employment. Computer-aided design has potential to deskill draughtsmen, and to a lesser extent engineers and architects, but it also has remarkable potential to enhance the creative aspect of their work. People making decisions in widely different areas such as medicine and law, as well as business and administration, must benefit from having available to them a wealth of organised, relevant, computerised information ... some ... may need to look for alternatives if they are to be occupied when these routine aspects of their work are automated.' (p.114)

The Committee notes a trend away from experience-based skills to technology-based skills. There is a shift to monitoring and maintenance tasks,and the manual manipulation of information is disappearing, while managerial and professional positions are maintained. Skills are being polarised, with a minor proportion of jobs becoming more skilled, and a large proportion becoming less skilled. The reduction in skill utilization impoverishes the work experience and leads to low job satisfaction for the majority of employees. While centralization and specialization are increased in many organizations adopting automated systems, it is possible to employ structures which can help reduce the adverse effects of automation. Strategies such as worker participation in job design, job enlargement, and the introduction of work groups are suggested.

Coates (1983) notes that 'telematics' (the technologies which record, store, manipulate and communicate information) allow organizations to disperse activities, functions and operations, while control is centralized. In addition they affect the way in which organizations budget their time, and this causes activities, programmes and work-forces to be restructured. Most significantly, the activities and effort telematics displaces are human activities and effort.

Concern about the adverse human and organizational effects of automation is reiterated in much of the literature in this area, and many writers offer strategies similar to those suggested by the Technological Change Committee. Sadler (1966) notes that human work contributes to human production in two ways - supplying physical energy, and supplying and processing information. Machines have long been able to take over the former, and now computers, as general purpose information-processing devices, can take over the latter, thus giving rise to widespread fears on the part of workers. Nevertheless, neither the scale nor the nature of a change to an automated system seems to be a good indicator of organizational impacts. There are observable trends to greater complexity, and towards larger batch and mass production. Also, trends towards smaller total numbers of employees and a higher proportion of high-level specialists can be partly attributed to new technology. But it is very difficult to analyse and measure the impacts of automation on qualities like responsibility of individuals, and adaptability of both individuals and organizations.

Hopwood (1983) also comments generally on the significance of computer systems both for the organization and its members:

> 'They not only have the potential to alter the nature of work, employment levels, cost structures and the efficiency of operations directly, but can have major indirect impacts on the whole functioning and performance of the organization over a long period of time.'

Hopwood notes that the indirect impacts may be both unplanned and unrecognized, and like several other writers, points to the undesirability of perpetuating features, which may be unduly rigid, of the previous manual system in the new automated system. Also undesirable is preoccupation with capital costs and anticipated savings, as against the 'value-added' practices of the new system.

The perpetuation of old system features, and of old structures to operate new systems is a matter for considerable concern. It was noted above that Woodward found certain structures to be more suited to particular technologies than others. Miller and Armstrong (1966) are concerned with the organizational consequences of computer control of operations, and optimum structures for coping with the new systems:

> '... the optimum organization must not simply be consistent with the technology; it must effectively relate the technology to the economic and social environment in which the enterprise is operating.'

Integrated control systems and automated scheduling of work require inter-departmental barriers to be lowered. The 'buffering' of each department through stockpiling of inputs and outputs is no longer so necessary. Quality control becomes an overall concern rather than a series of many small independent checks. Such changes reduce the autonomy, monopoly of expertise, and mystique of conventional production managers. In this situation, Miller and Armstrong suggest, scientific management assumptions may no longer be useful. Instead, organizational flexibility will be a requirement, and individuals may need to occupy different roles at different times, or even simultaneously.

Jasinski (1959) reports that a change in technology affects organizational relationships, and suggests that trying to fit the existing structure to the new system creates difficulties. Electronic data processing cuts across traditional vertical hierarchies and necessitates horizontal communication (which is rarely defined formally). The traditional concept of superior-subordinate relations is out of place where departments must be horizontally co-ordinated. Mutual adjustment and harmonious inter-departmental relations become the key to an effective operation. There is, of course, much room for conflict in this changing situation, and productivity may suffer if employees who should work as a cohesive unit have to report vertically to different supervisors. Where traditional structures and chains of command are dysfunctional, mechanisms such as committees and special work groups may help to alleviate the problems.

Mann and Williams (1970) in their investigation of organizational changes as a result of electronic data processing, observed organizational and functional realignments, including changes in the system of relationships among departments and people. Control and responsibility shifts, either horizontally or vertically. The computer takes over, and thereby eliminates, some jobs - particularly the routine and tedious jobs, but also higher level decision-making jobs. At the same time new jobs are created - particularly programming and equipment operating jobs. Programming itself is a step towards formalization and the rationalization of work. Not surprisingly, formalization tends to increase in an organization which introduces a machine programmed to make certain decisions itself. The status of those who formerly made these decisions is reduced. So too is the degree of autonomy of individuals and groups in setting their own work pace. With this loss of autonomy comes more interdependence of groups. Individual responsibilities and performance become more obvious and easily evaluated. Failures, errors and absences become more significant as they affect a group's ability to complete its work. This is a demanding and testing situation - especially for marginal employees and supervisors, and the most able individuals have the opportunity to demonstrate their potential. Michael (1966) also predicts that jobs will be eliminated from automated organizations. Fewer managers will be needed, and many specialized clerical positions will be superseded. Continuing education for decision makers and policy planners will necessarily become a standard feature of the organization's task environment.

McHale (1976) suggests that new information technology 'explodes' the vertical hierarchies of traditional organizations into newly flexible networks pursuing changing objectives. More extended use of interactive communication modes and remote terminals enables widely distributed decision centres to interact swiftly. As a result the organization becomes a

> '... more diffuse and geographically separated
> network type, with a high degree of adaptability
> and change in organizational configuration' (p.69)

Like many writers in this area, Crozier (1983) advocates care in the design of new systems, with participation at all levels and gradual incremental instalment and adjustment. However, he warns that a system perfect in every detail is probably an illusion. Management must recognize the existence of 'fragmented and not entirely compatible sub-systems', and leave room for discretion at operational levels. There is no optimum organizational structure for automated systems. In fact

> 'They can handle a wide variety of different organizational forms ... from extreme Taylorism to participative socio-technical designs.'

The issues raised so far in this review of the literature have mainly been concerned with structural aspects of the impact of automation. As will be seen later in this chapter, most of these issues are discussed by writers on automation in libraries. For now, let us turn to a consideration of some of the barriers to organizational change and the human impacts of automation.

Automation and organizations: barriers to change

Kaufmann (1971) lists a number of barriers to organizational change, including:

Collective benefits of stability, or the desire and need of people in groups for stability. Collective wisdom in organizations is against disruption and for the status quo.

Calculated opposition to change, or resistance from groups and individuals who want to protect existing advantages, or not to bear the costs of change. The costs include such factors as

> '... the humiliation of becoming a raw novice at a new trade after having been a master craftsman at an old one.' (p.13)

Inability to change. Members of an organization have programmed behaviours, and they may become misfits when it changes. Organizations themselves have environmental and resource limitations which can prevent change. Informal and customary restraints may be more formidable than official restraints. Staw (1982) introduces the concepts of escalation and commitment as counter-forces to change. By escalation, he means continuing investment in a failing operation. For example, having won a contract, a company feels bound to press on, even in the face of likely failure to successfully honour the contract, or losing its viability in the process. Commitment is a condition wherein a behaviour is irrevocable, or very difficult to change: a psychological as well as a situational force. Inflexibility and resistance to change are natural human and organizational characteristics. There is a tendency to persevere with past methods, and to be critical of new suggestions. As well as these psychological barriers, there are often structural impediments to change. It is not a simple matter to change standard operating procedures, or administrative structures that are supported by powerful coalitions. Smith et al (1982) agree that it is difficult to change an organization and the individuals within it, and note that management must realise no-one likes change, and resistance to change is a healthy reaction. It is necessary that technological change be planned and discussed with employees, and shown to be both relevant and legitimate. Otherwise, subtle resistance may prove to be the downfall of the new system.

Coffey and Dunphy (1981) noted the phenomenon of subtle resistance on the part of administrative secretaries who felt threatened by the introduction of a new word-processing system into their organization. Dunphy (1972) in a discussion of the challenge of change, remarks:

> 'We rush first to be saved by technology and
> then to be saved from it. But the pace of
> change is now so fast, the new technologies

> so revolutionary, that we cannot resist change for long without major problems occurring.' (p.12)

Management's problem is to strike a balance between embracing new technology regardless of its impact, and a sentimental attachment to the past or the status quo. Work needs to remain meaningful in the new systems. A possible strategy to achieve a more flexible and resourceful work force might be the creation of multi-skilled work groups, involved in organizational goals and freed from close supervision. Dunphy is one of many who call for this kind of job redesign, though he warns that such changes will not be easy, and may be resisted just as much as the new systems themselves are resisted.

Crozier (1983) speculates on the inflexibility of the new systems. Whereas human systems, however archaic they may be, do learn from experience, perhaps standardized computer systems may not. This could be one factor in the fear of and resistance to new systems. Additional factors are the alteration of traditional autonomies, career paths and tasks of line workers and of supervisors. Crozier also refers to the informal organizations which traditionally have operated, and with which the new systems may interfere. Tacit agreement, which leaves both supervisors and workers some leeway and margin for negotiation, are likely to be disrupted, and traditional power systems are disturbed.

Danzin (1983) continues the theme of attention to social and individual requirements, noting that fear arises from the apparent mystique and complexity of the new systems, and that insufficient staff preparation can lead to rejection of a system. It can take years to overcome the traumatic effects of the over-hasty and inadequately explained introduction of a new system. Otway and Peltu (1983) emphasize the need to adequately consider the broad impact of new systems on all aspects, including social aspects of the organization:

> 'Many computer based systems have failed because senior management and systems designers have focused too much attention on technical and short-term economic objectives while underrating, or completely ignoring, crucial social, individual and longer-term economic requirements.' (pp.15-16)

Clearly there are environmental, organizational, social and psychological barriers to change. Perhaps the most significant barriers to technological changes, such as the introduction of automated systems (and the strongest impacts of such changes) are social and human.

Automation and organizations: human impacts

Obviously not all the human impacts of automation are detrimental. Depending on circumstances and personalities, the computer can open new worlds for the employee. Routine and tedious tasks can be replaced by challenging and exciting new work, increased job satisfaction and renewed self-esteem. However, in most discussion of automation, the bogeymen of redundancy and unemployment are present to some degree, and the negative impacts of automation on individuals and on social systems are of pre-eminent concern.

Champion (1967) considers the impact of automation on bank employees. He suggests that a common result of increased automation is a reduction in the employee's responsibility for the product, or output of his work. This loss of responsibility carries with it a sense of powerlessness, and a loss of identity with one's output, and is defined as 'depersonalization'. Champion's study shows an increase in depersonalization for most staff members, following the installation of an electronic data processing system. Most employees experienced a loss of function, although one group - the book-keepers - experienced an increase in responsibility as they had to meet customers and deal with challenging problems after the introduction of the new system. Other groups found the content and skill requirements of their jobs had declined. Champion suggests the unfavourable reaction to depersonalization leads to an impairment of the subsequent quality of an employee's work.

Gross and Smith (1976) are also concerned with depersonalization and the self-esteem of employees affected by technological change. They relate this to Maslow's hierarchy of needs, and the frustrations due to non-satisfaction of certain needs. Reactions may include defensiveness and unwillingness to face reality.

Automated systems tend to eliminate certain jobs, or combine them, thus altering long standing values, goals (formal and informal) and relationships

> 'The fear of being displaced or of having to learn a new job is a threat to the need for security. Being uprooted from long-term, informal, job-related friendships represents a betrayal of the need for belongingness". (p.421)

In their suggested strategies for managing technological changes, Gross and Smith emphasize the need to recognize innate emotionalism, and desires for stability, certainty and freedom from threatening change. Like many other writers they prescribe incremental change, participation, good communications, job redesign and job rotation, while developing loyalty to organizational goals and encouraging creative risk-taking in organization members.

The devastating human impact of deskilling and the consequent feelings of worthlessness concern many writers in this area. Bjorn-Andersen (1983) notes that clerks and secretaries are likely to have fewer specific tasks. Typing, calculating and similar tasks are replaced by the new skill of operating the system. Not only is the self-esteem of the worker affected by the new irrelevance of his expertise, but he is faced with the daunting task of having to acquire new skills. In addition he may have to adjust to a more formalized working environment. Because the computer requires structural rules, pre-defined codes and programmed procedures, work is likely to become more formalized, and jobs more polarized, even though the system itself may provide flexibility. While office work has traditionally had an informal character, relying on staff to adapt in order to cope with new situations, Taylorism is often reflected in the new systems.

Gaffney (1983) in a study of a newspaper organization after the replacement of 'hot metal' composing by computerized type-setting, found that printers experienced deskilling, loss of prestige, closer supervision, diminished freedom, and a changed social system with new relativities.

It is not only the lower level members of the organization who experience the disturbing human impacts of automated systems. Argyris (1971) describes how managers might feel threatened by management information systems. The designers of the system

> '... may ask that behaviour, policies, practices and norms that have been operating covertly be surfaced so that their contributions to the problem be made explicit.'

This reduces the manager's freedom to move. Additionally, the system makes decisions for him, thereby reducing his self-esteem. His power is reduced as his position is incorporated in a work flow, and he feels less essential. His traditional qualities and competence are no longer so relevant to be requirements of the organization, and he is placed under stress.

Human satisfaction and the quality of working life are important not only to individuals, but also to the efficiency, effectiveness and adaptability of organizations. Therefore it is in the interest of the organization to attempt to provide these satisfactions. Kast and Rosenzweig (1979) are amongst several writers who suggest that the social and human problems of change are likely to be more difficult than the technical problems. They advocate attention to the psychosocial system, with the objectives of linking effective performance with interesting work, enabling employees to realize the full extent of their capabilities and allowing for group and intergroup relationships to develop and flourish. A balance needs to be achieved between an efficient technical system and an effective psychosocial system.

Job enrichment and job redesign are suggested by many writers as strategies to combat the human problems raised by new technology. Lansbury and Spillane (1983) warn that although many examples of implementation of job redesign as an effective tool for improving job satisfaction as well as production have been reported, it is still no panacea. There is a (largely undocumented) failure rate, and many reports

> '... tend to be more evangelical than thoughtful.' (p.171)

with little analytical data on costs and benefits. In addition, individuals have varying preferences. Some will prefer the routine, while others seek more challenging work

> 'Individual differences must be taken into account if optimum congruence between people and jobs is to be achieved.' (p.173)

Lansbury and Spillane are not arguing against attempts to improve job design, but for recognition of the difficulties involved in doing it well. Similarly, Oldham, Hackman and Pearce (1976) suggest that job enrichment will have varying beneficial impact upon workers, depending upon the circumstances of the work, the needs of employees, their relationships with peers and supervisors, the level of their remuneration, security and other industrial considerations. Five measurable characteristics of jobs which can improve motivation, satisfaction and performance are proposed. These are skill variety, task identity, task significance, autonomy and feedback.

Mumford (1981) examined the experience of organizations (government departments, industrial firms and a bank) which attempted to introduce computer systems in a humanistic manner. She looked at the comparative values of system designers, managers and system users, and the impact of new systems on the interaction between technical and social systems. Mumford found that values influenced the objectives, design and assimilation of computer systems. Job satisfaction, in some cases, became a system objective. In other cases a self-determining strategy, in which workers were made responsible for designing their own work organization was adopted. This resulted in both efficiency and job satisfaction and a good integration of the technical and social systems. Generally, the study

> '... provided no evidence to support the belief that computer technologists are influenced by a powerful technical ethic in which technical gains are striven for at all costs' (p.277)

If most managements are aware of the humanistic approach, not all are convinced of its appropriateness. In his discussion of job dissatisfaction in the 1970s, Braverman (1974) is cynical about the humanization of work as a remedy, and sees it as a passing fad.

> 'Management is habituated to carrying on labor processes in a setting of social antagonism and, in fact, has never known it to be otherwise ... they are concerned to ameliorate it only when

> it interferes with the orderly functioning of their plants, offices, warehouses and stores'
> (p.36)

Braverman sees job rotation, job enlargement, job enrichment, work groups, participation, profit-sharing and abandonment of assembly line constraints as being mere marketing strategies on the part of management. They pretend that workers are participating in management, and provide the illusion of decision making in much the same way that an advertising agency reduces the housewife's feeling of guilt and produces the illusion of skilled baking by allowing her to break an egg into her packet of instant cake mix! Braverman is in the minority, however. Most writers in this area see a humanistic approach, and a genuine concern for the individuals impacted by technological change as being of material benefit for the organization and its members.

We have considered some of the major organizational, social and human impacts of automation in organizations, as described in the literature. The remaining section of this literature review will focus upon the literature of automation in libraries. As will be seen, most of the major concerns of the literature examined so far re-emerge in papers on the impacts of new technology upon library organizations and their members.

Automation and libraries: organizational impacts:

The literature of automation in libraries ranges from detailed technical papers describing specific applications of computers in libraries, to the more general papers which speculate about the possible changes computer technology will cause in the libraries and the library profession of the future. A minority of the papers consider the organizational and human effects of automation on libraries, and academic libraries in particular. Not surprisingly, a common pre-occupation of many of these writers is 'getting the system to work', rather than what is happening to the organization and its members. After all, the academic librarian is typically under pressure to provide effective and efficient operational services in an increasingly difficult environment. But some of the papers do recognize the importance of looking at the organizational and human consequences of new technology in any consideration of the well-being of academic library operations. For this study I will concentrate on writers who deal with the organizational and/or human impacts of new technology upon libraries.

Wasserman (1972) discusses the rapidly changing library environment, in which technology is a major agent for change. He is concerned about the innate conservatism of libraries, with entrenched bureaucracies and traditional images of their roles and operations:

> 'It is very difficult, it may be impossible, for a conventional, passive, and complacent professional discipline to break dramatically with the past. Yet precisely this is necessary if librarianship is to survive as anything other than a custodial function' (p.XI)

Wasserman argues that in a time of rapid change it is perfectly natural for some administrators to avoid possibly imprudent or dysfunctional new directions, but that if libraries cling to irrelevant organizational forms, they may well endanger their future. This theme, of the dangers of irrelevant organizational forms and structures at a time of changing technology is taken up by several writers. Approaches vary, with some writers predicting change, while others advocate it, or express concern about the fate of libraries which do not adequately respond to the need for organizational change.

Little (1978) considers the growing public demand that service institutions like libraries must perform well if they are to continue to receive public funds. Computer technology is a possible avenue to improved productivity through its labour-saving and high output potential, but while this technology can do things for libraries, it will also do things to them, and change them.

Rogers and Weber (1971), writing well before the development of integrated on-line library systems, noted the traditional departmentation in university libraries, including the separation of such functions as acquisitions and cataloguing, and they questioned the efficiency of such separation. They predicted that automation might bring with it closer relationships between departments:

> '... it may be that the co-ordinate pattern will become more prevalent, with the whole technical services operation falling into a super department ...' (p.70)

Pflug (1975) draws attention to the repercussions of automated systems on library organization. Not only work processes but also traditional structures are affected. For example, electronic data processing sections or departments are established. Pflug also points to the personal problems created by the introduction of a new group, the systems specialists, into the library structure.

Gordon (1977) speculates about the impacts the new technologies might have on library strategy, behaviour, and desired or undesired modifications in structure. His suggestion is that new boundary spanning and diffusion functions will require re-examination of organizational norms, structures and options, and that library managers will need to cope with

> '... uncertainty, complexity, ambiguity, the requirement to keep current operations going and the requirement continuously to plan for alternative kinds of futures.'

Montague (1978) reviews the development of automated systems in libraries from the 1960s until the mid-1970s, and notes the lack of any sudden organizational revolution, despite the fact that the computer is a significant agent for change in libraries. He notes that there are other agents for change during this period, including economic pressures, the demand for accountability, the development of library networks, and staff demands for greater participation. One common organizational phenomenon in the 1960s, prompted by most librarians' lack of systems or programming expertise was the creation of a systems office in the library, and Montague comments that an autonomous systems staff was often the unfortunate result of this development. However, he is encouraged by

> '... a growing number of library managers and staff able and willing to specify needs, evaluate alternatives and make decisions'

due to the growth of automated systems in libraries during the 1970s. He sees a shift of responsibility from systems offices to line managers, even though systems experts remain important in the library. He also notes a new demand for job satisfaction and a share in the objectives of the organization on the part of library staff, and believes it is necessary for library management to provide the opportunities and foster the atmosphere of mutual trust and confidence necessary for such involvement.

Montague's perceptive paper also recognizes that the flexibility of automated systems has allowed wide variation in the efficiency and the effectiveness of their use in some libraries

> 'Facing the prospect of staff resistance to change, the temptation to program the manual system was unbearable for many managers. The failure to comprehend the potential impact of automation on traditional procedures and services and the

> resulting failure to take full advantage of the new tool is evident in our systems of today.'

In cases where the computer has been applied to historical practices, with little creativity, the resulting systems are as complex as the manual ones were, and little in the way of savings in cost or in staffing is achieved.

> 'The utilization and impact of automation has varied significantly among libraries. Some have increased staff, some have decreased staff, some have stayed the same; some have realised the goal of processing more material with the same staffing level, some have not. The difference is dependent upon a number of factors, including conditions before automation; staffing levels before automation; the attitudes, interests and philosophy of library management; and the extent to which the staff has been prepared or encouraged to deal positively with the change.'

Stanfield (1975) suggests that current organizational structures of libraries are the limiting factors in the continued required growth of organizational competence. Valentine (1980), looking at medical libraries in particular, believes computer-run systems have implications for library staff and the patterns of their work. The integrated systems especially require re-assessment of the organization and of the distribution of clerical and non-clerical routines and duties. The computer allows a considerable amount of flexibility, and its output can be tailored to suit local requirements, but it is important that new developments are considered on their merits, rather than simply assuming they will improve the quality of services and of library organization.

Shaughnessy (1978) comments that libraries have been overtaken by advancing technology, resulting in some degree of 'organizational malaise' and that library jobs ought to be redesigned in view of social, environmental and technological changes. The availability of bibliographic data via computers has affected the jobs of cataloguers, and the automated searching of data bases has affected the jobs of reference librarians, and as technology absorbs routine, monotonous tasks it can contribute to the design of more meaningful jobs. Shaughnessy sees librarianship as employing a craft technology relying upon experience, judgement and intuition, (whether this is an accurate categorization is a question I will address in chapter4) and that a flexible structure is appropriate for a non-routine technology of this kind. Perrow (1970) would agree that bureaucratic structures are most appropriate for routine organizations, whereas less routine organizations will be less structured.

Shaughnessy (1982) draws further on Perrow's proposition that bureaucratic structures are effective in organizations employing a routine, repetitive and predictable technology, whereas a non-routine, unstable and unpredictable technology requires higher levels of organizational responsiveness and flexibility. Shaughnessy notes that despite significant technological developments in many aspects of library operations in recent years, there appears to have been little corresponding change in the organizational structure of libraries. The traditional 'raw material' of libraries - resources and users - has led to an almost universal two-division structure. A technical services division handles the resources, while a public services division handles the users. This pre-occupation with raw materials often results in further differentiation according to the special characteristics of resources and users. For example, departments for serials, government publications, and undergraduate services.

Undesirable consequences of this traditional structure include an unnecessary separation between the library workers who serve the users, and those who prepare resources for them. Inter-divisional conflict, or at least lack of co-ordination may result:

> '... while the traditional structure is useful in providing a basis for the division of labor, the allocation of tasks, and the recruitment of personnel, it tends to foster organizational differentiation at the expense of integration and co-ordination.'

The suggestion is that the new technologies offer libraries an opportunity to break away from traditional structures, and to adopt more open, adaptive and organic structures which are better suited to sophisticated new technologies. The modern library could orient itself more to operations technology than to raw materials. However,

> '... library structures have not sufficiently changed to accommodate new technologies, and that this has resulted in poor utilization of staff and user frustration.'

Following this theme, Hanson (1982) sees a shift of responsibility for many library materials processing activities from professional to non-professional staff, with the advent of automated systems. This should free professional staff in the small academic library for more in depth research assistance. Varying job tasks for professionals might reduce the traditional separation between public and technical services. Hanson proposes a model for the academic library with automated systems, in which each professional librarian is responsible for selection, reference, liaison with academic staff, original cataloguing and collection supervision within a specified subject area.

Some writers have concentrated their attention upon the effects of automation within particular sub-units of the library. Miller and Ireland (1977) report a more functional cataloguing department structure in a university library, arising from the introduction of a machine readable shelf list which replaced the old card shelf list. Three original sections within the department - searching, cataloguing and processing - were replaced by two sections - cataloguing and cataloguing control. An improved work-flow resulted, and specialization increased. Job rotation was introduced in an effort to avoid any adverse effects of over-specialization.

Gavin (1977) is concerned with the effects of automation on the cataloguing department of the Lausanne University Library. Here, the change was from production of a single card catalogue to the creation of a computerized index, allowing a whole range of outputs to be produced. Gavin notes that the cessation of card filing removed a checking procedure, as any errors on new cards usually had been discovered when filing them into the catalogue. As a result a new checking procedure had to be introduced into the automated system. In this library, four areas of responsibility requiring centralized control became apparent after introduction of the new system. These were catalogue correction, data acquisition, operational handling, and handling of output. Previously, each of these responsibilities had been separately controlled by individual sub-units (monographs, periodicals, theses) within the cataloguing department.

Khan (1979) examines the reference function in an academic library, and finds the automation of such tasks as ordering, circulation control and bibliographic preparation have freed the reference librarian to concentrate more fully on personal assistance, and sophisticated research consultation with users. Instant reference assistance has become more feasible, although the reference function itself has not changed because of automation.

Burgess (1983) is concerned with computerized bibliographic retrieval in the reference department. This development has vastly increased the resources available to the reference librarian, and the power of searching. The reference department's task environment has been extended to include new suppliers, network user groups, and associations. The dynamic on-line searching operation has demanded a new concentration on continuing education for reference librarians, and it has also achieved an enhanced image and status for this group. This new development has affected other library operations, such as inter-library loans (on-line ordering of documents is now possible) and in some cases library structure has been altered by the creation of special on-line searching units.

Doll (1980) is also interested in the new image of on-line searchers. His paper discusses the latent, or unintended functions of technological changes in libraries. For example, the introduction of on-line searching of data bases has prompted library schools to emphasize this skill, and librarians to specialize in it. The unanticipated result may be a reduction in the number of librarians willing and able to assist users in the traditional mode. Budgetary pressure on libraries is liable to result in cuts to traditional areas, rather than to the new elite information systems, and this could result in a lessening of the library's traditional service role.

Doll suggests that the different cognitive pattern involved in operating the new systems requires different aptitudes, and a technological elite might develop within the library. An aura of glamour surrounds the on-line searcher, for example, whose skill is admired by those with a lesser aptitude in that direction, and who fear the cost of wasting expensive 'connect time' if they are unable to conduct an on-line search with maximum efficiency. The tendency may be to leave this 'glamorous' work to the technological elite.

The suggestion that a new breed of librarians is required in the world of library automation is not uncommon. Wasserman (1972) believes that for libraries to become more truly a client-response system rather than merely an inventory system, the profession must appeal to individuals with a background and education different from that which has produced the majority of librarians.

Simkins (1983) notes a decrease in repetitive operations, and an improvement in services available in libraries as a result of recent technological developments. In the case of on-line data base searching, only the person who searches regularly can operate cost-effectively, and he has become an essential intermediary, with a continuing role in the new information world.

> 'There is already less place for the patient plodder because this is precisely the person who can be replaced by the computer.'

To the librarian's traditional qualities of intelligence, thoroughness, commonsense and ability to communicate, must be added adaptability. Cronin (1983) suggests that there is a shift from procedures, tools and techniques developed over a long period to facilitate information handling. Computer and communications technologies are 'liberalising' information, and users are no longer forced to rely on institutions like libraries. In this environment libraries must promote or market themselves as being at the centre of information, and to operate in a boundary-spanning way, linking internal library services with external information services. The librarian will need entrepreneurial and promotional skills - otherwise there will be no automatic demand for his services.

Bone (1983) considers that sophisticated management skills are a requirement for libraries, as the information world becomes more complex. Typically, libraries have been administered by professional librarians with minimal administrative training:

> '... it was assumed that individuals who could perform the bibliographic responsibilities well could also administer well'

sometimes with unfortunate results.

Bone emphasizes the importance of planning, control, interpersonal skills, and the issues of motivation and staff participation in management decisions, in enabling the library to cope with its new environment.

Automation and libraries: human impacts

As already suggested, it is not possible to separate absolutely the organizational impacts from the human impacts of automation upon libraries. Martell (1983) shares the concern of many of the writers already cited in this review, that traditional library structures are becoming increasingly less suitable for automated library operations, but his concern is based not only on the need for organizational efficiency but also on the human needs of organization members.

Martell notes that new technology has brought a crisis of concept for the academic library, even though the environmental turbulence it is experiencing is not greater than that facing many other kinds of organizations. He believes job design is necessary to satisfy technological and organizational requirements, as well as being important to the social and personal aspects of work for the job holder. Like several other writers Martell suggests that boundary spanning service functions are increasing in importance, and yet

> 'This shift, however, has not resulted in the type of organizational restructuring necessary for the academic research library to meet effectively the needs of a post-industrial society.' (p.5)

Martell notes that in an environment of changing technology, a traditional management preoccupation with control and efficiency tends to rigidify tasks, increase routinization, reduce the individual's range of skills, and his personal satisfaction, with generally dysfunctional results. A review of studies of job satisfaction amongst professional librarians reveals a general feeling that they are under-utilized. The evidence is incomplete, but

> 'Lacking more than marginal autonomy, bogged down in routine, repetitive tasks, and handicapped by a rather rigid organizational structure, library workers might understandably exhibit signs of dissatisfaction.' (p.11)

Martell's suggestion for creating less routine work and assisting librarians to develop a broader perspective in information providing operations, is to combine functions, and replace single function jobs with multi-functioning work groups.

Fine (1982) takes a psychological viewpoint of the impact of technology on libraries and librarians. She sees technology as a powerful stimulus eliciting intense behaviour responses. This response is likely to take the form of resistance, not because librarians have rigid personalities, but because they fear that inter-personal relationships will suffer in the new systems. The peculiar characteristics of the new technology - its speed, pervasiveness, apparent rigidity and remoteness, and its mystique - evoke an ambivalence and an emotional reaction. Resistant reactions are not necessarily negative, and to try and eliminate resistance might well create more serious problems.

Veaner (1981) puts it very succinctly:

> 'For every one person who is an enthusiast, eager for change, there can be found ten or a hundred persons who prefer things as they are or were ... it is impracticable to impose systems on people ... Probably the least well functioning systems are those whose features have been designed by an all knowing expert or a committee of persons who are far removed from the actual workplace.'

People are the vital elements in any system. Because of their adaptability and flexibility, people can make (or break) a system.

A working party of the Library Association (1982) looked at new technology's effects on the library profession and on work in libraries. While their report draws attention to problems of worker resistance, especially in relation to job content, and fear of unemployment, the greatest emphasis is on the capabilities of the new systems, and their relevance to community needs.

In a paper on personnel aspects of automation in libraries, Weber (1971) is concerned that the team involved in designing and implementing a new system should have diverse talent, strong motivation, and close contact with the librarians. Weber's experience is with a large automation project at Stanford University Libraries, which involved a special project team. He notes the importance of informing library staff about what is going on, not only to explain the programme, but also to create a climate hospitable to change. He acknowledges the possibility of resistance, but views it as a shortcoming in the make-up of some individuals - even an irrational antipathy:

> 'Those receptive to the change will benefit by having their job horizons enlarged ... That is not to say that all library staff members will enjoy the exacting refinements of a machine system, just as not everyone has talent to be a first-rate cataloguer. It is not suited to everyone ...'

In this emphasis on relevant aptitudes there is no recognition of the importance of a social system, nor any thought that it may be possible to fit the system to the people, rather than imposing it upon them.

Other writers do recognize a need to harmonize systems. McClure and Samuels (1982) are concerned with the impact of new systems on the users and the staff of libraries and information centres. The cost of a computer system includes such factors as the dignity and self-respect of both the organization's members and its clients.

Malinconico (1983, a) suggests

> 'Resistance is a distress signal from individuals that feel themselves impelled in a direction they find forbidding.'

The resistance is not so much to the technological changes, as to social change, and the challenge for library administrators:

> '... is no longer to specify the functional details of automation systems, but rather to design appropriate organizational structures that will operate effectively when these systems are introduced into them.'

In a further paper on social aspects of technological change in libraries, Malinconico (1983, b) looks at the social relationships and traditions which exist within the library - the informal organization.

> '... people are remarkably resourceful in finding ways of defeating and rejecting changes that threaten established relationships.'

Dysfunctional impacts on the social system must be considered. For example, work at the computer terminal may leave the library worker much less opportunity for social and personal diversions than was available in the manual operation. Frustration and friction could ensue. Library management needs to seek congruence between systems and workers; formal structure and informal structure, and to be aware of the resistance a lack of congruence may generate. One suggested strategy for achieving the desired congruence is to allow increased participation by those affected. Good communications can also help counteract the anxiety generated by change.

Malinconico (1983, c) expands this point in a paper about the importance of negotiation in the library's changing task environment. As well as the need to negotiate with new suppliers, library management must negotiate new agreements with those members of the organization whose work and role may be changed by new options. A temporary 'victory' by management may turn out to be dysfunctional in the long run, therefore agreements must not be damaging to relationships between the parties.

In contrast to Malinconico's emphasis on the need for congruence between technical and social systems, Griffin (1979) refers to 'people conversion'. This concept is one of training people to use the new options well, and to abandon old ways with which they may have been more comfortable.

> 'Problems often indicate that a user has not learned how to use the product properly (or does not want to learn to use it properly) or they may indicate oversights in the system that need to be reviewed and corrected.'

While Griffin acknowledges by implication the fact of the phenomenon of resistance, his suggested approach of making people fit the system is reminiscent of that of Weber (see above).

Estabrook (1983) is concerned with the loss of control over his work experienced by the reference librarian working with an on-line catalogue:

> '... it is less clear exactly how the numbers/ words/comments get into and out of the machine. It, therefore, becomes more difficult to verify or check one's work or to feel in control.'

If the reference librarian is relying less upon his own skill and thoroughness in searching, and more on the system he may experience a sense of powerlessness or loss of self-esteem. On the other hand, other writers (Gavin, 1977, for example) have pointed to the additional checking features of some cataloguing systems, which allow the librarian additional opportunities to ensure that he has done his work well.

Presthus (1970) carried out a major study of 36 North American libraries looking at the library occupation and its capacity to cope with change, including automation, changes in traditional rules, and in the forms of materials with which the library works. Presthus sees new technology as being 'new ways of carrying out traditional library functions', and he is concerned with the skills, attitudes, prestige, security and professional expectations of library staff and library administrators, as new technical mechanisms are integrated into the library's apparatus. He hypothesises that the library processes which lend themselves to automation - acquisitions, storing, retrieval and the like - will become more standardized as they are automated, possibly at the cost of some flexibility.

Presthus suggests that the major barrier to the successful implementation of new systems will be socio-psychological. The reduced manpower requirements of computer-driven operations disrupt well-established and comfortable modes of work, cause role displacement and uncertainty, and this uncertainty may be accompanied by a mild Luddite reaction. He believes that libraries have a fairly strong traditionalism and that library workers

> 'seeing themselves as scholars ... have come to share scholarly values of independence, idiosyncracy and freedom from constraints of time and organization' (p.6)

and are likely to resist computers and automated systems as alien intruders into their genteel, leisurely world, and their 'comfortable ways of thought and behaviour'. Human resistance to change is, after all, a natural phenomen, and understandable in such circumstances.

In view of social and cultural barriers to innovation, an essential to change in the library environment is the existence of an entrepreneurial, change inspiring element in the library's management. What is needed is risk-taking, achievement-oriented people who are

> '... highly committed to their work, like new ways of doing things, and are inspired by the opportunity for personal achievement through their work' (p.7)

Presthus found a generally ambivalent reaction on the part of libraries to the introduction of changes in their work place, ranging from reluctant acceptance to a 'wait and see' posture. Most librarians had backgrounds in the social sciences or humanities and were not particularly disposed to accept change and innovation. Library administrations were generally unsympathetic to the concept of scientific management. There was a general predilection towards conflict avoidance and order.

He concluded that major automation in libraries might have to wait for

> 'a new generation of librarians trained in schools that have fully incorporated the skills and concepts of a new librarianship into their teaching programmes.' (p.109)

In this review of the literature of automation and libraries, several themes have emerged. One is traditionalism, and the difficulties libraries and librarians have in breaking away from it. It is a concern common to all organizations experiencing the change to new systems. Irrelevantorganizational structures, and resistance to change are major phenomena related to the problem of traditionalism. Tradition and sentiment are among the major barriers to the effective introduction and operation of new systems. Fears and apprehension, whether soundly based or not, are also barriers and major factors affecting the impact of new systems.

Many writers are concerned about the irrelevance of traditional library structures to the new technology, and the need for more flexible and adaptable structures if library organizations are to operate efficiently and effectively. The inadvertent effects of introducing new systems, both on the organization and on individuals within it, are noted. Concerns about the attitudes and satisfactions of library workers, and the nature of the social system within the library organization are also emphasized. Deskilling, depersonalization, self-esteem, job satisfaction and the general social and psychological well-being of employees are widely discussed, as are strategies for improving these aspects of library work. The need for entrepreneurs, or people with non-traditional attitudes and ways of thinking is addressed by several writers.

These are matters of more than usual interest for university library administrators in the current period of a relatively turbulent task environment, and drastically changing systems. It is hoped that a case study of a university library will throw some light on the nature and extent of the impacts of automation in that kind of organization.

Methodology: the case study

While the impact of technology is a matter of importance for all university libraries, indeed for libraries in general, it was felt that the retrieval of large scale quantitative data would not be appropriate for the complex organizational, human and social issues involved. A close look at the particular impacts on one university library seemed more appropriate.

The case study provides an opportunity to look at a complex problem in some depth, and is appropriate for the retrieval of selected qualitative data from a population of manageable size. Through a combination of observation, interview and questionnaire methods it is possible to build up a picture of the impacts of a significant change in the task environment of a university library - the introduction of automated systems - on the organization and its members. The data collected, although empirical, might provide, nevertheless, subtle insights into the complexities of the changes. The background and the development of new technologies can be observed, recorded and analysed.

Historical and developmental methods are also employed. The history of the University of Tasmania Library is briefly examined in order to determine historical influences on the organization and its members, and to present the fullest possible picture of the organization in question. The case study incorporates the developmental techniques of the observation and interpretation of a particular phenomenon and its influences on activities and individuals over a given period. The study could also be categorized as a 'trend analysis' in that phenomena that are or have been in the process of change, are examined (Mauch and Birch, 1983).

It was felt that the required information for this study could best be obtained through examination of relevant management records, and through observation - spending time in the library observing the operation of its various sub-units. In addition, informal interviews and group discussions with organization members at various levels helped point to areas of particular interest and concern. Data on some of the human impacts of new technology were obtained through a questionnaire survey of employees. Problems of obtrusive observation were diminished by the fact that the researcher was a familiar figure in the organization - in fact a former library staff member, recently transferred to another University department. This mutual familiarity was of assistance in the interview situation, in that interviewees did not feel too threatened, and in the general relationship of the researcher with the library administration. In the opinion of the researcher an effective working relationship was achieved with members of the organization being studied. Of course, such a relationship and personal familiarity with the organization and its members could lead to a loss of objectivity in the research. However, in recognition of this danger, care was taken to maintain a properly detached attitude.

It should be noted that this study limits its focus to selected aspects of the new technology employed by a particular organization, and the impacts of that technology on organizational and human factors within the organization. It is not concerned with technical details of the design, installation and operation of new systems. It does not (except incidentally) concern itself with the effects of new systems on the library's clients, nor on how technological developments might change the nature of the library's services. There has been no attempt to collect large amounts of quantitative data.* Nor is this a comparative survey. Its findings cannot be generalized in respect of university libraries elsewhere. These are substantial delimitations. Nevertheless,

*the questionnaire on human impacts, for example, is not a precise tool of measurement, and no claims of scientific precision are made. Rather, indications of general trends are sought.

it is felt to be more useful, for a study of this kind. to concentrate on probing deeply, through discussions and unstructured interviews with the people affected by the changes, and observations, for insights into the impacts of new technology in one organization.

Having reviewed the literature and developed some propositions about the likely impact of automation on university library administration, the next step is to consider the history and nature of the particular university library (Chapter 2). Following that, to complete the setting of the context of the case study, is a consideration of the nature of the task environment of the university library (Chapter 3).

Subsequent chapters will report various organizational, human and social impacts of automation in the University of Tasmania Library, as revealed by the case study.

Chapter 2

THE UNIVERSITY LIBRARY AND ITS ENVIRONMENT (i) THE NATURE, HISTORY AND TECHNOLOGY OF THE UNIVERSITY OF TASMANIA LIBRARY

In order to show what kind of organization we are dealing with this chapter looks at the University of Tasmania Library, its history, its position within the University and the kind of technology it employs. Then follows a discussion of the level of the University Library's commitment to new technology in recent years - at a time when turbulence in the task environment appeared to threaten the hard-won stability only newly achieved after a long history of inadequate support.

In terms of concepts introduced by Thompson (1967), adoption of new technology is one strategy open to organizations facing uncertainty. In the case of the University Library this strategy could increase capabilities and competitiveness. It could increase the organization's prestige and lead to an increase in the population served. Such developments are likely to achieve an increase in the resources available to the organization, thereby enabling it to reaffirm its position. Hence our first proposition:

> The University Library will attempt to reinforce its niche within the parent organization through adoption of new technology.

However, as a preliminary to examining this proposition it is interesting to consider how the University Library came to arrive at a position worth defending, for the University of Tasmania carried on for a considerable period without the benefit of a well-developed library - and in the first place, without a library at all.

University libraries are service institutions. They are organizations for the transfer of information, which provide environments and services by which the information they acquire and store is passed on to those who need it. (Bryan, 1977). Historically, libraries have provided communities with culture, education, information and recreation, and their value has lain in their contribution to the needs of their communities. (Hannabuss, 1983). The university library's community consists of students and academics.

Of course, the university library is by no means the only information source for the students and academics in the institution. However, it has at least become the library of first resort for all members of the institution (Ratcliffe, 1982) and it takes its service role very seriously. Libraries, including academic libraries, in the past may have been more concerned with their repository role, and the preservation of man's knowledge, but in the second half of the twentieth century, the emphasis has increasingly been on a more active role of service to users.

The university library is a sub-system of a larger system - the university - which is itself a sub-system of the education system, and of society at large. Obviously, the university library will be affected by its environment, and in particular by its task environment, which comprises its suppliers, clients, competitors and regulatory bodies. It has to adapt to and manipulate elements of its task environment, and employ strategies to deal with environmental opportunities and constraints.

While the library's task environment is not particularly complex or diverse, compared to those of many other organizations, there is a high degree of cross membership within it. The individual academic may be not only a client of the university library but also a supplier and a regulator, through his membership of boards and committees. Indeed, he may also be a competitor, both as a personal information source, and through maintenance of an unofficial library in his department. His attitude to the library may well be coloured by this multiplicity of roles in its task environment.

As a sub-system of the University of Tasmania, its Library is dependent upon a typically slow and cumbersome decision-making structure, involving deliberation by committees whose membership represents many conflicting interests within the organization. In this situation the University of Tasmania Library has an inherently limited control over the financial and other resources it can obtain, and, indeed, in most areas of decision-making which will affect the University at large.

The University of Tasmania is one of Australia's older and more traditional universities. Its Library exists (inter alia):

'(a) to provide undergraduate and postgraduate students with such printed and other relevant educational materials and services as they may need to pursue their studies;

(b) to provide academic staff with such printed and related materials and services as they may require in pursuit of their teaching and research functions;

(c) to assist the University in its general educative role of producing not only graduates of particular disciplines but informed and questioning citizens'(1)

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(1) University Statute XXIX - of the Library

The above statement of the Library's functions was written in 1976, some 86 years after the University's foundation. There was no library statute at all until 1956, and that was a very brief statement about the management of the library by a Committee responsible to the University Council, and with the Librarian as its executive officer. Not until 1976 did the University include any mention of the functions of the library in its statutes! While the above functions are now widely, if vaguely perceived within the institution, the University existed for at least 60 years without a library which even remotely could have fulfilled such functions, either in terms of materials or of services. In fact, for its first 55 years the University did not have the services of even one full-time professional librarian.

Whereas the University of Tasmania Library has the atmosphere of a long-established enterprise with a traditional position and role within its parent institution, its period as an adequate university library has been comparatively brief, considering the University is approaching its centenary. For only a short time has the Library enjoyed the stable task environment, with few competitors, small and homogeneous supplier and client groups, and relatively benign regulatory bodies, which one would assume is the normal lot of a university library. The continuing source of instability has been in the supply of resources, which has been adequate only for a small proportion of the Library's years of operation.

The history: Established in 1890, during what Bryan (1977) calls Australia's 'period of colonial pride', the University of Tasmania was preceded in Australia only by those of Sydney, Melbourne and Adelaide. These early universities were heavily oriented to the classics and modelled on English and Scottish institutions of the time (Auchmuty and

Jeffares, 1959). Bryan notes that in each of these early universities there was

> 'an hiatus between the establishment of a university, even its commencement of teaching, and the offering of what could in any sense be described as a library service.' (p.6)

The University of Tasmania was the extreme example, as pointed out by Scrivener (1983):

> 'The University of Tasmania apparently had the dubious distinction of spending no money at all on library provisions for more than a decade after it first began teaching ... The University ... hardly had a library at all for the first twenty years of its existence and there was no designated officer in charge.' (pp.206-207)

In 1919, a lecturer in Psychology, E. Morris Miller, was officially appointed Honorary Librarian. Since his appointment as lecturer in 1913, Morris Miller had devoted his spare time to developing and organizing a library collection for the University (Scrivener). He continued as Honorary Librarian until his retirement in 1945, although he became Associate Professor of Psychology in 1925, Professor of Psychology and Philosophy in 1928, and Vice-Chancellor in 1933.(1) Morris Miller was not a professional librarian, although he had previous experience of library work in the Public Library of Victoria. Finally, in 1945 the first full-time professional librarian (E.H. Clark) was appointed to the University Library, some fifty-five years after the establishment of the University. It seems reasonable to conclude that the University had no great commitment to library provision during its early years, and had it not been for the enthusiasm of a member of the academic staff, the library might have been even slower in its development.

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(1) University of Tasmania. Calendar, Vol.2, 1983.

As it was, by the time of the report of Munn and Pitt (1935) Australian university libraries in general were observed to be lacking in status and priority within the parent institutions compared to the leading universities in the United States. The University of Tasmania was by far the smallest and poorest of the (by then) six universities. Its library contained just under 30,000 volumes, and took 200 periodicals. One clerical assistant was Professor Morris Miller's only staff, and the annual budget for the University Library was £685 - a little under 4% of total university expenditures. However, in his spare time, Professor Morris Miller had

> '... catalogued three-fifths of the collection and introduced modern methods of service.'
> (p.100)

In common with other Australian university libraries, lack of space was a problem. The library room was used also for social functions, and many books were housed in a closed stack. It was this situation, combined with the move of some science departments to a separate site at Sandy Bay shortly after the Second World War and the determination of some professors to retain 'their' books and periodicals within their departments which led to the proliferation of branch and departmental libraries in a comparatively small university.

Munn and Pitt found that professorial control of libraries was firmly entrenched. For example, no university gave the librarian much discretion in the selection of books, resulting in strong sections related to the hobbies of successive professors, and a great many gaps in library collections. Munn and Pitt's survey provided only a slight impetus for the development of university libraries in Australia. More significant was the Commonwealth Reconstruction and Training Scheme and the consequent influx of undergraduates, following the Second World War (Scrivener, 1983).

By the time D.H. Borchardt was appointed as the third full-time professional University Librarian in 1953, just 18 years after Munn and Pitt's report, the University of Tasmania Library had 10 staff, of whom eight were professionals. The collection contained 81,000 volumes, and annual expenditure on the library was £12,858, or 5.2% of total university expenditure (Borchardt, 1961) - a modest enough expansion. However, by 1982, the library staff had grown to 82.7, the collection to 576,600 and annual expenditure to $2,838,967, being 8.9% of total university expenditure.(1) In common with other academic libraries in Australia, the period from the late 1950s until the early 1970s was that of most spectacular growth, coinciding with substantial Commonwealth funding for universities. In addition, the amalgamation of the University with the Mt. Nelson campus of the Tasmanian College of Advanced Education in 1981 caused a sudden expansion in the Library.

The Central Library was moved from the old Queen's Domain site and relocated in spacious new quarters on the Sandy Bay campus in 1961, and an extension of three new floors was completed in 1969. During the 1960s and 1970s several new branch and departmental library facilities were also provided. Some of the smaller departmental collections were amalgamated into larger branch libraries, but the library's collections remain rather decentralized.

By 1980, a total collection of 486,000 volumes, serving a university population of about 3,800 on a comparatively small campus (with only one off-campus department - the Clinical School at the Royal Hobart Hospital) was scattered in eight locations besides the Central Library building.

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(1) Australian Academic and Research Libraries. Supplement, Library Statistics, 1982. V.14 No.3. September 1983

Many of the smaller departmental libraries had no professional library staff, and could offer only limited services and hours of opening. In addition, there were several 'unofficial' library collections of books and audiovisual materials in departments throughout the University. This is by no means a unique situation in Australia. With the exception of the University of Adelaide, departmental libraries have proliferated in all the older universities. To some extent they are under the control of the main university library systems, but many individual collections remain under departmental control.

Thus the history of the University of Tasmania Library is one of uneven development, and long years of inadequacy. Impoverishment and enforced decentralization, with its scattering of resources - both physical and human - are difficult setbacks to overcome in such an organization. The development of library collections is to some extent cumulative. The gaps of former years are not always possible to fill, even if financial resources are eventually made available. The library's one period of substantial and consistent support and growth - from the late 1960s until the late 1970s - laid the foundations for library collections and services which could begin to fulfill the functions set out in Statute XXIX, but by the end of this period sudden changes once again introduced uncertainty into the University Library's task environment.

Amalgamation with the Tasmanian College of Advanced Education

In 1976 the Report of the Committee on Post-Secondary Education in Tasmania (the 'Karmel Report') recommended the closing down of the Mt. Nelson (Hobart) campus of the Tasmanian College of Advanced Education, and the relocation of most of its courses at the University. After a lengthy and heated community debate, the Tasmanian Government eventually decided in February 1980 that the Mt. Nelson courses in Art, Music, Education and Librarianship should move to the University, and most of the remaining courses to the Newnham (Launceston) campus of the TCAE.

The University of Tasmania would become Australia's first 'comprehensive university', offering CAE-style courses as well as its traditional activities. In fact, the nature of the University does not seem to have changed very markedly, and in the subsequent period most of the transferred departments have become very much like traditional university departments. The effect upon the libraries involved had not been a primary consideration in the Government's decision, but the sudden amalgamation presented enormous problems of library rationalization.

> 'In essence the task was to identify, relocate (in several possible locations) and achieve catalogue control of perhaps 90,000 items, while minimizing disruption to the continuing teaching programmes ... Inevitably, the systems of the two libraries were quite different. The catalogues could not be merged in any straightforward way, and different classification systems were used.' (Waters, 1981)

Only minimal additional financial resources were allocated by the University for the huge tasks of identifying the materials to be transferred, reprocessing and transferring them. Because of the nature of the departments being transferred to the University, the relevant library collections contained large numbers of records, slides, prints, films, videotapes and other audiovisual formats with which the University library had little experience. These materials introduced an element of uncertainty into the Library's task environment, and into its technology. They provided new 'raw material' - new objects and symbols upon which actions would have to be performed in order to change them.

To some extent, the strategy employed to cope with this uncertainty was to avoid the difficult materials. Some were transferred to other institutions or to other departments within the University. The film collection was sent to the State Library of Tasmania. The study kits, film strips, maps, overhead transparencies and many of the pictures and slides were sent to the Curriculum Resource Centre - a new 'unofficial library' in the Centre for Education. It is proposed to transfer the records to the Conservatorium of Music. The art slides and videotapes have been left in the Art branch library, but are not included in the University Library's catalogue.

The large-scale acceptance of audiovisual materials is one aspect of new technology with which the University of Tasmania Library does not yet seem to have come to terms. Perhaps this is understandable in view of the relative recency of achievement of a satisfactory level of book collections and bibliographically related services in this Library. However, by avoiding the problems of audiovisual materials, the Library is placing unnecessary limitations on its role of providing relevant educational materials and services for students and staff, and increasing the possibility that rival organizations in its task environment - the 'unofficial libraries' - will take over an important and developing area of its potential activities. By relinquishing such a function in an increasingly difficult task environment, the Library risks loss of support in the future.

The amalgamation also brought with it human problems. Former Mt. Nelson staff had to be absorbed into the organizational structure at appropriate levels, and in appropriate positions. There was understandable trepidation on the part of those to be transferred to a new organization, and on the part of those already in the organization who feared the possibilitity of disruption. In particular, there was a feeling that Mt. Nelson staff were in some cases at higher levels of status and salary than they might have achieved in the University, and that if their positions were not downgraded, existing staff might be at a disadvantage.

Apart from some minor problems, this situation was handled successfully. Some staff members from Mt. Nelson had their salaries pegged. Some believed they lost status. But in general the transition was harmonious. The University Library gained a new major branch library to serve Art and Music, 14 new library staff, and an increased population to serve. (The total University population was 3,813 in 1980; and 5,469 in 1981.)

Technology: The other major environmental factor to have affected the University Library within the last ten years is new information technology. If there has been one area in which libraries have traditionally enjoyed stability it is that of technology.

Traditionally, the technology of the academic library has been bibliographic in nature. Skills such as the careful selection of library materials, the building of balanced collections, and the retrieval of information from these collections; the meticulous, standardized description of bibliographic materials, their classification, subject cataloguing and indexing, and their organization into logical arrangements have been the core of librarianship. To this can be added the skills of interpersonal communication. The success of the reference interview, in which the librarian must elicit from the client exactly what his information requirements are, helps determine the effectiveness of the subsequent information service to that client.

The advent of the computer and of a standard format for machine-readable bibliographic descriptions ('MARC', or Machine Readable Cataloguing) have meant that the bibliographic data upon which virtually all library operations depend can be stored and manipulated automatically.

The automated system means that once a bibliographic record has been entered into the data base it is permanently available for all library processing and service tasks, with a consequent saving in time and dramatically increased capability. The inherent advantages of such a capacity are enormous. To take just one application, it becomes possible to produce, automatically, a bibliography on any subject or combination of subjects from the library's catalogue. The computer can select the relevant records from its machine-readable bibliographic data base in seconds, and display or print them out in any desired order, in response to perhaps a few minutes of input at a computer terminal. To perform the same task manually might take weeks or months of effort. Advances in telecommunications mean that access to and manipulation of the data base are possible from almost any location.

To reach such a stage of development, however, involves very considerable resources, both financial and human.

In addition the library finds itself in a new and turbulent environment. It has to adjust to new constraints, deal with new suppliers, fight for new resources, achieve a new commitment from key employees, and convince its members and its clients that what it is doing is for the best. Ironically, just as the new technology has become available, universities in Australia have entered a new period of financial stringency. It has become very difficult to obtain sufficient resources to take advantage of modern developments. Having achieved at last a reasonable level of library provision using traditional library technology, the University of Tasmania Library made its first commitment to the new information technology in 1973 when it began purchasing (from an American library supplier) bibliographic data for its new acquisitions in both card and machine-readable form. In this way a machine-readable data base was built up for possible future use in an as yet to be determined system. In fact this data base enabled the regular production of a computer output microform (COM) library catalogue from 1977 onwards. It eventually formed the basis of the data which was loaded into the Library's new stand-alone minicomputer in 1981.

These developments were due largely to the foresight of the Head, Technical Services, who energetically pursued the creation of a machine-readable data base, compatible with national and international standards, and the acquisition of computing services and expertise for the Library. These efforts were rewarded when, in 1974, the Vice-Chancellor appointed a working party to consider library automation. The working party concluded that the Library needed access to the University's mainframe computer, and that the Library had a continuing need for its own systems staff. As a result, the key post of Systems Officer was created, and an appointment made in June 1975. A computer programmer was added to the staff in 1977.

A monograph acquisitions system was designed and installed on a shared-time basis in the University's mainframe computer in 1976. In subsequent years further modules of an integrated library system were planned for use on the mainframe computer, and a supplementary cataloguing programme was installed. However, it became increasingly apparent that the Library's requirements for extensive storage space, and interactive data entry and enquiry programmes were placing a heavy load on the system, to the disadvantage of other users. A working party was set up, which recommended, in May 1980, that a stand-alone system be purchased for the Library. The overwhelming reason was to relieve the pressure (which promised to increase dramatically) on the University's mainframe computer. The recommendation was agreed to, tenders were called for, and in April 1981 the decision to purchase A.W.A./Reality hardware and URICA software for a stand-alone integrated library computing system at a cost of about $200,000 was made. (The specifications for the new system are listed in Appendix I.)

Although the various committees and working parties which discussed the pros and cons of a new library system all took pains to detail the expected capabilities of the system and the consequent improvement in the quality of library service for the University, as well as a continuation of staff savings already achieved through the Library's existing automation, (by 1980 the University Librarian was able to report in an internal memorandum that the staffing of the monographic acquisitions department had been reduced from 7.6 f.t.e. in 1977 to 3.1 f.t.e. Cataloguing staff had also been reduced by 2.5 f.t.e. in the same period. These reductions were due to the introduction of automated systems.) one feels that the real reason for the success of the Library's application for its own computing system was the anticipation by all concerned that getting the Library's programmes off the University's main computer system would be the most immediate benefit to the University! The additional load to be imposed by the impending transfer of TCAE library collections was an additional impetus.

If the University of Tasmania Library has had a history of slow and patchy development, lagging behind comparable institutions in other States, it is in this area of new information technology that it has now become a leader. Many other university libraries made a similar commitment to automation in the 1960s and 1970s, developing home-grown systems using shared time computing facilities, but no other Australian university library is so far advanced in the installation of a total integrated library system. I would suggest that the major reason for this development was the careful planning of the early applications in the 1970s: the creation of a bibliographic data base capable of adaptation to future developments, and the planning of individual systems, such as the monographs acquisition system and the supplementary cataloguing system as modules of a potential integrated system.

The comparatively small size of the collection was also significant. The larger the backlog of manual records requiring conversion to the new system, the more daunting is the task of conversion. And, of course, the fact that the University's computing system was bursting at the seams just as the Library was preparing to increase its load on the system was instrumental in freeing the Library from the constraints of shared-time computing facilities.

To summarize this chapter on the nature, history and technology of the University of Tasmania Library:

The Library is a service organization within a larger parent organization. It has a reasonably well defined role, but is limited in its ability to acquire resources, make management decisions and introduce new initiatives. It has had a somewhat chequered career with long periods of neglect and impoverishment, relatively sudden spurts of growth, and an enforced amalgamation. Despite its comparatively small size the Library has had to decentralize its services. The benefits of this decentralization are probably outweighed by the additional strain on the Library's limited resources. However, the new capabilities provided by new technology - notably on-line access to the Library catalogues from any convenient location - promise to alleviate these constraints. Whilst the Library has tended to avoid one of the challenges of new technology - the building of collections of educational materials in new formats - it has been entrepreneurial in its adoption of new information technology and is in the process of progressively installing a new, totally integrated on-line library system based on the Library's own mini-computer. These information technology initiatives coincided with the end of the period of the Library's greatest growth and the emergence of a new period of stringency in funding for tertiary education in Australia.

Thus the proposition that the University Library will attempt to reinforce its niche within the parent organization through the adoption of new technology is supported on one hand, but not on the other. New information technology has been embraced with some enthusiasm, and this promises to provide the Library with important new capabilities. Improved services due to automation give the Library the potential to increase the relevance of the Library to its client's information needs and consequently, to increase the population served. However, the discernible reluctance to accept educational materials in new formats runs counter to this trend. Already, a new 'unofficial library' - the Curriculum Resource Centre, in the Centre for Education - has been established, and is a significant new competitor in the Library's task environment. The Curriculum Resource Centre is operated by a qualified librarian, and has already achieved the transfer of non-fiction children's literature from the Library to the Centre. Thus its role has been extended to include traditional library materials, as well as the study kits, film strips, maps, games and other more unusual formats which the University Library was reluctant to accept. The proposed transfer of the record collection to the Conservatorium of Music promises to establish another competitor for the University Library.

Inevitably, these developments reduce the Library's capabilities, and tend to reduce the population served. Thus we must conclude that the Library's response to new technologies has been enigmatic. In the area of new information technology our proposition is supported, but in the area of new audio-visual materials it is not.

Chapter 3

THE UNIVERSITY LIBRARY AND ITS ENVIRONMENT (ii) THE TASK ENVIRONMENT OF THE UNIVERSITY LIBRARY

The previous chapter looked at the nature and history of the University of Tasmania Library, with emphasis on its use of new technology as a strategy to confirm its niche within the University. An open system view of an organization must emphasize the environment within which the organization operates. Thus the purpose of this chapter is to broaden our view of the background for the case study by examining the nature of the domain within which Australian university libraries must operate, and the part played by technology in that domain. This broader view will assist our consideration of the second of the propositions put forward in chapter 1:

> Turbulence and uncertainty are increasing in the University Library's task environment, and much of this turbulence and uncertainty is due to technological factors.

Any organization needs to reduce uncertainty, as far as possible, and to seek stability. In fact Thompson (1967) has suggested that coping with uncertainty is

> 'the essence of the administrative process' (p.159)

It should be useful, then, to consider the nature of the university library's task environment, to attempt to gauge the level of uncertainty faced by this type of organization, and to assess the role of technology in various environmental elements. It is evident from the survey of the literature of automation and libraries (chapter 1) that libraries of various kinds, including university libraries, are undergoing a crisis of confidence, and are searching anew for legitimacy, largely because of the emergence of new communications and computing technologies. This chapter will consider the challenge these technologies appear to present for the library's traditional role - especially at a time of increased competition for scarce financial resources. It will use a typology suggested by Emery and Trist (1965) in its consideration of the level of uncertainty which exists in the university library's task environment In addition, the new opportunities and constraints due to technological factors - both within the organization's core technology and in the changing task environment - will be considered.

Technology is one of many environmental factors affecting organizations. Technological change can hardly occur unless new technology is available in the organization's environment. The environment at large will affect the nature, indeed the very existence of particular kinds of organizations. The general environment consists of socio-cultural, political, legal, economic and technological features. According to Stinchcombe (1965) a population or a society has an 'organizational capacity' which depends upon such factors as levels of wealth, literacy, traditionalism, urbanization and the availability of appropriate technologies. Organizations can only grow and flourish in an appropriate environmental setting. In Australia, a relatively wealthy country with widespread if not universal literacy, a democratic political system, a high degree of urbanization, and relatively ready access to the new technology of the Western world, the university and its library exist in an appropriate environmental setting. While participation in tertiary education is not high compared to the United States of America, for example, the education system is a prominent area of endeavour enjoying a high level of public support, and the universities have an established position in society. The expectation of a university education has been a part of the socialization of a sufficient proportion of the population to ensure the continuation of the university as an accepted organization in Australian society for more than one hundred years. That is not to say that all is plain sailing for Australian universities and their libraries, for their environment is changing.

The new uncertainty in the environment of post-industrial society - an uncertainty due in no small part to the rapid advance of new technology - is affecting organizations of all kinds. More than ever before, universities and their libraries have to justify their existence, and to be publicly accountable if they are to continue to attract funding from a public purse which receives competing demands from ever increasing areas of social welfare and public service activities. Universities have to respond to new community demands, to show that their teaching and research activities are relevant to current social and economic needs, as well as achieving efficiency and coping with financial stringencies. The library within the university is likely to find itself pressed to provide new services and to cope with new technologies, and new competitors. At the same time it is likely to experience greater difficulty in securing its traditional share of the institution's financial resources, as competition for funds amongst university departments becomes more intense.

Certainly, the era of the ever expanding academic library seems to have ended. Academic libraries in Australia can no longer expect to acquire new buildings or extensions whenever their stacks approach full capacity. There is a new emphasis on the weeding of lesser used material from library collections, and making do with existing facilities. While the concept of the 'steady-state library' and the recommendation of the Atkinson Report[1] that university libraries should not grow beyond a 'reasonable size' was not fully accepted in Australia, they have inevitably had some impact.

While university libraries struggle to reduce uncertainties of supply of financial resources and general support within their parent institutions, librarians are at the same time continually reminded of developments in the

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(1) University Grants Committee. Capital Provision for University Libraries: Report of a Working Party. London, HMSO, 1976

general environment which may threaten the very existence of the traditional university library. I have already suggested (Chapter 1) that university libraries are experiencing a crisis of confidence, or a crisis of identity. Western society in the 1980s is undergoing a period of major upheaval, largely due to the technological advancements of the post-industrial era. The unemployment brought about by automation, its deskilling and job satisfaction implications, and its apparent contradiction of a previously accepted work ethic, are creating new attitudes in society and a new public climate for such institutions as universities and their libraries. It is not clear just how the level of public acceptance and valuation of educational institutions will be affected in a society in which full employment is no longer possible. The university library may not be able to retain its established niche, and may need to search anew for legitimacy in a changing environment. Gordon (1977) describes this kind of problem as

> 'the crisis of identity that besets a great variety of organisations that face the ambiguities of: no clear output measures; no clear criteria for evaluating corporate effort; no clear indication of who is doing the evaluating; and no clear vision of what to be and what to do for a future guaranteed to provide uncertainty, complexity and change and these at varying rates.' (p.107)

The library's established niche has always been its mediating role. It has been the link, or the interface, between recorded information and seekers of information; the channel of communication between a particular clientele (the students and staff of the university) and the stored knowledge they require to carry out their teaching, their learning and their research. If predictions of the paperless information system, and the home or office information control centre come to be fulfilled, the possibility is that the library's mediating role might be usurped. Lancaster (1982) refers to several forecasts that libraries may be bypassed by the new technology, and suggests that electronic networks may lead to the gradual disembodiment of the library.

The technology for the individual home or office control centre already exists. Interactive cable television, videotex, packet switching, satellite communications, personal computers, and public and private data banks are all established technologies. Information is becoming increasingly available in machine readable format, and libraries are accessing electronic data more and more. Lancaster (1982) points out that

> 'Before computers, the only way to make an information source accessible was to buy it ... This accessibility is achieved through a capital investment in the physical availability of materials on library shelves ... The ability to access a data base on-line changes this. A library need not make a capital investment in an electronic publication to make it accessible. It can be accessed when needed; the library pays only for the amount of access used at the time it is used.' (p.107)

Lancaster has predicted that by 1990 about 85-90% of all scientific and technical information will be available only in machine readable format. The question is whether individual scholars will be able to manage their own information requirements without need of the university library's mediating function. The answer may be that some scholars will probably be able to achieve this kind of self-sufficiency, but that the majority of the university library's clientele will still require the assistance of information specialists in gaining access to the information they require for their university activities. In that case, the university library's strategy must still be to demonstrate an appropriate mediating role, showing that it has not been superseded by the new technologies, but rather that it is an essential provider and interpreter of information in all appropriate formats. It is likely that this role must be demonstrated in the face of strong competition from alternative information suppliers, vendors and brokers, especially from the private sector. As information becomes increasingly important in the economy, it is becoming big business. Already, data bases operated by private companies (DIALOG, and ORBIT, for example) have been shown to be highly profitable. Commercially owned videotex systems are seeking to extend their penetration into the information market.

Publicly funded libraries are co-operating with commercial vendors in offering on-line access to data banks, but market forces could alter this kind of relationship. To meet new competition, university libraries may need to change from their traditional library collection orientation to a more flexible and broader orientation towards information service of all kinds. Such changes do not come easily to established organizations, and it is still not at all clear just what the changes might entail, or which are the appropriate technologies for the university library to embrace. Hence the crisis of confidence or purpose experienced by university libraries.

No organization exists in a vacuum. An organization like a university is not only a product of the society of which it is a sub-system, but is dependent upon environmental conditions within that society, and it interacts with the environment.

> 'Political, economic, technological, legal and social dimensions of the environment shape this interaction by providing resources necessary to achieve organizational objectives.' (Stewart and Carson, 1983, p.184)

While an organization's boundaries help to identify it, they are not impervious barriers. Emery and Trist (1965) use a biological analogy:

> 'Any living entity survives by importing into itself certain types of material from its environment, transforming these in accordance with its own system characteristics, and exporting other types back into the environment.'

The two quotations above indicate the organization's reliance on the environment for its resources, and to absorb its outputs, but the environment plays a still greater role in the life of the organization, because it provides constraints and problems as well as opportunities. Thompson (1967) views organizations as having certain dependencies and powers as they cope with uncertainties in their environments. He proposes that the complex organization is an open system facing, indeed expecting uncertainty, yet needing rationality and a degree of certainty. As part of its interaction with its environment, the organization achieves bounded rationality by employing such strategies as sealing off its core technology, buffering it with input and output components, smoothing input and output transactions and seeking to adapt to environmental influences which cannot be buffered or smoothed.

The environment is widely viewed as presenting both constraints and opportunities for the organization. Brown and Moberg (1980) are amongst several writers who suggest that the successful organization is the one which can adapt to these environmental constraints and opportunities. Jackson and Morgan (1982) suggest that organizations not only adapt to their environments, but also manipulate them, and that it is the less successful organization which has to expend effort in manipulation. Khandwalla (1977) notes the various environmental constraints, contingencies, opportunities and problems an organization might face, and suggests that the major attributes of the external environment likely to impact the organization are its levels of turbulence, hostility, diversity, technical complexity and restrictiveness. These concepts reappear constantly in the literature, and seem to be well accepted.

Emery and Trist (1965) produced a typology of environments based upon the 'causal texture' of the organization's environment. They recognized the interactions between elements within the organization, between the organization and elements in its environment, and between different parts of the environment. All of these categories of interaction have implications for the individual organization, and taken together, they are a causal influence on the strategies, techniques and structures adopted by the organization.

Emery and Trist's typology has four types of environment:

1. Placid, randomized, in which the favourable and unfavourable elements are relatively unchanging and randomly distributed.

2. Placid, clustered, in which the rate of change is still slow, but trends are more predictable. Planning is more important in this environment.
3. Disturbed, reactive. The environment is confused and contains many similar and competing organizations. Organizational strategies are required, including actions to draw off other organizations.
4. Turbulent fields. The environment is very complex, uncertain, unpredictable and rapidly changing. There is heavy interdependence between economic and social factors, and the organization is increasingly involved in legislation and regulation. Research and development activities are relied upon to produce solutions to competitive challenge.

Where does the environment of the Australian university library fit into Emery and Trist's typology? For the first half of this century, I believe this environment could have been categorized as 'placid, randomized'. Libraries went about their traditional and unquestioned business of collecting books and periodicals, arranging and recording them in orderly ways for the benefit of the institution's scholars. Generally speaking, the environment provided the necessary organizational capacity to support university libraries, although, as noted in Chapter 2, sufficient impetus to establish a formal library organization at the University of Tasmania did not occur until 1919. New technology was not a significant factor. The typewriter and the duplicating machine were gradually accepted but did not change the core technology of librarianship. Of course, the environment had its unfavourable features, the most obvious being the scarcity of financial resources, and the consequent limitations of library collections and services, but the university library led a sheltered existence in a relatively stable environment. A general improvement in financial support for university libraries in the 1950s and 1960s, along with the increased rate of expansion of the universities required more planning on the part of university libraries and indicated a change to the 'placid, clustered' environment. As Emery and Trist suggest is appropriate for this type of environment, there were tendencies towards larger, more hierarchical, centralized, and coordinated university library organizations. New technology, in the form of computer applications for libraries, was emerging as a possible new direction, but was by no means universally embraced by university libraries. Development was piecemeal, and the inevitable problems and failures experienced by experimenters were taken by many librarians and library administrators as comfortable indications that such systems were inappropriate for their organizations. In most cases, new media were regarded with suspicion as inappropriate for the serious scholarly purposes of the university library.

It has become clear over the past ten or fifteen years that library automation is not only appropriate for university libraries, but that it is an unavoidable feature of a new, disturbed, uncertain, and unstable environment. As already indicated, new technology in the computing and communications fields is causing uncertainty for the university library, not only in the changes it presents for the core technology, or traditional library processes, but in drastically changed methods of information strategy and transfer outside the library.

Australian university libraries have lately been experiencing Emery and Trist's 'disturbed, reactive' environment. New suppliers and competitors have to be considered in administrative strategies, and traditional structures and procedures no longer seem relevant or appropriate. The question is whether the environment has yet reached the 'turbulent field' stage, as conceptualized by Emery and Trist.

Despite the crisis of confidence being experienced by the university library in the face of such developments as computer stored data banks, videotex, cable television, machine readable data files and high speed data transmission, it is not yet clear which of the new technologies presents a real threat to libraries as we know them. Indeed, libraries are beginning to use some of these new technologies, for example cable television and videotex, as an enhancement of their normal services. Some Australian universities are already experimenting with satellite communications. However, public libraries and special libraries seem to be more adventurous than university libraries in their willingness to experiment with new media. At any rate, the paperless information system is not yet a reality - nor is the book dead.

While financial resources have to be fought for against increasing competition, and demands for performance evaluation of libraries grow, contemporary society has not yet rejected the traditional university, nor its library, as suitable institutions for its tertiary education and research needs.

There is no doubt that areas of turbulence exist in the environment, nor that the future seems highly uncertain. Using Emery and Trist's analogy: more or less distant tremors are continually discernible, but the ground is not yet in motion. University library administrators need to monitor the turbulence, try to determine which of the new technologies are tools rather than competitors, act to employ those which can be used by the library and thereby maintain an appropriate niche (albeit a continually changing one) and public acceptance and support for their organization's role. Cline and Sinnott (1983) suggest:

> '... The era in which university library managers could readily anticipate alternating periods of organizational turbulence and

> calm appears to be at an end, at least for the forseeable future... We are, however, not confident that university librarians fully recognize that the adoption of automatic systems has moved libraries into an environment of continuous change.' (p.173)

I would add that not only automated systems, but a whole new world of communications technology is creating this new environment. Disturbance and uncertainties exist in both the particular environment of the university library and the general world of information and communications.

Thus far my comments have been mainly about the environment at large. Of more immediate concern for the individual organization is its particular domain, or task environment. The concept of a task environment - the particular domain within which an organization operates, as opposed to the environment at large - is widely accepted in the literature. The task environment comprises the suppliers, clients, competitors, and regulatory bodies with which the organization has to deal. Employees are sometimes included in this list, but most employees are also members of regulatory bodies, such as unions, staff societies or professional bodies. They are also suppliers of labour and expertise, and may be clients as well. Therefore it seems unnecessary to list them separately.

The university library is a sub-system of the university, and this parent institution within which the library operates has dominated its task environment, although to a decreasing extent with the advance of modern technology. The parent institution incorporates the majority of the university library's clients, some of its suppliers and regulatory bodies, and also some of its competitors. Traditionally the boundary spanning roles of university library staff have linked the library with clients who are university members, and with the other sub-units of the parent institution - the academic and administrative departments of the university - although there have always been strong contacts with the book trade and other traditional outside suppliers of resources for the library. Automation has brought with it the need to maintain contact, for example, with suppliers of computing equipment and software, telecommunications organizations and data base vendors such as AUSINET, DIALOG and MEDLINE. In addition, the development of cooperative networks based on shared access to computer stored bibliographic data has created significant new organizations in the university library's task environment. Australian examples include the Australian Bibliographic Network (ABN), Cooperative Action by Victorian Academic Libraries (CAVAL) and College Libraries Activity Network in New South Wales (CLANN). The sharing of library resources through inter-library loan has been a long-standing form of inter-library cooperation, or boundary spanning activity by university libraries, but the establishment of the automated networks has enabled cooperation to take on a whole new dimension, including shared cataloguing, cooperative acquisitions and in some cases reciprocal borrowing privileges for the clients of member libraries. These networks are, in effect, suppliers of additional resources for the individual university library, and, at the same time, clients who receive cataloguing input, inter-library loans, and other products from the individual members of the network. Thus they have a complex, multi-purpose role in the university library's task environment.

According to Salaman (1979) universities are organizations with a high degree of normative power, as opposed to the coercive and remunerative power which dominates many organizations. The academic enjoys a high degree of freedom and discretion, and is one of the least constrained of all employees.

The parent organization within which the university library operates is, generally speaking, one where the organization of work and the degree of control exercised is rather flexible. This contrasts with organizational structures in which strict regulation minimises the influence of individual variations. For example, the traditional industrial firm employing a production-line technology may involve work that is repetitive, boring, lacking in challenge, and yet involving the pressure of completing a prescribed number of repetitive tasks in a given time.

Of course the work of the university library may be very much more routine than that of the academic department, and the library worker is likely to have a lower level of discretion than the academic. Nevertheless the library, as a sub-system of the university, exists in an environment where scholarship and individualism are valued more highly than output figures. What is more, academic staff in Australian universities generally enjoy a very high level of security of tenure, which adds to their levels of freedom and discretion. The tenure system could be seen as a constraint on efficiency in that it is extremely difficult to dismiss employees who do not perform well. The extent to which the tenure system flows on to university library staff varies in different institutions, but a high level of permanency (except for fixed-term contract appointments) is part of the university environment. The atmosphere of the immediate task environment of the university library is one of freedom rather than constraint, and flexibility rather than regimentation. It seems inevitable that the library organization and its employees will be influenced to some extent by this aspect of the task environment.

Of course, the influences of the parent institution are many and complex. Library employees with boundary spanning roles within the parent institution are in more or less close contact with academic staff and students, and may be directed and motivated by academics as much as by the library hierarchy. For example, the branch librarian serving a particular academic department or group of departments is in constant liaison with academic staff, and may be considered to be virtually a member of the department, even though formally an employee of the university library. A branch librarian within a traditional hierarchical library structure may well find that his role vis-à-vis the faculty or department to which he offers library services brings with it a contradiction of the traditional principles of unity of command. To avoid the problems this could present, a degree of flexibility on the part of the employee, as well as in the library structure, is necessary. The complex multiple roles that individuals play in the university library's task environment - for example, the academic who is a supplier, a regulator and a competitor as well as a client - have been referred to above (Chapter 2).

Let us look more closely at the elements of the university library's task environment - its suppliers, clients, competitors and regulatory bodies. The university library's suppliers include book-sellers, subscription agents, publishers, library equipment vendors, and suppliers of computer hardware and software. As noted earlier, library networks are also suppliers of bibliographic data and other resources. Other libraries might be viewed as competitors, but through inter-library cooperation they are also suppliers of alternative resources. Library schools are suppliers of professionally trained staff. Governments and their agencies (notably the Commonwealth Tertiary Education Commission) are the funding bodies, and suppliers of financial resources to the parent institutions. Within this institution are the governing councils, senates, professional boards, budget and finance committees which are the suppliers of financial and other resources for the library.

All of these supplier elements control vital resources, and the availability or scarcity of the resources they supply can provide opportunities, constraints and problems for the library.

The supply of various resources will be affected by such variables as the relative cost of materials; geographical location of publishers and book-sellers; whether equipment vendors are competing with each other; rates of unemployment; the state of the economy and the availability of funds to the parent organization. Ever present in the task environment is rapidly developing new technology, which is at once a resource for libraries - something of which it must gain supplies - and a provider of opportunities and constraints. Generally speaking, university libraries do not experience scarcity of potential library acquisitions. Books, periodicals and other library materials are published in far greater quantity and variety than can be encompassed by library budgets. On occasion, however, the particular scholarly materials needed for university research purposes may be rare, expensive and difficult to obtain.

Out-of-print materials, and private collections may well contain resources of inestimable value to some sections of the library's clientele. Urgent action occasionally may be necessary in order not to lose a purchase to a rival bidder. Supply of sophisticated new communications media may provide new challenges for the university library. For example, the library that decides to become an active information provider, rather than simply a receiver of information via new videotex systems, or interactive cable television services, will be involved in negotiations with the system operators and with programme producers. Constant monitoring of the viability and levels of user acceptance of the new systems will be required. Generally speaking, the university library is unable to buffer or smooth its core technology from environmental uncertainty through vertical integration, in the way that an oil company might do, by acquiring ownership of oil production and of petrol selling outlets. Such a strategy is most appropriate to mass production or long-linked technologies, as defined by Thompson (1967). However, some library sub-systems do lend themselves to such a strategy. An example is the binding of periodicals. The library can establish its own bindery, thereby controlling one area of supply or input, and eliminating the uncertainties involved in having to rely on commercial binderies.

The supply of computing equipment, software and expertise may present difficulties for the library. While there is no shortage of vendors offering equipment of varying degrees of sophistication and at a wide range of prices, the choice of an appropriate machine, for which adequate software is available, may not be easy. Acquiring adequate system maintenance and support may involve careful negotiation. In many cases (the University of Tasmania Library is a case in point) considerable software and system development may have to be carried out during the installation and testing of a new system. A common strategy to reduce uncertainty in the supply of systems expertise is to appoint systems staff. This is a way of coping with uncertainty by smoothing input transactions (to use the terminology adopted by Thompson). Rather than having to endure instability and unpredictability in its boundary transactions, the organization can try to incorporate unreliable units. Of course, such strategy could lead to staff and line difficulties, as professional librarians have to deal with a new group of systems professionals within the organization.

The opportunities and constraints provided by the supply of bibliographic information via network membership has already been mentioned. The more traditional area of inter-library cooperation - inter-library loans - becomes increasingly important as libraries are less able to keep up with individual ownership of prolific and expensive journals and other library materials. The constraints are greatest for the net lenders - those libraries which lend more often than they borrow through the inter-library loan network. In most cases a standard fee is charged for inter-library loans, at a rate well below the real cost of providing the service. Thus the larger university libraries with the richer collections generally subsidize the smaller university libraries. This has led to considerable debate over the appropriate level of charging for inter-library loans in Australia. At the same time, more and more of the world's periodical and report literature can be ordered on-line and obtained quickly via the database vendors (but at far greater cost than through inter-library loan).

The Australian university library, like its parent organization, is almost entirely dependent, for its financial resources, on public funding. It has a relatively low level of capability or power in determining the level of financial resources it will obtain. Its strategy must be to persuade the relevant authorities - usually budgeting and finance committees of the university - that an adequate level of funding for the library is required. Like most organizations, if it can succeed in 'selling' its services, financial success is more likely. If clients are satisfied that the library's role is essential, and its performance effective, the suppliers of financial resources (and in many cases the members of the appropriate committees are also library clients) may be sufficiently persuaded.

The university library is fortunate in having a relatively small and homogeneous client group compared, for example, to the public library. Most Australian university libraries do have a subsidiary role of service to the community at large, usually with the proviso that this must not disadvantage university staff and students in any way. However, the major clientele comprises the academics and students of the university. One would expect these groups to be highly motivated and supportive of the library. Thus the client elements of the task environment should contribute a degree of stability and certainty to the task environment. Nevertheless, in at least some course areas there is a very low level of sophisticated library use by either academics or students. Price (1980) suggests that in scientific and technical courses

> '... most students receive very full notes in association with a textbook, so there is no need to worry about the library, and as undergraduates rarely understand current research in

> technical areas, lecturers tend to emphasize basics rather than the literature and the use of the library.[1]

In this case it may be difficult for the library to achieve strong client support in some areas of the university. Strategies such as user surveys, public relations work, and user education programmes may be employed in efforts to improve this level of support. It may well be that technological advances in library work may assist here. For example, the prestige of librarians who master the complexities of on-line searching of remote databases, may be very much enhanced in the eyes of technical and scientific academics and students who have not been impacted greatly by traditional library services.

The university library's competitors include other information sources within the institution (lectures, computer services, machine readable data files, and unofficial libraries, or informal collections of documents or data in academic departments) and outside it (other libraries, the mass media, bookshops, videotex, cable TV and the like). The university library usually has no competitor within the institution with exactly the same role or goals - a circumstance which contributes to the relative stability of this aspect of its task environment. In fact other libraries are not particularly regarded as competitors, but more as co-operative elements in the environment, which can provide additional resources to the library in its provision of information to its clients. However, the library must be aware of changing technology and changing needs within the institution because if the library does not meet these needs, some other agency will. The traditional print-oriented library may not even notice an increasing tendency amongst its potential clients to use different formats, such as audio and video recordings, slides and maps, provided by competitors in its task environment. Similarly, the increasing tendency to store data in machine-readable formats might lead to loss of clientele to departments which exploit such formats more readily than the library does. The university library must watch the horizon in order to be aware of new challenges and uncertainties presented by potential new competitors.

The final element of the university library's task environment, the regulatory bodies, include such organizations as the Library Association of Australia, which lays down professional standards, and the Federation of Australian University Staff Associations, and local unions, which must be considered in dealings with employees. Employee organizations are likely to be heavily involved in discussions, negotiations and disputes with management, arising from the introduction of new technology, and its impact on employees.

Governments and their agencies - both federal and state - are also regulatory bodies to varying extents, as are the councils, professorial boards, and committees of the parent institution. Librarians must also be aware of relevant legislation in areas like copyright and censorship, and may have to deal with legal and law enforcement agencies on such issues. The regulations of state or local authorities in the areas of health and safety must also be taken into consideration. The introduction of new technology can bring with it problems of ergonomics, possible health risks associated with long-term exposure to video terminals, and with the excessively repetitive work involved in some automated procedures.

It can be seen that technology is a factor to be considered in each element of the university library's task environment. The resources available, and the attitudes of suppliers are profoundly influenced by technological factors. Clients are influenced by the library's ability to employ new technology and to provide relevant services in a changing environment. New competitors for the library emerge as a direct result of technological developments, and new areas of regulation and control emerge as new technologies are incorporated into the library's activities. Technology helps shape the task environment, as well as influencing the ways in which the library pursues its goals. The availability of new technologies for possible incorporation into the organization's core technology, and the emergence of technologies which may be competitors are environmental factors of great significance for the university library.

All this is further influenced by the rapid rate of the changes triggered by technological advances, and the role uncertainties and management problems which therefore arise for the university library.

It is interesting to reflect upon the strategies an organization like a university library can employ in order to cope with environmental problems and adapt to the opportunities and constraints the environment presents. In general, organizations attempt to decrease dependencies as far as possible, and to increase their capabilities. Brown and Moberg (1980) suggest general strategies such as dropping unprofitable activities, and finding an appropriate niche to improve market penetration. Such strategies are applicable to the university library. We examined one such strategy - the adoption of new technology by the University of Tasmania Library - in chapter 2. A university library might also embark on a programme to drop unprofitable activities by abandoning uneconomic service points and branches, or by combining small branches into larger and more practical units. Use of new technology could be of assistance in such a programme. For example, remote terminals for accessing the library's bibliographic data base on line could be provided in place of an uneconomic departmental or branch library. Finding an appropriate niche might involve the exploitation of new media, or new communications technology. For example, the library might turn to alternative formats such as videotapes and computer discs to enhance its collections and attract new users.

Existing or new data transmission lines might be used for videotex or other information systems. Thompson (1967) has provided us with a number of propositions about the strategies various types of organizations use in coping with problems in the task environment. For example, organizations employing a long-linked technology tend to buffer and smooth their core technologies from environmental uncertainty through vertical integration. As suggested earlier, this strategy is appropriate only for some sub-units and processes within libraries, such as the establishment of a library bindery. Thompson suggests that a mediating technology will attempt to increase the population it serves, in order to reduce uncertainty. To join a network is a strategy which immediately expands the library's boundaries and increases the population served. The university library's ~~user~~ population is inherently limited, but it can use public relations techniques, market research, and carefully developed user education programmes to help convert more of that population from potential to actual library clients. It can also incorporate new media formats into its collections and services and woo clients away from competing information sources. As suggested in chapter 2, the use of computers and telecommunications to provide more effective and efficient bibliographic services and information retrieval can also help increase the user population. The resulting increase in prestige for the library should lead to a corresponding increase in power or capability. Thompson suggests the appropriate strategy for the organization employing an intensive technology (the type of technology employed by university libraries vis-à-vis Thompson's and other classifications is discussed in chapter 4) is to temporarily place its boundaries around the client. As the student becomes a member of the university during the period of his studies, so too he is registered as a member of the library. Some clients (academic and student) are elected or appointed to liaison or controlling library committees, on which they represent the client groups as a whole. High office holders of the university are generally ex officio members of such committees. The library may lobby to include key figures (for example, the chairman of the university's computing committee) as library committee members, thus increasing its power, and the likelihood of success in competing for scarce university resources.

Thompson also puts forward the concepts of coordination, cooption and coalescing as strategies for coping with environmental constraints. The use of shared data bases and the emergence of library networks are evidence of this kind of strategy in university libraries. A policy of coordination with or cooption of the unofficial libraries on campus would help increase the university library's capabilities, while removing potential competitors. In each of these examples, the use of new technology is a vital ingredient. In the former case, computing and high speed data transmission are essential to the operation of the networks. In the latter case, the library embraces new media and new formats of information resources.

It has become obvious throughout this discussion of the university library's task environment, that turbulence and uncertainty are increasing, and that new technology looms large in this turbulence and uncertainty. However, it appears that these factors have not yet reached the extreme in Emery and Trist's suggested scale. In fact, the crisis of confidence suggested by many writers on this theme may be an over-reaction, as the university library which is willing to make adventurous decisions to coopt new technologies, rather than to view them as competitors, can be optimistic about the continued legitimacy of its information service role within the university. As university library administrators choose strategies in their search for

> '... a more aggressive co-alignment which keeps the organization at the nexus of several necessary streams of action.' (Thompson, 1967 p.162)

they constantly have to take note of technological developments. As well as keeping watch for new environmental constraints and challenges, Thompson argues that the organization must maintain a viable technology in a changing environment. It must continually decide

> '... which technology to retain, which to expel, and which to adopt.' (p.145)

and it must adopt a structure which is appropriate to its technology and to the demands of the task environment.

The university library has to cope with and adapt to an uncertain, disturbed and changing environment. Whether the library copes and adapts successfully will hinge very largely on the ways in which the challenges, the constraints and the opportunities of new technology are handled by the library's administrators.

Chapter 4

THE CONSEQUENCES OF TECHNOLOGY: ORGANIZATIONAL IMPACTS (1) ROUTINENESS

We have considered at some length the literature of the impacts of technology with particular emphasis on automation and libraries (Chapter 1). One conclusion which can be drawn from that literature is that new technology is likely to have different impacts in different circumstances. In order to illuminate the circumstances relevant to the case study, Chapters 2 and 3 examined the nature of the particular organization and the task environment within which it must operate.

In an attempt to determine whether it might be possible to predict with any confidence the likely impacts of new technology on an organization like the University Library, this chapter begins with a look at the work of some prominent writers on organizations and technology. Theories about the different types of technologies employed by organizations, and their significance for the organization are discussed. While it does not appear that any of the theories can provide confident predictions, one of the more promising classifications of technology - Perrow's scale of routineness - is taken up, and the technology of the University of Tasmania Library is examined in the light of Perrow's classification. Finally, an attempt is made to determine the effect of the introduction of new technology upon the level of routineness (as defined by Perrow) in the Library's operations. The intention is to examine the third of the propositions put forward in Chapter 1. That is:

> The level of routineness of the University Library's technology will be increased by automated systems. Standardization and formalization will increase, possibly with some loss of flexibility.

Despite a considerable literature on technology and organizations, no very clear or definite theory of the impact of technology has yet emerged. In fact the main lesson to be learned from this literature is that there is confusion, disagreement, and not very much consensus. Some studies seem to support a 'technological imperative', wherein the nature and structure of the organization (or at least some dimensions of structure) are dependent upon the technology employed. For example, Woodward (1965) found a number of relationships between increased technical complexity and the structural characteristics of an organization, including a curvilinear relationship between span of control and management style and the technical complexity of organizations. Others have found organization size to be a more significant determinant. A number of writers agree that technology has particular significance at the operating level of the organization, affecting the work group, or the individual operator, but not the structure of the organization as a whole. For example, Hickson, Pugh and Pheysey (1969) reported the Aston Group findings that technology affected job count variables at the shop floor, such as the number of workers per supervisor, but in general their research did not support a technological imperative.

The 'National' studies reported by Child and Mansfield (1972) tended to confirm the Aston group's suggestion that size is a more important determinant than technology or organizational structure.

The lack of consensus seems to be due in part to inconsistent definitions of technology, different scales of technology, and in the examination by the various studies of different aspects or dimensions of technology in organizations.

In the 1950s, studies looked at operations technology or production processes, and the social or technical effects of these processes, in organizations (Jackson and Morgan, 1982). Later studies, such as those of Perrow and Thompson used a broader definition of technology. For example, Woodward (1970) defined technology as

> '... the collection of plant, machines, tools and recipes available at a given time for the execution of the production task and the rationale underlying their utilization.' (p.4)

However, Perrow (1967) defined technology more generally:

> '... the actions that an individual performs on an object, with or without the aid of tools or mechanical devices, in order to make some change in that object. The object or "raw material" may be a living being, human or otherwise, a symbol or an inanimate object.'

Woodward looked at technical complexity, using a three-stage scale: unit or small batch production; mass production; process production. Perrow (1967) used a scale of routineness. Thompson (1967) classified technology into three types: mediating; intensive; long-linked. Dewar and Hage (1978) saw the variety of tasks of an organization, or task scope as the dimension most likely to affect aspects of structure. Perrow and Thompson have been most influential in this area, and many researchers have used their models, or parts thereof, to examine aspects of technology and its impacts.

Perrow's scale of routineness looked at organizations as being craft, non-routine, routine, or engineering in nature. He studied the search behaviour and exceptions involved in their operations. By search behaviour is meant the amount of searching involved in order to find solutions to operation problems. Exceptions are new or unfamiliar situations which present themselves. Organizations which face few exceptions and have to do little searching are likely to be routine in nature and bureaucratic in structure.

Perrow's concept of routineness or predictability in technology has been linked to such organizational dimensions as centralization, formalization, differentiation, and standardization by subsequent investigators.

Thompson (1967) also took a broad view of technology. His mediating technology is that kind which links interdependent clients or customers, as a bank links depositors and borrowers. Intensive technology involves specialized operators on a particular problem as in craft or unit production. For instance a construction company provides structures to suit the individual needs of particular clients and sites. While standardized routines may be employed, their selection, combination and application depend upon the circumstances of the individual case. Long-linked technology is that of the mass-production assembly line. Once again, Thompson's model has been used to relate different types of technology to structured variables like decentralization, coordination devices, and the degree of discretion at different levels.

It seems hardly surprising that this variety of classification schemes has not produced very much consensus. The various empirical and theoretical studies have tended to choose a model, or part of a model, and to look at particular aspects of the impact of technology. Taylor (1971) suggests that it would be useful to separate studies of white-collar organizations, or white-collar sub-units of industrial firms from the more usual blue-collar industry studies. It seems likely that the impacts in each kind of organization might well be different. Taylor also points to the existence of contaminating factors in organizations which increase their level of technology by automating operations For example transitional jobs are maintained for 'debugging', because of agreements about redundancy, or through incorrect forecasting of labour needs.

> 'In any event, jobs of this type are bound to be less fulfilling, less secure, and hence more disrupting and dissatisfying.' (p.4)

As Jackson and Morgan suggest, technology has been used to mean different things; it has multiple dimensions, and many technologies may be used within an organization. There is confusion between technological variables and structural variables:

> '... is the interdependence of a set of tasks or jobs part of the technology employed by a department as in an assembly line, or is it part of the structural arrangement?' (p.209)

So far as the human and social consequences of technology and technological change are concerned, it is clear that there is always likely to be anxiety, fear and resistance in the face of new technology, as with change in general. There is generally an inertia, or support for the status quo, rational or otherwise, amongst organization members, referred to by many writers on the human aspects of organizations (for example, Roethlisberger and Dickson, 1950). Matters such as redundancy, deskilling, work prestige, social distance and the maintenance of a social organization will concern individuals and groups within the organization and affect their behaviour and attitudes. If it is true that technology is a major determinant of organization structure, or of job count variables and other aspects of that structure, then members of the organization have been affected by technology. If certain technologies are likely to produce a mechanistic or bureaucratic structure, while others tend to produce an organic type of structure, that will be very significant for the work experience of individuals and groups in these organizations. However, as indicated, there is not universal acceptance of a causal link between technology and structure.

There is no clear indication that automation or computerization will universally lead to standardization and inflexibility in the way that automation of an assembly line might do. Mintzberg (1979) suggests that although work at the operating level might become standardized and formalized the fact that unskilled workers have been eliminated from that level may well remove an organizational problem in that the remaining workers enjoy a much more organic structure than before.

In view of the foregoing it is not at all clear what we might expect to find in an examination of the impact of new technology upon an organization like a university library. There is no unified theory from which confident predictions might be made. In the case under review, the organization is undergoing a change from a traditionally manual/intellectual operation to an automated one. In such a change many processes necessarily become more standardized or routinized. This does not always mean that the work to be carried out by organization members becomes more routine, as Mintzberg has pointed out. We can presume that this new technology will lead to changes: technical, social, and possibly structural, but the theory of technology and organizations cannot do much more than suggest possible lines of investigation.

Every writer in this field suggests that new technology creates change of one kind or another, at various levels and in various departments or sub-units of the organization. There can be no doubt that new technology is a powerful agent for change. Faced with a confusing variety of predictions, it is perhaps wisest to choose one scale for its measurement, and attempt to use that scale in examining the impacts in the particular case.

Which scale should we choose? Let us consider the models of three outstanding writers in this field: Joan Woodward, J.D. Thompson and Charles Perrow. Woodward's (1958) scale of technical complexity was devised for manufacturing firms. It provides three categories of 'technical complexity' according to the production system of the firm.

Unit or small batch production is the least technically complex category. It includes the production of individual units or small batches of units to the requirements of particular customers.

Mass production is a more technically complex category using assembly lines techniques to produce large batches of standard units.

Process production is the most technically complex category. It uses a continuous flow plant to produce products such as chemicals, liquids or gases which are normally measured by volume rather than as individual units.

Using this three-stage scale, Woodward found that technical complexity is an important influence on such aspects of organizational structure as size of the administrative staff component; the number of levels in the organization; number of graduates employed; span of control.

Several writers (e.g. Hickson, Pugh and Pheysey, 1969) have pointed out that Woodward's scale is more a measure of technical smoothness than technical complexity, and that many unit production firms employ extremely complex and sophisticated technology to produce unique products for individual customers.

It is not clear just how a university library can be fitted into Woodward's scheme. At one level the organization is involved in small batch or individual operations or services meeting the reference and research needs of academic departments and individual academics. At another level, the acquisition and some of the technical processing of books, periodicals and other library materials is almost production-line in nature. However, the individual cataloguing and classification of library materials is, once again, at the unit production level of complexity.

The lending of books and other materials to academics and students involves a large-scale repetition of standard processes, but at the same time is concerned with the provision of unique products for individual borrowers. Woodward allows for a combination of production techniques existing in the one organization. Nevertheless, her scale does not seem particularly appropriate for a university library, whose largely unit and small batch production is currently being adapted for the employment of a highly sophisticated new automated system. Whilst the new system may produce higher levels of standardization in certain library activities, leading to an increase in batch size, it seems unlikely that the university

Library will tend to move towards Woodward's mass production category of technical complexity. It seems probable that a new automated library system will relieve workers of many routine tasks, and perhaps reduce the number of lower level workers. The fact that the University library is likely to have a high proportion of administrative staff and a high proportion of graduates - features which Woodward found to be typical of process production forms at the top end of her scale of technical complexity - is probably due to the differences between manufacturing firms, and professional service organizations.

Thompson (1967) is concerned with technical rationality in complex organizations as they pursue desired outcomes, and with the strategies they use to protect or buffer their core technologies from environmental factors. He identifies three varieties of technology which may throw light on the nature of the organizations which use them, and point to the kinds of strategies appropriate to the maintenance of their particular core technologies.

Thompson's long-linked technology is that of the mass-production assembly line, where there is a serial interdependence of procedures, and standard products are constantly and repetitively produced. Scientific management is most appropriate to the standardized operations and resources of a long-linked technology:

> 'Production of only one kind of product means that a single technology is required, and this in turn permits the use of clear-cut criteria for the selection of machines and tools, construction of work-flow arrangements, acquisition of raw materials, and selection of human operators' (p.16)

Mediating technology provides standardized ways of linking categories of clients and customers. Although enterprises like banks and insurance firms have to deal with many different clients who have individual needs and requirements, nevertheless they must operate

> '... according to standardized criteria and on terms uniformly applied to the category appropriate to the particular (case).' (p.17)

A mediating organization links one person with another, but it does so by grouping clients, customers, borrowers and the like into standard categories which can then be matched against standardized requests or requirements.

Thus Thompson's mediating technology is appropriate for 'bureaucratic techniques of categorization and impersonal application of rules'.

Intensive technology uses a variety of techniques. Standard as well as non-standard techniques may be used, but a different combination of techniques is selected to fit the individual case. With such a technology there is an obvious need for horizontal communication between sub-units of the organization, for professionalism and for flexibility. Scientific management, bureaucratic techniques and impersonal rules do not seem to be appropriate.

> 'Once started, most of the action involved in the long-linked technology is dictated by the internal logic of the technology itself. With the mediating technology, customers or clients intrude to make difficult the standardized activities required by the technology. And with the intensive technology, the specific case defines the component activities and their combination from the larger array of components contained in the abstract technology.' (Thompson, p.18)

Which of Thompson's categories of technology, then, is employed by the academic library? From one point of view, it seems to be an intensive technology. Each student and academic staff member is an individual case, with particular information needs. In satisfying particular requirements, the librarian chooses a unique selection of information sources and reference techniques for the individual. One client may need an extensive on-line search of certain data bases, the purchase of particular books, and inter-library loan of other library material. Decisions on how to meet his needs can only be made upon the examination of his particular case.

However, it is also possible to view the academic library as employing a mediating technology. It links one group of clients, the students and staff (or the information seekers) with another group, the authors of the books, documents, periodical articles, the composers and performers of musical scores and recordings, the artists who produce the visual and graphic materials (or the information providers). If the academic library is seen as a channel of communication between information providers, and those who seek that information, then it can be seen to be using a mediating technology. From this viewpoint the academic library has a function similar to that of other channels of communication, such as the mass media, who link producers, entertainers and advertisers and other information providers with consumers of information and entertainment. The academic library differs from these other channels of communication in the kinds of information it provides, and in the more limited group of clients it serves, but, like all libraries, it is in the information provision business.

However, the modern university library could be said to differ from Thompson's mediating category in the extent to which it categorizes its clients.

The University library categorizes groups of users, such as undergraduates in a particular university faculty or department, as capable of deriving most of their information needs from a given collection of books, periodicals and other library materials which it acquires in anticipation of these standardized needs. Similarly it categorizes a group of information providers, whose works are placed in a collection, as being capable of satisfying a particular range of information requirements.

But of course the needs of scholars, researchers and even undergraduate students are not always capable of fulfilment from standard sources. A standard response to certain categories of library user whose particular needs are not met by the local collection, might be to offer an inter-library loan service. However, even this service might be denied to the undergraduate, just as a bank will deny a loan to a would-be borrower who does not meet certain standard criteria. The mediating technology applies standard rules impersonally, so that clients with insufficient assets cannot obtain bank loans and students with insufficient status cannot obtain inter-library loans.

For certain categories of library user, the library will offer further services such as information and literature searches, and the compilation of bibliographies, working in close consultation with the individual client, and employing varied techniques, according to the nature of the particular problem. Such activities seem to fit Thompson's intensive technology category. In other words, the academic library does not always employ the standard approaches of the mediating organization. The extent to which the University library goes beyond standardized responses to requests is the extent to which it employs intensive rather than mediating technology.

To complicate still further the consideration of Thompson's model of technology, and university libraries, it is possible to view some subcomponents of library operations as long-linked in nature. For example, the cataloguing, classification, processing and binding of new books for the collection can be seen as a production-line operation with serial interdependencies and standardized procedures. This is especially true of the modern trend towards shared data bases and co-operative library networks, where cataloguing is often simply a matter of calling up a pre-existing bibliographic record on a computer terminal and adding a location symbol. To a limited degree it is even possible for the library to use the strategy of vertical integration, commonly employed by long-linked technologies to buffer their core technologies, in that it can set up its own bindery, thus protecting itself from possible turbulence in one part of its task environment. Scientific management may be quite appropriate in such sub-units of the library.

It has to be concluded that while there is no doubt that Thompson has thrown light upon the categorization of varieties of technology it is not easy to place an organization like a university library within any one of the three categories.

Perrow (1967) defines technology broadly (see above). He looks at organizations as a whole and sees them as 'systems for getting work done.' He avoids the problem of confusion between technology and structure by suggesting that the form of the interaction between individuals in the organization is its structure:

> 'The distinction between technology and structure has its gray areas, but basically it is the difference between an individual acting directly upon a material that is to be changed and an individual interacting with other individuals in the course of trying to change that material.'

Perrow's scale of routineness contains four categories - craft; non-routine; routine; engineering - but he does not suggest that there are four distinct types of organization. Rather there are two continua of routineness upon which an organization can be placed. The first of these is 'the number of exceptional cases encountered in their work', or the level of occurrence of new or unusual situations. The second is the type of search that is involved when exceptional cases occur. At one end of the scale, the search may be logical, systematic and analytical. At the other end of the scale is the vague, poorly conceptualized search, relying on intuition, experience and guesswork:

> 'We can conceive of a scale from analyzable to unanalyzable problems.'

At one extreme of this model is the non-routine organization which encounters many exceptions in its operations, and where the problems which arise from these exceptions are difficult to analyze. At the other extreme is the routine industry which encounters few exceptions; and when exceptions do occur, there are available techniques for handling them. In between these two extremes are the 'craft industries' which encounter a few difficult problems, and the 'engineering' industries which encounter many problems, but find the solution to these problems well within their capabilities.

Perrow suggests that the raw material on which the organization works, has two interacting characteristics which affect routineness. One is the ability to analyze the nature of the raw material, and the other is the ability to treat it in a standardized fashion. If an organization is to increase its routineness

> 'it can only do so either by reducing the variability of the material and thus the number of exceptional cases that occur, or by increasing the knowledge of

> this material and thus allowing more analytic techniques to be used, or both.'

Perrow's broad definition of technology and his scale of routineness seem to be capable of application to any type of organization. A university library is a system for getting work done, and it performs actions on objects, human beings and symbols, in order to make some change in them. It should be possible to place the university library's technology within a scale of routineness, according to the number of exceptions encountered, and the difficulty or otherwise of analyzing these problems. But as Perrow is careful to point out, we must beware of assuming that all such organization will be at the same point in the scale:

> 'In fact, the variations between one type of organization may be such that some schools are like prisons, some prisons like churches, some churches like factories, some factories like universities, and so on.'

It seems reasonable, then, to use Perrow's scale in an examination of the technology of a university library and in trying to ascertain what impact new technology might have on the organization. For example, it may be that the introduction of a new system has the effect of enabling larger production runs, or of increasing the number of clients served, which are strategies an organization might use for reducing the proportion of exceptional cases, and thereby increasing routineness.

third
Our third proposition is concerned with the effect of new library systems on the routineness of library operations. The remainder of this chapter will attempt to clarify the level of routineness of the University Library's operations, and whether this level has been affected by automation.

Looked at as a whole, the University Library's technology consists of actions performed on all three of the 'objects' suggested by Perrow: inanimate objects, symbols, and human beings.

Inanimate objects (books, periodicals, microforms, graphic materials etc.) are purchased, described, listed, catalogued, classified, organized, bound, displayed, lent and otherwise promoted. Symbols (bibliographic descriptions, classification symbols, subject headings and the like) are created, stored, manipulated and communicated to appropriate recipients. Human beings are communicated with, supplied with information, enriched and educated in various ways. In fulfilling its functions, the University Library performs complex sets of operations, in many different combinations to suit the particular needs of different clients, and the characteristics of different educational materials.

We need to consider where the University Library fits into Perrow's model of routineness of technology. Bearing in mind that a great many of its activities (for example the purchasing of books and other materials; some aspects of processing them; lending them; keeping them in order; circulating them; answering queries about them) are generally rather routine in nature, it might be reasonable to place the library at some point near the routine end of the scale. At the same time, when a more intensive effort is required to deal with a particular client's information needs, or to handle unusual or difficult library materials, the library's technology becomes intensive (in the sense in which Thompson uses the word) and non-routine. These occasions upon which an intensive technology is employed, can be seen as the exceptions conceptualized by Perrow. In order to find the particular organization's position in Perrow's model we must consider the frequency with which such exceptions arise, and the analyzability, or otherwise, of the exceptions.

If possible, we should consider the main functions of the University of Tasmania Library at an organizational level, if we are to assess the organization's routineness. According to University Statute No.XXIX, these functions include the provision of undergraduate and postgraduate students and academic staff with the printed and other library materials relevant to their various needs and requirements. Also included is the less tangible function of assisting the University to produce 'informed and questioning citizens'. In addition, the Library educates Library users, cooperates with other libraries in building the nation's library resources, and assists members of the general community to obtain access to library materials (so long as this does not prejudice the Library's primary responsibility to University users).

The main theme running through these functions is that of bringing library users into contact with relevant library materials, and helping them to use them effectively. The technology involved in this work will vary according to the type of user; the particular needs of users; their experience or expertise in using libraries and library materials; the level of difficulty experienced by the library in acquiring, processing and retrieving different types of library materials; and the library's ability to provide relevant materials from its own collections or from other sources in response to particular demands. The assessment of the routineness, or the number of exceptions occurring in this technology, is problematical.

In common with service organizations generally, it is no easy matter to measure the productivity of a library. It is possible to count the materials added to the collection; to record the number of books and other materials borrowed; to record the numbers of reference questions asked and answered (though this can be rather meaningless unless there is some system for weighting questions according to the degree of difficulty and length of the search); to keep a tally of library orientation tours, lectures and seminars held, and of the number of users attending them, and so on.

Such statistics can do no more than indicate the level of activity of a library. As indicators of output, they leave a lot to be desired. For example they take no account of the library user who comes into the library, finds a book or books (or other items), reads them, or selects information from them, and leaves without having had any contact with library staff. Such transactions take place continually. They are of widely varying levels of difficulty, and have widely varying success rates. It cannot be assumed that the library user with a problem (even a difficult one) will communicate that problem to the library staff. There is a significant level of 'self-help' in a library, which cannot be recorded easily. Only through such strategies as surveys of users can a library obtain any indication of the amount and the nature of the in-library use of its materials.

Similarly, it is impossible to assess in any clear way the library's contribution to the production of informed and questioning citizens.

If we cannot be sure how many transactions take place in the library, how can we know how many of them are exceptional?

An additional problem is that such indicators as do exist refer only to individual operations within the library system, and not to the library's output as a whole. However, for the moment perhaps we can view lending and reference figures as primary indicators of the bringing together of users and relevant library materials.

Even allowing for their crudeness, lending tallies do seem to point to a fairly high level of routineness in this aspect of a library's technology.

It can be seen from figure 1 that there is a high proportion of 'reserve lending' which reflects the use of 'standard' reading by undergraduates. In contrast, the inter-library loan service represents a rather small proportion of total lending.

Figure 1

UNIVERSITY OF TASMANIA LIBRARY LENDING: 1980-1983

	Items lent from Central Library	Items lent from branches	Reserve lending	Inter-library lending lent	Inter-library lending borrowed
1980	53,848	32,073	93,155	3,709	4,865
1981	75,531	62,177	95,842	3,942	4,470
1982	82,959	59,093	89,546	3,846	5,159
1983	73,379	57,001	85,122	3,696	4,638
Total 1980-1983	285,717	210,344	363,665	15,193	19,132

Generally speaking, the lending of 'reserve' books is a very routine operation. Students are referred by academic staff to particular books and articles. The library is notified that these items will be in particular demand, and it places them in a controlled location, under strictly limited borrowing conditions. Typically the student locates the item himself and requests for assistance are routine and straightforward. Exceptions arise only on rare occasions: for example, when an academic requests items which are not held and not easily obtainable, or when items are lost or stolen.

This highly routine operation accounted for over 41% of lending from the University of Tasmania Library in the period 1980-1983. (The sudden increase of general lending, as opposed to reserve lending from 1981 coincided with the amalgamation of the University with the TCAE.) General borrowing is, once again, a routine activity. Exceptions may involve assistance in locating missing items, or in retrieving items to meet a particular need, and the recalling of items already on loan to other borrowers. But these activities are themselves routine in nature in all but a few cases.

Inter-library loans represent the more exceptional needs of library users (inter-library loans are restricted to postgraduate students and academic staff). Nevertheless, a routine technology exists to handle the location, requesting and handling of material from other libraries. Items lent to other libraries are also handled routinely.

Obtaining items from other libraries for the University Library's clientele represents less than 3% of the total lending activity. Perhaps this figure would be higher if inter-library borrowing privileges were extended to undergraduates. However, university libraries in Australia generally consider that undergraduate needs ought to be met by the student's own institution, and that inter-library loans for undergraduates are neither necessary nor practicable.

Although we cannot simply equate inter-library loans with exceptions in library lending and recognizing that the most exceptional cases - those in which neither the library collections nor the inter-lending service could supply the wanted materials - are not represented in these figures, it does seem reasonable to say that in a lending operation in which just over 41% of transactions are very routine, over 56% of transactions are generally routine, and in only a little over 2% of cases is there need to look further than the library's own collections, the University Library falls very much at the routine end of Perrow's continuum for the number of exceptions in the organization's technology. It cannot be emphasized too much that lending figures are only a crude indication of the Library's level of activity, and they represent only one aspect (albeit a central one) of the total library service. Indeed, the fact that such statistics can be collected is very much a result of their relative routineness, and one reason that other library statistics are difficult or impossible to collect is at least partly their non-routineness.

If there were no exceptions in the University Library's transactions - if all library users were able to locate easily the information they needed - there would be little need for a reference service. Again, it is simplistic to suggest that a reference department exists solely to deal with the exceptions that arise in the library's transactions, as much reference work involves simple directional information, and basic instruction in the use of catalogues and of library materials. However, reference enquiries which go beyond the simple directional category, and the requests for particular items - for example, the more open-ended requests for information on a topic, the literature search, and the compiling of bibliographies - are, to varying degrees, exceptions to the routine transactions of the library. The fact that the University of Tasmania Library employs four specialist reference librarians in the Central Library, and that the professionals in the branch libraries also spend a considerable proportion of their time in reference work, indicates that the organization recognizes that library users will need special assistance at times, and is willing to make provision for these exceptions. Statistics of reference work are not recorded at the University of Tasmania Library, with the exception of on-line searches of remote data bases. The Reference Librarian estimates that on-line searches (which numbered 646 in 1984), constitute about 20% of the reference enquiries in the Central Library.

As an indication of the extent of the reference service in the University of Tasmania Library, we can look at the proportion of library staff employed in reference work. If we assume that the branch librarians spend about half of their time on reference tasks, then the full-time equivalent staff employed in reference work is about eight, out of a total library staff of 82.7 (f.t.e.). In other words, about 10% of the library workforce is devoted to the more or less exceptional needs of library users.

Once again, this is by no means an accurate indicator of the occurrence of exceptions in the Library's activities, and although the lending and reference units are central to the Library's main functions, they are nevertheless just two library sub-units among many, all of which are at least indirectly aimed at bringing the University population into contact with the library materials and the information they need. Having said that, the indications we have do seem to point to a largely routine library technology, with a relatively low incidence of exceptions. The same can be said for other operations such the selection, acquisition and processing of library materials - especially in a library which concentrates largely on library materials in traditional printed formats. Exceptions will arise when 'fugitive' materials have to be acquired. Unpublished documents, machine readable data files, and the publications of some foreign countries, all present particular acquisition and processing problems. In a few cases, notably the Archives and Special Collections sections, difficult materials may be the rule, rather than the exception, wherein almost every acquisition presents its own unique problems. However, although exceptions occur in all sub-units, the University Library generally can be said to be at the routine end of the continuum.

As for the techniques for solving the problems which arise, for the most part they are analyzable, and the Library has techniques for solving them. To take the example of the library user who has a poorly defined need for information or library materials and who approaches the reference librarian for assistance, the reference librarian's training and experience have armed him with an ability to analyze the problem, and strategies to cope with it. Jahoda and Braunagel (1980) have produced a five-stage model of the process of answering reference questions:

1. Message selection: (identifying the essential information in the request - its subject and the type of information needed)
2. Negotiation (the reference interview)
3. Selection of answer-providing tools
4. Location of answers (including determination of search terms; searching; and assessing appropriateness of potential answers)
5. Communicating the answer to the patron.

This model is perhaps a little over-simplified, in that it assumes 'the answer' will be available in reference tools, whereas the question may be so vague and open-ended as not to have any clearly identifiable answer. Nevertheless, if we equate the answer with the provision of information or materials that are at least useful to an enquirer, the model is a valid one. Location of answers may require more than searching the library's resources. Alternative sources such as government agencies, community information bureaux and local authorities may need to be investigated. The search may be both intensive and extensive, but in most cases the librarian's searching skills together with his interpersonal communication skills provide him or her with the capability to analyze and solve the problem.

This picture of the reference service is one of routineness. It could be argued that each individual reference enquiry is unique - different users needing different levels and aspects of information, even if the subject is a common one (classes of students doing the same courses and having to produce the same assignments will have very similar needs, but will not necessarily have uniform requests, as their work experience, knowledge and capability will all vary). At the same time the variation in the requests is not often so great as to require unusual techniques on the part of the reference librarian.

A similar pattern emerges in technical services sections. For example, the Cataloguing Section catalogues a great many unique items - each different title is a unique item - but there is sufficient uniformity of items passing through the section to allow standard techniques to be employed for most cases.

In a majority of cases, a machine readable bibliographic record is available for purchase from commercial or national agencies. With the exceptions, where an item is too recent or too rare for inclusion in these data bases, original cataloguing is carried out. The items which have to be catalogued in this way vary in difficulty, but the cataloguer has available cataloguing rules and thesauri of subject headings which are sufficient to cope with virtually all exceptions, depending upon his or her level of experience, expertise and subject knowledge.

From the foregoing, it seems reasonable to conclude that the University Library's technology falls within Perrow's routine category. That is, it experiences relatively few exceptions, and these exceptions involve problems which are generally analyzable.

Such a finding seems surprising. After all, university libraries are involved in a wide range of information services to a clientele which varies from the inexperienced student, ignorant of the literature of his subject(s) and of what the library can offer, to the researcher of international reputation, working at the frontiers of knowledge. If they are to offer good library services to their clients, library workers need to be flexible and creative, and not tied to sets of inflexible rules and procedures. They need to be able to turn to unusual information sources, and to access information in a huge variety of formats. In a rapidly changing technological environment, where machine-readable data files, videotex and similar developments are already presenting new problems to the library as an information gathering and disseminating agency, and when the promise (or threat) of electronic publishing as a replacement for at least some traditional library formats holds as yet unknown implications for academic library services, established rules, traditions and procedures may be becoming irrelevant.

Although our examination of operations in the University of Tasmania Library leads us to conclude that exceptions do not comprise a large proportion of the total library activity, it could be argued that the number of exceptions is still large, compared with a mass-production firm, for example, which seems to fit much more happily into Perrow's routine category. If we accept the view that although most library transactions are routine in nature, in each case in which a librarian's assistance is required, he uses discretion in choosing an appropriate technology in order to satisfy an individual client, then we could appropriately place the library into Perrow's engineering category, which is characterized by analyzable problems with many exceptions. Some writers, for example Shaughnessy (1978), assume the library falls into the craft category, at the non-routine end of Perrow's continua. That is, the problems which arise, although few in number, are unanalyzable, requiring a creative individual appraisal by the librarian. It may be that this type of problem is arising more and more, in various library operations, due partly to the uncertainty which has been introduced by new technology and partly to the increased expectations of information seekers, but my own observations of the University of Tasmania Library suggest that unanalyzable problems are a relatively minor occurrence, and that new technology is making their analysis less difficult.

The question arising now is whether the introduction of new technology into the University of Tasmania Library is affecting the routineness of its technology. In other words, is the number of exceptions which occur as the organization works with its new technology increasing or decreasing, and are the exceptions presenting problems of greater or lesser difficulty? If routineness is increasing, is it accompanied by greater standardization and formalization, and is there a corresponding loss of flexibility?

People working in an organization such as the University Library are involved in a great variety of different tasks, all of which to varying extents are relevant to overall organizational objectives. Clearly, it would be impracticable to attempt to examine every task in detail in a study of this kind. In addition, I have already pointed to the difficulties involved in quantifying the exceptions which occur in library operations, and measuring the degree to which they are exceptional. Rather than attempt quantitative analysis in this area, it would seem more useful to look in turn at each of several major library activities, and to try to identify changing trends in levels of routineness in each section, through observations of the activities and discussions with the operators. To this end, the Monograph Acquisitions, Serials, Cataloguing and Reference Sections will be considered. Notable for their absence from this list are the Bindery and the Circulation section. The Bindery is omitted because it is really a separate operation and its work is not affected in any significant way by the installation of new library systems (although over a period of several years its operations have changed dramatically as a result of the installation of new machines with increasing levels of automaticity).

On the other hand, circulation - the library's lending service - could be expected to be affected dramatically by the new library system. However, the circulation module of the URICA system had not been installed by the time of this study (although planning for its installation was well under way). It is anticipated that the clerical tasks of filing and file maintenance (of loan records) will be eliminated. The exceptions created in the manual system by errors in filing, loan records not found, items incorrectly charged or discharged, excessive or unauthorized borrowings, abuse of borrowing privileges by individuals, will all be capable of dramatic reduction, if not elimination by the automated circulation system. Notification of overdue items will be automatic, reservation of wanted items will be simplified, and information about the loan status of books and other items will be automatically available. That is, the on-line catalogue will inform the user, not only of the fact that the library holds a certain item, but also whether it happens to be on loan at the moment. In addition, a wealth of management information about borrowing trends will become accessible through the automated system. Thus the expectation is that exceptions to the loan routines will decrease, and that many of the problems which do arise will be more easily solved. Problems of inflexibility, such as the system disallowing a legitimate loan which does not conform to normal preconditions, can be expected, but should be minimised by an over-ride capability for staff operating the system. However, at this stage it is not possible to verify these expectations.

Monograph Acquisitions:

One of the more dramatic changes in the nature of work in the University of Tasmania Library has occurred in the monograph acquisitions section. There has been an overall reduction in clerical work. Tedious repetitive filing operations including the consultation and amendment of manual files, have been virtually eliminated. This is not a sudden change as a result of the introduction of the URICA acquisitions module. Automation of the monograph acquisitions system occurred some years earlier, using the University's mainframe computer, and clerical work was significantly reduced from that time. The URICA system has continued this trend. As noted earlier, the staff of the section was consequently reduced from 7.6 (full-time equivalent) to 3.1 over a three-year period, largely because of the decrease in filing and file maintenance work.

This is a case of an automated system taking over a large proportion of the lower level production tasks, and remaining workers becoming 'supervisors' of automated procedures. As well as decreasing tedious clerical work, the system has reduced the number of exceptions which occur in file maintenance. In the former manual operation, acquisition records consisted of duplicates of order forms filed in three separate sequences. Any correspondence concerning items on order required retrieval and amendment of one or more of these records. Upon receipt of an ordered item, all three records had to be located, amended and refiled. The potential for misfiling, error, and failure to find relevant records in such a system is considerable. Therefore, exceptions in the form of missing, misfiled, or inaccurate records are quite common.

The operation of the automated system involves input of a bibliographic description of a book or other item into the data base. The system assigns a bibliographic record number (BRN) to each new item input, and produces an order form which is sent to the supplier. Upon recipt of an item the BRN (or one of several alternative identifiers) is keyed in at a terminal and the bibliographical record appears on the screen. Details of receipt, payment, and any necessary amendments are keyed in. A process slip is automatically produced, and the new item is ready for cataloguing.

In the manual system, donations, and books or other items received in non-standard ways (e.g. selected from a local bookshop without a formal order) required the production and filing of dummy order records in the acquisitions files. The automated system merely requires input of a bibliographical description along with the purchasing details, into the data base.

With the manual acquisitions system the production of monthly financial statements required cessation of normal activities, and devotion of about two man-days to preparation of the statement. Approximately half an hour of data input is sufficient for automatic production of financial statements by the new system.

In the manual system typing of orders was, more or less, a continuous process. It included the loading of continuous, multi-part stationery into the typewriter, and the subsequent separation and sorting of the typed forms, ready for posting or filing. Input of order details into the data bases is considerably less time-consuming and has become a batched task. This has led to some loss of flexibility, in that an urgent order may not be placed until the next scheduled input of a batch of orders. Previously, the exceptional order could be given directly to the typist permanently occupied in the production of orders, for urgent typing. A new problem introduced by the automated system is the level of dependence upon the computer. If for any reason the computer is down (power cut, malfunction, or maintenance) the routine work of the section must cease for the duration of the interruption. It is not easy to find sufficient non-computer related tasks to occupy the staff of the section during an extended breakdown.

A more significant problem of the new system is the loss of the permanent order record. Once an item has been received and goes for cataloguing, the bibliographical record is called up by the cataloguer, who may amend it in various ways to achieve the required cataloguing standards, and compatibility with other catalogue records. If, for example, additional volumes of a previously recorded multi-volume work arrive in the acquisitions section, the record when it is called up may bear little resemblance to its original form. In this case, the system has given rise to a new problem, which requires a new level of coordination between acquisition and cataloguing sections.

In common with most Australian university libraries, much of the selection of new material is carried out by members of academic departments.

Traditionally an order is initiated by members of the academic staff filling out purchase request forms and forwarding them to the acquisitions section. Automation has streamlined this procedure in many cases, as major library suppliers now provide computer-produced selection forms according to agreed subject profiles. In general, these selection forms provide a reliable bibliographic description which can be used to generate orders.

Bibliographic verification of purchase requests has been streamlined, due to the existence of machine-readable data bases. In addition, the holdings check in the library's catalogue, necessary to guard against accidental duplication of books and other material, is greatly simplified at the on-line terminal. Records are easily accessible from a variety of access points. For example, it is possible to simply key in an International Standard Book Number (ISBN) to determine whether an item is included in the data base.

In summary, the major function of the monograph acquisitions section - the verification and placing of orders and the recording of receipts and payment for new items - has become quicker and more straightford in most respects. There is a new simplicity and flexibility in calling up order records. Not only author, title and BRN, but also keywords in the titles, and the ISBN can be used as alternative points of access to a particular record.

Fewer exceptions occur, problems are more analyzable, and formalization and standardization of work have increased. While the system offers flexibility in areas like retrieval of order records and the preparation of financial statements, a degree of inflexibility has resulted from the batching of order inputs, and from the section's dependence upon the reliable and continuous functioning of both hardware and software. Generally speaking, the trend is towards an increase in routineness in the operations of the monograph acquisitions section.

Serials:

The Serials Section is also primarily concerned with acquisition. However, the ordering of a serial - that is, the entering of a subscription - is a relatively minor component of the serials acquisition process. Far more complex, and making up the bulk of the section's work, are the tasks of recording the receipt of issues, following up non-receipt, making regular payment for the continuing subscription, and generally ensuring that all is well with each title received. The manual system involves a master card for every serial title taken by the library, on which all details of receipts, payments, claims for missing items and any other information relevant to that title are recorded. Events such as the arrival of a new issue, the receipt of an invoice, and the binding of a volume must be recorded on the relevant master card, and any enquiry as to the status of a subscription, the currency of the receipt of issues, missing and claimed issues, requires reference to the master card.

The URICA serials module substitutes an on-line computer record for the master card. At the current stage of the technology there is no possibility of automatic recognition of physical issues in the way that an automated supermarket checkout can recognize items passing through. (Bar-coded labels for individual titles might be a future possibility, but unique labels to identify individual issues of each title would be very difficult to achieve.) Each new issue must be individually recorded by calling up the appropriate record and noting the receipt and details (number, part, date) of the issue in hand. Likewise, to record subscription payment the master record must be called up and details of the invoice keyed in.

In essence, the tasks involved in the automatic system are not greatly dissimilar from those of the manual system, and clerical work has not been substantially reduced. However, there are system benefits which do affect clerical work. Most importantly, the sorting of new issues into alphabetical order before recording their receipt is no longer essential. In the manual system, cards were filed in alphabetical order (by title, or by the name of the body responsible for the publication). It was necessary to sort the new issues into this same order to enable an orderly recording procedure. In fact, clerical assistants specialized in particular sections of the alphabet, and developed expertise in the serial titles which occurred in their sections.

With the automated system, titles can be accessed in any order with no loss of efficiency. Access to a record is possible by International Standard Serial Number (ISSN) and by order number, as well as by title, and the name of the body or organization responsible for the publication.

The automated system also alerts staff to the non-receipt of an expected issue. A listing of issues'overdue for receipt' can be obtained at any time. Automatic claiming of missing issues would be possible, but is not carried out because the system must assess the lateness of an issue according to its expectations of the publication's frequency. It cannot make adjustment for circumstances such as changes in frequency of publication, postal delays, strikes and other untoward circumstances. Therefore a decision must be made by the operator on the advisability or otherwise of claiming individual issues flagged by the system as being overdue. The great advantage of the automated system is its ability to alert staff to a possible problem. With the manual system a missing issue might be noticed by the person recording receipt of a later issue. However, if no issues of a title are received, the matter is likely to go unnoticed until a would-be user complains. The only remedy for this problem is the continuous manual review of records, card by card; a task so tedious and time-consuming that it is rarely undertaken. The automated system has eliminated the need for this type of comprehensive review. The system can also alert staff to the fact that a volume is complete, and ready for binding. The clerical effort of identifying titles which need binding is thereby reduced. Once again, however, some inflexibility is inherent in the system. It can only record a volume as complete when every issue, contents list, title page and index it has been expecting have been received. A change in the publisher's policy may mean that the system's expectations are unrealistic. The manual record had a space for notes about any difficulties experienced with a particular title. Irregularities announced by the publisher, problems of non-payment or duplicate payment, in fact any correspondence related to the subscription could be noted here. The automated system has no such facility, and it is difficult to record comments which can alert users to a known problem.

How, then, has the routineness of serials acquisition work changed? It is clear that there has not been the same dramatic reduction in clerical work as has been experienced in monograph acquisitions. Efficiency has been increased in the area of claiming overdue or missing issues through improved means of identifying these problems, but this is really a case of facilitating a procedure which was not previously carried out regularly, rather than of reduction in actual clerical work.

Elimination of the necessity to sort new issues is not an unqualified benefit. In fact, the 'local knowledge' of individual staff of particular sections of the manual alphabetical file was an advantage worth retaining, and for this reason, a rough sort of new issues is still carried out.

Speed of access to serial records, and of inputting new data does not appear to have altered significantly as a result of the new system. While access via ISSN is very quick, the ISSN does not always appear on the issue in hand, and almost never on an invoice. Access by title requires precisely accurate input for successful call-up of the correct record. A similar constraint applies to access via the body responsbile for the publication. The fact that only one record appears on the screen at any one time can sometimes make access to a particular record less easy than with a visible index, where a whole tray of cards is simultaneously visible. In addition, the response time of the system varies, according to the load on it at a particular time. On some occasions it can be considerably slower than the time it would have taken to amend a manual record.

Problems, such as variations in frequency may be less easily solved in a system which is 'expecting' an issue other than the one in hand. For example, the manual record may reveal a pattern of irregularities in previous years. Such clues are not so easily discernible in the on-line system. The modular nature of the on-line system can delay the input of details of an unexpected issue. Access to the enquiry module, which may reveal the wanted information about the history of a title, involves leaving the serials accessions module and going through several system menus. The procedure then has to be reversed (or the system operator's identification and password re-input) to regain access to the serials accessions module.

At the time of this study, the serials module was still in the early stages of implementation. (Installation commenced in early 1984). It is not yet clear what proportion of the problems which occur are simply teething problems which may be eliminated by improvements to the system. For example, the absence of a 'notes' facility makes it rather difficult to alert system users to foreseen problems, but future system updates may provide a solution for this problem.
The serials module of the URICA system appears to have introduced an element of standardization and inflexibility into serials accessions. The system is designed to expect certain patterns of regularity in serials, such as weekly, fortnightly, monthly, quarterly and other regular frequencies of publication. The fact that serials often vary from such set patterns increases the incidence of problems for

the serials accessioner, and to that extent the operation becomes less routine. At the same time, the easy access to a large proportion of serials, via ISSN, thus avoiding the search for difficult or obscure title or responsible body entries, tends to reduce the number of exceptions.

Generally speaking, the area in which the routineness of work in the Serials Section has changed are the important ones of claiming overdue issues and identifying complete volumes. Although the system has produced a higher level of routineness here, the overall incidence of exceptions and the difficulties experienced in solving them have not changed very much. Tedious routine tasks - notably the sorting of new issues - has been reduced, but a higher level of inflexibility seems to be inherent in the system.

Cataloguing:

From the point of view of University Library users, cataloguing is the library service most obviously affected by automation. First, the traditional card catalogue was largely replaced by computer output microform catalogues, requiring the use of microfilm readers. Now the microfiche is being superseded by the on-line terminal.

One of the most significant changes for those working in cataloguing has been the ability to place a copy of the library's catalogue on each cataloguer's desk. The cataloguer no longer has to leave the work station to consult the catalogue. Thus there are fewer interruptions to the work flow.

Unlike the work in Monographs Acquisitions, routine manual filing and file maintenance tasks have not been entirely eliminated from cataloguing work. At the current level of technology it is still necessary to maintain both a shelf list and authority files in card format. Nevertheless, the public card catalogue has been superseded (with the exception of the catalogue for material acquired before 1973) and the enormous task of maintaining manual author/title and subject catalogues in card format has been virtually eliminated. Therefore, it is true to say that technology has meant a very considerable decrease in routine filing and file maintenance tasks in the cataloguing section.

The availability of on-line data bases has typically hastened a decline in the incidence of original cataloguing carried out by libraries. Copy cataloguing is not simply a result of automation, as the increasing availability of bibliographic records from sources such as national library catalogues has long made it unnecessary for individual libraries to initiate their own bibliographic descriptions for many of the new titles they acquire. On-line data bases have made such records even more readily available. However, the increased efficiency of the automated acquisition system, together with the new service of advance announcements of publications likely to be of interest to the particular library, offered by library suppliers (a service made possible by the automated systems of library suppliers) has meant that the University Library often acquires an item before its description appears in national catalogues and other data bases.

The URICA cataloguing system is designed for the easy input of original records, and the updating or amendment of an order record already in the data base is also a relatively simple operation - so much so that it is often simpler to create a new record rather than wait for a machine readable record from a network or library supplier. In the previous system, the cataloguer had to type a bibliographic description on a card, which became the order for a machine readable record. With the new system, the cataloguer keys data directly into the data base. For these reasons, original cataloguing, or at least original input by cataloguers, has tended to increase in this library.

The routine cataloguing operation (called 'Fastcat') involves a minor update of the bibliographic description input by the Monograph Acquisitions section in the ordering process. This constitutes the cataloguing record until a full bibliographic record has been ordered and received from a commercial or national agency. This work is generally carried out by clerical staff. The number of exceptions to this routine has increased, with the tendency of professional cataloguers to replace the interim record with a full record. However, these exceptions are generally analyzable. Indeed, in many cases the new input is largely copied from a pre-existing record in a national or other data base.

A higher degree of system control is a feature of the new automated cataloguing system. A daily report of the work of each cataloguer is produced automatically. This is personally checked for errors, and the need for supervision is thereby decreased. In addition, the element of self-discipline is increased by the provision of approximately one computer terminal for every two cataloguers. A new element of cooperation, and of batching of work has been introduced into the cataloguers' work.

Once again, the cataloguing section has experienced a decrease in tedious filing and file maintenance tasks, as a result of automation. Clerical tasks have been reduced. Cataloguers no longer have to interrupt their work flow by leaving the work station in order to consult the catalogue. While exceptions seem to have increased, in that fewer records are purchased from agencies, and more original inputs occur, these exceptions have become easier to solve. If anything, routineness in cataloguing work has increased, as a result of automation. That is not to say that the administration of the section has become more routine. Indeed, the constraints of working with systems experts, hardware and software suppliers and maintenance people, and the complexities occasioned by factors other than automation - particularly the retrospective change of classification from Bliss to Library of Congress and the backlog of processing of material from the former TCAE library - have all contributed to an increasingly comple cataloguing operation. Nevertheless, the work of cataloguers and of clerical workers within the section seems to be smoother-flowing and more routine.

Reference:

The library catalogue is perhaps the single most important tool for reference librarians in their work of assisting library users to locate the materials and the information they need. Naturally, a change in the format and the capabilities of the catalogue will affect this work. At the present stage of development, not all of the library's holdings are included in the automated data base. Therefore it is still necessary to use the old card catalogue for access to much of the older material in the library. Also, as there was only one terminal in the reference section at the time of this study, use of the computer output microform (microfiche) catalogues has remained substantial. However, the on-line terminal has become the clearly preferred mode of catalogue access for the reference librarians. Even when system response time is slow, and a quick finding task could be accomplished faster via the microfiche, the reference librarians tend to persevere with the on-line terminal. While bottlenecks sometimes occur at the terminal, the microfiche format can only be up to date to the time it was produced, and is, therefore, less reliable. Supplements have to be relied upon for recent additions to the catalogue, and even the supplements go out of date. The on-line catalogue has the advantage of access to every record in the system - even a record input just a few moments earlier. In addition, for the experienced user, the on-line catalogue is much more powerful than card or microfiche versions. For example, there are many more access points for each record. Keyword searches improve the success rate of locating incompletely cited items, and Boolean logic allows a greater degree of refinement in searches for information.

Ironically, the introduction of new technology has led, indirectly, to an increase in manual file maintenance tasks for reference staff. The orientation of the Cataloguing section towards the automated system has resulted in the responsibility for filing in the old card catalogue being transferred to the reference staff. In earlier days, when there was only a card catalogue, this responsibility was always closely retained by the Cataloguing section.

Of course, despite its great importance, the library catalogue is only one of many bibliographical tools used in reference work. Dictionaries, encyclopaedias, handbooks, indexing and abstracting services and bibliographies, and of course materials of all kinds from the collections at large, are constantly used in response to enquiries at the reference desk.

Another major innovation has been the interrogation, on-line, of remote data bases, as an alternative to the manual searching of hard-copy bibliographical tools, in response to certain categories of reference query. In 1976 a teletype terminal was installed (in the Biomedical Library) for on-line access to MEDLINE - a service of the US National Library of Medicine. On-line access was expanded in 1980 by the installation of a new terminal in the central Reference section. This VDU terminal is used to access remote data bases via the AUSINET, DIALOG and ORBIT services.

Once again, the on-line search for citations of documents relevant to a particular topic is capable of a refinement through Boolean logic, which cannot be matched in a manual search. There is generally a wider choice of access points, including, in many databases, keyword search of the entire abstract of each document, as well as its descriptors. In addition, there are many more data bases available on-line than in hard-copy format in the Library's reference collection. On-line searching is a powerful new capability in the services offered by the Reference section. However, it has not superseded the manual search. In fact, manual searching is generally considered to be sufficient to meet normal undergraduate needs. The on-line search is usually reserved for postgraduate students and academic staff requests, and even in those cases it is normal for either the requester or the librarian to begin with a preliminary search of the printed abstract and indexes. This helps determine the nature of the problem, the likely extent of the literature, and relevant search terms, thereby assisting in the development of a suitable strategy for a future on-line search. While manual searches have not been superseded by the on-line capability, it is true to say that most major searches are now conducted on-line. With only one terminal available a new batching element has occurred in the work flow. Searches are saved until the terminal is available. There is also a tendency to save searches until the most experienced on-line searcher is available to carry them out. While all reference librarians are able to search on-line, it happened that one librarian received her training for on-line searching just at the time the terminal was installed, and was better able to develop her expertise than other librarians who had attended an earlier training session. Requests for searches are often passed on to this librarian, and the experience she gains thereby tends to confirm her as the on-line specialist in the section.

The terminal's electronic mail facility is used for the transmission of inter-library loan requests. Most university libraries in Australia now belong to a network which facilitates the rapid transmission of such messages between library terminals. Inter-library loan requests which were formerly transmitted via Telex are now sent by electronic mail. As a result clerical record-keeping tasks have been greatly reduced in this area.

In general, staff in the Reference section feel that new technology has not greatly changed the work they do. They still respond to requests from library users for assistance in using the library, or in finding information. The terminals accessing the on-line catalogues and the remote data bases are new tools which extend capabilities and improve services. New skills have to be developed and maintained if these tools are to be exploited properly, but the old skills have not been superseded.

I suggested earlier that to some extent the Reference section exists in order to cope with exceptions in the library's work - for example, the open-ended or difficult requests for information, requests for bibliography compilation, and the special assistance which library users sometimes need.

What new technology has done is make these exceptions or problems easier to solve. The unsuccessful manual search can now be followed up using the more powerful capabilities of the on-line catalogue and the more sophisticated service of on-line searching of remote data bases. New skills and new capabilities for handling exceptions, tend to increase the routineness of reference work in terms of Perrow's model. In addition, some exceptions, such as specific items which were difficult to locate in the manual catalogues because the user had an insufficient citation, become routine or unexceptional because of the increased access provided by the computerized catalogue.

Conclusion:

This chapter has been looking at the proposition:

> The level of routineness of the University Library's technology will be increased by automated systems. Standardization and formalization will increase, possibly with some loss of flexibility.

Generally speaking, new capabilities provided by computers and new telecommunications have decreased and even eliminated some clerical work. They have also decreased the number of exceptions which occur in the Library's work, have rendered problems easier to solve, and have led to a smoother work flow. This trend has not been uniform over every library activity. As noted, there appears to have been an increase in exceptions in cataloguing (if original cataloguing, and original input of bibliographic data are taken to be exceptions) but the exceptions are much easier to handle. Monograph Acquisitions staff have to beware of new problems arising from the demise of the permanent orders file; but the number of exceptions caused by lost or misfiled order records has been greatly reduced. In fact, fewer employees are handling the work in acquisitions, from which it can be inferred that larger 'production runs' per employee are facilitated by the new system. As suggested earlier, this is a strategy for reducing the proportion of exceptional cases, thereby increasing routineness. Serials staff have not experienced a dramatic reduction in the level of exceptions as a result of installation of the URICA Serials module, although it is not yet clear whether many of the exceptions are teething problems. The incidence of serial issues received for which a record is difficult to locate is about the same as that experienced with the manual system. However, the problems of identifying missing issues, and volumes which are complete have been reduced significantly.

The two major innovations in reference work - an on-line catalogue, and on-line searching of remote data bases - have increased the section's capabilities, with the effect of reducing the exceptions and allowing easier solution of problems experienced by reference librarians. The new capabilities provided by the system potentially increase the population served, leading in turn to an increase in routineness. The conclusion is that, overall, according to Perrow's criteria, the level of routineness of the University Library's technology has been increased by automated systems. Thus the first part of our proposition is supported.

We need to consider also the effect automation has had or is having on standardization, formalization and flexibility in the Library's operations. By standardization is meant the performance of tasks in standard ways, which conform to the requirements of the automated system. Likewise, formalization implies conformity to prescribed patterns, in order to provide the element of predictability which automated systems require. The need for such conformity is likely to affect the level of flexibility in library work. Once again, it has become clear that the need for conformity and the resulting level of flexibility varies in the different library activities examined. As far as the input of data into the data base is concerned, this must be carried out in standard ways. However, this kind of constraint is not new to library work. Cataloguers, for example, have always worked to standard rules of bibliographic description, thesauri of subject headings, authority files for names and subjects. Manual catalogues, if they are to be effective must be managed with a high level of consistency and conformity. While the automated system demands that input follow certain conventions, so too does the layout of a catalogue card demand conformity. In that input of data into the URICA cataloguing module is a relatively convenient procedure for cataloguers, it is fair to say that the system has actually increased the flexibility of cataloguing work. Rather than having to wait until a standard bibliographic description in machine readable format can be purchased, the cataloguer can choose to input an original record into the data base.

A feature of the automated system is a new flexibility in accessing records in the data base. As has been noted, monograph acquisitions staff can call up an order record simply by keying in an ISBN or an order number as well as the author and title approaches. Likewise, reference staff using the enquiry module have a much more powerful means of locating relevant items in the data base than is possible with the card or microfiche catalogue. Naturally, the enquiry module is available to all sections of the library, and this new flexibility is library-wide. Of course, interrogation of the catalogue must be done in standard ways. Users must learn the conventions involved in enquiry. Incorrect methods will result in an unsuccessful search. However, it is true to say that use of a card catalogue also involves searching skills, and once the techniques of searching the on-line catalogues have been mastered, the searcher has a powerful new flexibility, including the use of Boolean logic to refine searches.

A higher level of inflexibility does appear to be inherent in the serials module. Here, the system expects serials to conform to predictable patterns, and problems arise when exceptions, such as variations in frequency of publication, occur. The lack of a 'notes' facility makes it difficult to alert users to individual peculiarities of certain titles, and serials accessioners cannot easily discover needed information about individual titles without going through the rather tedious standard procedures involved in changing from one 'menu' to another within the system. However, even in the serials module there are new flexibilities in access to records.

While standardization and formalization have increased, in that certain conventions must be observed both when inputting new data and when calling up records, these are not significant constraints for library workers, and loss of flexibility has not been widely experienced. The automated system has introduced some necessity to batch work, largely because of the limited number of terminals available, and 'down time' (whether through system failure, or for maintenance) occasionally introduces a new constraint, but these are minor factors when measured against the new flexibility and creativity facilitated by the system. The overall conclusion is that with the exception of some aspects of serials work (and possibly some aspects of circulation work) the enhanced capabilities of the automated system have created a new flexibility in the major library operations.

Chapter 5

THE CONSEQUENCES OF TECHNOLOGY: ORGANIZATIONAL IMPACTS (ii) FORMAL AND INFORMAL STRUCTURES

The purpose of this chapter is to consider the impacts which new technology may have had on the organizational structure of the University of Tasmania Library. The structure of organizations is influenced by a large number of variables, including age, type, size, complexity, environment and technology, and it is difficult to isolate the individual effects of any one of these variables. Indeed, each of the variables is multi-dimensional. For example, the age of an organization must be looked at in conjunction with its level of development or maturity relative to other organizations of similar type; the size of an organization can be measured in different ways, such as number of personnel, level of output, wealth of resources and physical capacity; the environment contains cultural, social, economic, political, industrial, technological and other factors.

The kind of technology an organization employs is itself influenced by many of the other important variables such as size, wealth, physical capacity, and so on. There is a danger, then, in attributing structural changes in an organization purely to the impact of new technology. Nevertheless, it is clear that new technology is an agent for change. It seems reasonable, in our case study, to point to changes which have been influenced by the introduction of new technology, while recognizing that the impact of new technology may be just one of several contributing factors. As Montague (1978) suggests, the fact that technology is a significant agent for change does not mean that there will be any sudden organizational revolution. Therefore, it is necessary to look for subtle, or minor changes which may be attributable to some extent to new technology.

In the previous chapter we gave some consideration to structural variables relative to the level of routineness of work - notably standardization, formalization and flexibility of work procedures - in the University of Tasmania Library. This chapter concerns itself with our fourth proposition:

> Adoption of new technology by the University Library is likely to affect various aspects of its structure, including departmentation, lines of authority, relative size of the administrative staff component, specialization, and the informal organization.

It should become apparent through consideration of these dimensions, whether the significant structural changes suggested by such writers as Wasserman (1972), Rogers and Weber (1971), Pflug (1975), Gordon (1977) and Montague (1978) as appropriate for libraries adopting new technology, are occurring in the University of Tasmania Library.

Departmentation:

The departmental structure is one of the dimensions most often cited by writers predicting structural change in libraries, as a result of the introduction of automated systems. While the traditional pattern of departmentation may have emphasized differentiation - that is, the separation of work into specialist departments - rather than integration, many writers believe that this differentiation will (or should) diminish with the advent of automation. Boss (1984) suggests that

> 'The traditional library organizational structure is built around files; without the files, units begin to disappear, and the organization chart shrinks' (p.101)

Pflug (1975) believes the existence of a data bank reduces the influence of departmental heads, because of the much stronger inter-relatedness of library departments using the data bank. This theme of the inter-relatedness of library operations in an automated system is reiterated by many writers. It is a feature of a total library system, using one central data base for such functions as acquisitions, cataloguing, enquiring and circulation that employees throughout the library will be performing very similar operations at the on-line terminal. Whereas departments of the University of Tasmania's Library have been relatively independent and self-contained in the past, developing their own expertise, maintaining their own files and remaining more or less untroubled by the activities of other departments, the automated system has brought a new element of library-wide uniformity into the daily work of many operators. In each department, work is carried out at an on-line terminal. Operators in all departments continually call up records via the terminal. The acquisitions person may key in new data which alters the status of an on-order record; the cataloguer may key in new data which upgrades a bibliographic description; the serials person may key in data which updates the holdings information for a periodical title; the circulation person may key in data which alters the loan status of an item. In each case, the relevant file is no longer uniquely held in a particular department. The information is all in one central, shared data base. It is now just as possible to catalogue a book at the Reference Section's terminal as it is to answer a reference inquiry at a Cataloguing Section terminal. It is this kind of uniformity which has led many writers to predict radical changes in departmentation in libraries. New boundary-spanning activities seem to indicate the desirability of much more integration and less separation in library structures. For example, more open, adaptive structures are advocated by Shaughnessy (1982). Martell (1983) suggests that boundary-spanning activities require broader perspectives and flexibility and that these might be achieved through multi-functioning work groups.

As mentioned earlier, many writers are also concerned about the possibly adverse effects of retaining outmoded or inappropriate structures, once new technology has been adopted. For example, Hopwood (1983) believes there is a danger of perpetuating unduly rigid structures which were appropriate to manual systems. Wassermann (1972) is concerned that the conservative and even complacent library profession will find it extremely difficult to break away from traditional images of their roles and operations, which are in danger of becoming irrelevant at a time of changing technology. Jasinski (1959) warns against attempts to fit existing structures to new systems, and suggests that traditional hierarchical relationships become less important than good horizontal coordination. Miller and Armstrong (1966) suggest that the traditional barriers between departments are not only unnecessary but possibly dysfunctional. The overwhelming message of writers on this topic is that a new flexibility, adaptability and the facilitation of horizontal communications are more desirable than traditional patterns of departmentation.

The question is whether the traditional departmental pattern of the University of Tasmania Library is appropriate to the new automated system, and whether changes have occurred in response to the requirements or the influence of new technology. As noted above, Boss (1984) believes the traditional structure is built around the files created in performing various library functions. To some extent this is true of the University of Tasmania Library. For example, the manual circulation of library materials relies for its proper control on the loans file, which is a record of every item currently on loan, including details of the borrower, and when the item is due for return. In this case, the file has been kept at the circulation desk, located near the Library's door. The existence of the Circulation Section reflects the basic essentiality of the loans file. (Similar files are maintained at each of the branch and departmental libraries in the library system.)

In much the same way, acquisitions work in the manual system relied heavily on departmental files. In the case of Serials Acquisition, work was centred around the visible index, which incorporated a master record card for every title taken by the Library. Monograph Acquisitions depended upon the manual orders files, and no acquisitions enquiry could be answered except through consultation of those files, located within the department. Cataloguing work depended upon the maintenance of authority files and shelf list, located in the Cataloguing Section, and of the main catalogue. The Reference Section, of course, relies heavily on the catalogues, on its own reference files, and upon physical access to the reference collections.

As well as reliance on individual files, some library activities need to be publicly accessible while others do not. For this reason, departments have been grouped since 1971 into two major divisions: Reader Services, which deals directly with the Library's clients; and Technical Services, which includes the behind-the-scenes activities of acquiring and processing material. Thus the traditionally functional departments are incorporated within large, apparently purpose-oriented divisions, less typical of the traditional bureaucratic form. This hybrid form of departmentation is normal in Australian university libraries, most of which have grouped their functional departments within divisions.

I suggest that the Divisions in the University of Tasmania Library are purpose-oriented, as opposed to functional, or process-oriented units, as the Technical Services division brings together sections engaged in the quite dissimilar activities of acquisitions and cataloguing. Likewise the circulation and reference functions incorporated into the Reader Services division are quite unlike each other. Thus there had been some movement away from the strictly functional form of departmentation prior to the introduction of new information technology.

The most immediately obvious departmental change as a result of new technology has been the establishment of a Computer Systems Office consisting of a Systems Officer and two (part-time) assistants. Unlike all other departments in the University Library, the Computer Systems Office is not incorporated into either of the two major Divisions. The Systems Officer reports directly to the University Librarian. As mentioned earlier (chapter 2) the position of Systems Officer was created in 1975, well before the introduction of the integrated on-line system. The appointment followed recognition by the University that the Library's excursions into automation using University computing facilities as well as acquiring machine-readable cataloguing records from external sources, signified the Library's need for its own systems staff.

Clearly, the creation of a Computer Systems Office is directly attributable to the influence of new technology. Not surprisingly, the new department has assumed a key role in the planning, installation and maintenance of the Library's new automated system, working closely with each of the departments affected.

Virtually all of the Library's early ventures into automation were in the area of technical services - notably the creation of a machine-readable data base, and the installation of a monograph acquisitions system on the University's main frame computer. The one exception was a minor programme for the production of recall notices for overdue books. As previously noted, much of the impetus for computerization and virtually all of the planning and development of new systems came from the Divisional Librarian, Technical Services. Thus it would have been convenient enough to locate the new systems unit within the Technical Services Division. However, the decision was for a systems unit independent of the Library's two major divisions. As suggested by writers in this area, there is an increased need for fluent horizontal communication in the library which adopts new technology. Placing the Computer Systems Office outside the divisional structure avoided potential difficulties in horizontal communication which might have occurred had the Systems Officer been made directly responsible to one or other of the divisional heads.

In fact, communication has occurred both horizontally, between sections heads and the Systems Officer, and vertically, with proposals and information following the scalar chain from sections up to the University Librarian, and thence to the Computer Systems Officer.

Following the Library's successful application for a stand-alone computer for its own use, and the decision, in 1981, to purchase the AWA Reality hardware and URICA software, horizontal communication within the library structure has been facilitated by a series of committees and working parties which cut across traditional departmental and divisional lines.

Prior to the introduction of the new system in 1981, a monthly meeting of senior library staff was the main vehicle for formal inter-departmental communication. That is not to say that informal horizontal communication did not otherwise occur. In fact, horizontal communication between the Computer Systems Office and the Cataloguing and Monograph Acquisitions Sections in particular was strong. However, the decision to install a new, integrated, library-wide automated system created a need for better and more consistent coordination. The fact that the chosen URICA system was at an early stage of development meant that the library was to be involved in a considerable amount of design and development work with the vendor. It was essential to involve key staff members from all relevant departments in producing specifications for each module of the new system. Thus the climate existed for a more flexible, adaptive and less strongly departmental structure to accommodate the planning and development of the new installation.

Early in 1981 a committee was formed with the aim of specifying the form and content of the reports to be generated, to define the screen prompts for data entry, and to identify the data elements to be entered for the various modules of the new system. The committee (called "GAFFER" - an acronym devised from the names of some of its members) included representation from Monographs Acquisitions, Serials, Cataloguing, Reference and central administration, as well as the Systems Officer and the Divisional Librarian, Technical Services.

In June 1981, two additional committees were created. A "Data Base Working Group" was established to define the structure and content of the data base, and to supervise its loading into the computer. Membership of this group also represented several departments. A "Materials Processing Working Group" was also concerned with some aspects of the new system, but its major purpose was to coordinate the processing of library materials being transferred from the T.C.A.E. to the University. In recognition of the need for staff orientation to the new computer system the Data Base Working Group established a sub-committee to coordinate staff training.

During the course of 1981 the senior library staff meetings which previously had been the major organ of inter-departmental communication fell into abeyance. In September 1981 a new coordinating body - the Library Information Coordination Committee was established.

Early in 1982 the two working groups were abolished and their functions incorporated into the Library Information Coordinating Committee. This Committee was subsequently enlarged and renamed the Librarian's Advisory Committee. From time to time it forms sub-committees or working groups to undertake specific tasks in relation to the installation and ongoing development of modules of the automated system. This committee is now the main vehicle for formal horizontal communication within the Library organization.

On the surface, then, not very much seems to have changed in the area of horizontal communication. The Senior Librarians' Meeting has been replaced, after a couple of years of rapid activity and adaptation, by the Librarian's Advisory Committee. However, the creation of specific-purpose committees to handle particular problems arising from automation is the new ingredient in inter-departmental communication. In fact, the various committees and working groups which emerged during the initial period of specification for and development of modules of the new automated system, and which superseded the Senior Librarians' Meeting, grew from informal inter-departmental contacts, rather than through administrative directives. The Library's administration has now acted to formalize this structural phenomenon.

Jackson and Morgan (1982) describe such committees as "internal relations mechanisms", formed when traditional structures can no longer handle the information that must be processed. Decisions become more decentralized and the barriers of departmental lines are temporarily removed. Jackson and Morgan point to a literature which is undecided whether committees are disruptive and wasteful, or creative and beneficial. Many writers see committees as a way of achieving participation in decision-making, leading to improved job satisfaction as well as better coordination. On the other hand, some writers see committees as an expensive form of organizational procrastination. Burns (1963) sees the proliferation of committees as a "super-personal" pathological form of mechanistic systems. He suggests such committees are devices to allow a temporary solution of problems which go beyond the capacities of individual departments without actually upsetting the traditional bureaucratic structure. A change to a more organic structure would be more logical, but would conflict with established sectional interests.

It might not be unreasonable to suggest that the growth of informal committees and working groups in the University Library during 1981 was the spontaneous response of at least some members of the organization as they tried to grapple with the problems of new automation. In effect, parts of the organization were heading towards this more adaptive or organic kind of structure which many writers believe to be appropriate to organizations adopting new technology, or coping with environmental turbulence. They reached towards cooperation and creative solutions to the problems raised by a new computer, and their efforts greatly assisted the organization in the difficult task of planning and implementing the installation of a new and largely untried system.

Then, when the Library administration moved to check the proliferation of ad hoc committees, it moved away from the more adaptive or organic form of structure and brought the organization back to a more mechanistic system - albeit a system in which formal committees, or lateral relations mechanisms, are more prominent in the organization than they were before the advent of the new system.

This seems not to be a case of the organization adopting a more flexible and adaptive type of structure than traditional departmentation in order to cope with new technology. In fact, one new department - the Computer Systems Office - has been created. The new department is clearly a functional department and has been placed outside the purpose-oriented divisions in what I have called a hybrid form of departmentation. In addition, new ad hoc committees and working parties have been set up from time to time to address particular technological problems. This is a common strategy for organizations faced with problems which go beyond the abilities of individual departments to solve - a strategy which Burns would see as the pathological reaction of an organization unwilling to abandon its traditional structure.

To use the terminology of Boss (1984) referred to earlier in this chapter, units have not begun to disappear, nor has the organization chart shrunk. In other words, the Library has not reacted to a new library system which cuts across traditional departmental barriers, by making any very radical structural alterations. Whether it should have done so is a moot point. Certainly the weight of opinion in the literature suggests that such changes are desirable or even inevitable, and the present structure does not reflect the new flexibility provided by the boundary-spanning capabilities of the total, integrated, automated library system. However, (as is also evident from the literature) dramatic change in traditional organizations is not easily achieved, even if it is desired. The weight of tradition, and the established positions of organization members tend to work against such change, and swift revolutionary reforms rarely occur. It may be that the present structure is still appropriate to many of the goals and the needs of the organization and of its members.

Lines of authority:

A major theme emerging from the preceding discussion on departmentation and how it has been affected by new technology, has been the increased need for horizontal communication cutting across traditional departmental lines. This phenomenon has implications for the traditional lines of authority which have existed in the organization. Lansbury and Spillane (1983) suggest that the pattern of interpersonal relationships, and the authority structure, are among aspects of the organization likely to be affected by changing technology. Jasinski (1959) suggests that traditional hierarchical relationships may hinder productivity and are out of place when interdepartmental coordination is the key to effective operations. We have noted that mechanisms like committees and work groups have been used in the organization to alleviate the problems of traditional departmentation, when the new system requires horizontal coordination. The fact that working parties and committees emerged in the organization without any specific direction from top management has also been observed. Some individuals within the organization perceived a need for structural mechanisms which would enable system development and installation to proceed in a logical way, and these organization members provided the inspiration for working groups which transcended departmental barriers. As mentioned earlier, the key figures in the introduction of automation in the University Library have been the Divisional Head, Technical Services, and the Systems Officer (indeed the creation of the latter's position was largely due to the efforts of the former). The Library's success in gaining University support for its stand-alone computer is also attributable in large part to the submissions of these two individuals. The emergence of the ad hoc committees and working parties for development and installation of the new system was due to informal discussions between the Divisional Head, Technical Services, the Systems Officer, and about half a dozen middle and lower management personnel who shared a deep interest in the new system and a common concern that it should be developed in ways most beneficial to library activities and services. Thus a group has emerged within the organization which has developed a particular expertise and knowledge of the automated system. This group has become a new element in the authority system. In particular, its leaders have become a real centre of power within the organization. These leaders established a position of power and authority because of their entrepreneurial role - providing the inspiration and impetus which led the

University Library to adopt a new computer system, and this position has been emphasised and confirmed through their knowledge of the new system which now dominates library activities.

Not surprisingly, the membership of the formal ad hoc committees now set up from time to time by the Librarian's Advisory Committee generally comprises many of the same individuals who worked in the original informal working parties and committees which emerged in 1981. This same group of enthusiastic and expert people is relied upon to make important decisions about the operation and development of modules of the new system.

It must be stressed that the formal lines of authority remain unchanged. Section heads still report to Divisional Librarians (or, in the case of the Systems Officer, to the University Librarian) and Divisional Librarians to the University Librarian. The Deputy Librarian retains his particular responsibilies for personnel, properties, and financial planning. But in practice, the centre of decision making, and therefore the real authority, for all matters concerning the automated system and its future developments lies in the hands of the entrepreneurs for library automation - the Divisional Librarian, Technical Services and the Systems Officer.

Control of decisions regarding automated developments really means control of most significant library developments, and of the whole future direction of the Library and its activities. The top library management might be said to have contributed to this shift of power in their organization, for they have not shown comparable enthusiasm or drive in the development of new systems. Nor have they made the necessary effort to acquire systems knowledge and information at the same level as that of the Divisional Librarian, Technical Services. The Library executive has tolerated rather than inspired the installation and development of computer systems. It has been left to those with the enthusiasm and the expertise to formulate their own guidelines, to choose their own directions, and to make decisions which set the course of the Library along a route of their choosing.

This phenomenon of middle management making many of the Library's most important decisions and setting its course has been evident since 1973 when the Library set out to create a machine readable data base. This was bound in with a proposal to reclassify the Library's collections. At the time reclassification seemed to be the major issue, but was really of minor long-term significance compared with the machine readable data base and its potential to alter library operations and services.

The Divisional Librarian, Technical Services was also instrumental in the University's decision, in 1974, to give the Library access to its main frame computer, in order to install a monograph acquisitions system. It is probably true to say that no-one else in the University appreciated the likely extent of the load on the computing facility that a bibliographic data base would create. As mentioned in chapter 2, a major factor in the Library's successful bid for a stand-alone computer was the strain the Library's programmes created for the University's main computer system.

Implicit in the submission for the Library's computer was acceptance of a relatively short useful life-span for the hardware, as additional modules of the system were installed. Once again, probably only the Divisional Librarian, Technical Services, and the Systems Officer really appreciated the need for an upgraded system within a few years. Other members of the relevant committees, including the University's Computing Committee still underestimated the size of the computing facility necessary to operate large and complex library systems. In 1984, the 'REALITY' machine began to suffer from overload but the Divisional Librarian, Technical Services' submission for a new 'SEQUEL' to replace it was delayed by the Library executive, as it was not thought such a submission, only three years after the installation of the 'REALITY', could be successful. The Divisional Librarian forced the issue by sending a new submission directly to the University's Computing Committee, and by proposing to save the University money through using the Library's 'REALITY' as the University Administration's computer, rather than purchasing a new machine for Administration.

In the meantime, the addition of an additional disk-drive to the REALITY had proved unsuccessful, and the vendor was faced with an expensive system modification to solve this problem. The Divisional Librarian seized this opportunity to negotiate a very favourable price for a new 'SEQUEL' as an alternative to modification of the 'REALITY'. The upshot was University approval for an order for a new 'SEQUEL' to be installed in the Library in December 1984. Once again, middle management had provided the impetus for a result which the Library executive had not considered feasible.

Similarly, the same middle managers have determined the sequence of priority for the development and installation of each module of the system. Significantly, the circulation module - urgently needed to replace an outmoded manual circulation system, and of major potential benefit to the Reader Services Division - has yet to be installed.

While all this smacks of intra-organizational politics, the major conclusion is that those middle or lower managers who have provided the inspiration, the enthusiasm and the impetus for automated systems in the Library have become the real centre of power in the University Library. It must be reiterated that this phenomenon is not reflected in the formal structure.

In fact, the formal lines of authority have not changed, with the exception of formally created, although temporary, lateral communication mechanisms. The real change is in the informal organization.

Administrative staff component:
The relative size of the administrative staff component in the University Library is a structural dimension which has been affected in two ways by the introduction of new technology. Firstly, the creation of the Computer Systems Office, attached directly to the Library's central administration rather than to either of the operational divisions, has increased the number of administrative staff. Secondly, the reduction in low-level clerical work in some departments has reduced the number of clerical employees. The most obvious example is in Monograph Acquisitions, where the elimination of most filing and file maintenance work has led to a reduction from 7.6 staff in 1977 to 3.1 staff in 1984. Cataloguing staff has also been reduced. The expected reduction in filing work after the circulation module is installed may well lead to a reduction in the number of clerical employees in the Circulation section. Thus the proportion of staff employees has been increased, while the proportion of line employees has been reduced.

A reduction in low-level jobs, because the relevant work has been taken over by the computer, is in line with the theory of Hickson, Pugh and Pheysey (1969) who suggest that job-count variables are the structural dimension most likely to be affected by changing technology. Just as fewer lathe operators are needed when an automated lathe is introduced to the factory's production line, so fewer filers and sorters are required when library data bases are transferred from card files to computer storage. Similarly, Child and Mansfield (1972) believe that technology can be a good predictor of configurational variables such as the number of workers per supervisor. It is in this type of area that the so-called "technological imperative" is most likely to apply. It does seem clear that, in Monograph Acquisitions at least, the reduction in clerical workers is directly attributable to the influence of new technology. The automated system carries out many of the tasks which were formerly undertaken by clerical workers in this section, resulting in a reduction in the line personnel component.

Not only is the line component reduced, relative to the staff component in the organization, but it also becomes more dependent upon staff personnel. In the traditional organization, staff personnel have an advisory role and line personnel can operate fairly independently. But with the introduction of an automated system, the role of staff personnel becomes much more than an advisory one. System maintenance is absolutely vital to line operations, and the relationship between systems staff and line personnel becomes very important. I have already referred to the informal power centre, based on systems expertise. Naturally, systems staff are most significant in the power centre. Thus we could say that at least some members of the administrative staff component have become very significant in the organization.

It is not surprising that an organization adopting sophisticated new technology will need to employ staff with specialized knowledge, nor that these staff will play a much more essential role than the traditional advisory one. In fact, it may well be that, as Kast and Rosenzweig (1979) suggest, the traditional line and staff concept is obsolete in the case of an organization adopting automated systems. Kast and Rosenzweig propose that this form of organization might be replaced by newer forms, which allow better integration of activities. Specialist staff can no longer remain in an advisory capacity but must be closely integrated into the organization's main activities, and this is likely to conflict with the hierarchical arrangement of line activities. In the case of the University of Tasmania Library, the efforts - both informal and formal - to create coordination, or integration mechanisms have been noted. Those with expertise in the automated system do not necessarily have authority over line personnel, but their specialist advice cannot be ignored if the system is to operate properly.

In fact, the group of experts upon whom the Library relies for system development, installation and operation is a mixture of line and staff personnel, who communicate with each other through lateral coordination mechanism, both formally and informally, and the concept of line and staff does indeed appear to be redundant in this organization. Thus, while the administrative staff component has increased as a proportion of total employees, due to the reduction in clerical work as well as to the creation of a new systems unit attached to the Library's administration, it would be misleading to categorize employees in the Computer Systems Office as "staff" in the traditional sense, as their role is a central one, and vital to the daily operations of "line" units.

Specialization:

Presthus (1979) is one of several writers who suggest that advancing technology reduces the need for craftsmen. It seems self-evident that a technology which takes over work from humans will result in a reduction in the skilled and specialized tasks formerly carried out by organization members. If computers are quicker and more efficient than humans at sorting and searching through library data bases, there is likely to be a resulting reduction in specialist sorting and searching jobs in the automated library. On the other hand there does seem to be some likelihood of an increase in specialized service departments in organizations using sophisticated new technology. For instance, a word-processing section is a likely example of the kind of specialized service unit that is likely to emerge. The University Library's creation of a Computer Systems Office, comprising experts who specialize in the design, development and maintenance of complete systems is an example of a new element of specialization in the University Library. The question is whether and to what extent has the degree of specialization been affected by automation. The division of labour is one of the most universal principles of management. It is of some significance to the organization if a new technology has the effect of upsetting this principle.

The integrated nature of the new automated library system has been noted earlier. Particularly relevant to the concepts of division of labour and departmentation is the provision, in many parts of the Library, of computer terminals - each one capable of accessing the data base to carry out any of the system's functions. Employees in various sections carry out quite similar operations on identical terminals, and each operation could be carried out at any of the terminals, regardless of its location. In other words, the circumstances exist in which specialization could be significantly reduced. Nevertheless, the Library's traditional departmentation has been retained. Each section accesses its particular module of the system (and system security prevents access to particular modules by unauthorized individuals). For example, only authorized employees can enter the serials module and record or update data about serial titles. However, there is a new element of task sharing and a reduction in the specialization of individual jobs evident in some sections of the Library. I have noted previously (chapter 4) that serials accessioners are no longer limited to specific sections of the alphabet when recording the receipt of new issues, but can range over the whole serials collection. In addition to this, there are now instances of an employee from Monograph Acquisitions spending time in the Serials section, accessioning new issues. The fact is that the work of serials accessioning via the computer terminal is relatively easily learned by one familiar with use of the terminal in monograph acquisition procedures. Indeed, workers in every section using computer terminals are developing skills which are transferable from one section to another.

Within Monograph Acquisitions there is some sharing of tasks since the installation of the new system. For example, the employee who normally inputs new orders, now spends some time recording the accession of new materials. The considerable reduction in the number of employees in Monograph Acquisitions since the advent of automation has brought with it some relaxation in the specialization of tasks, because there are fewer people to perform the various acquisition functions. In addition, there is a commonality of skills involved in using the computer terminal to carry out various different acquisitions tasks, which makes the specialization of work less necessary.

In the Cataloguing section, the creation of the "Fastcat" process indicates a change in the specialization of jobs. Clerical workers carry out minor updates of acquisition records in the data base which then become the interim catalogue records for new library materials. Before the days of automation, the creation of records for the catalogues was the exclusive province of professional cataloguers. Clerical workers concentrated on lower level tasks like filing. Once again, as the computer takes over lower level tasks, the work of employees changes. Clerical workers in this section have a higher degree of autonomy, and a new variety in the tasks assigned to them. In other words, the division of work is less regimented than before, and the work of the individual is less specialized.

In contrast, there is the phenomenon of the specialist on-line searcher in the Reference section. As noted in chapter 4, despite no official policy of assigning on-line searching work to one particular reference librarian, in practice this work has become to some extent the exclusive province of one experienced and skilled searcher. Difficult or complex searches are passed on to this person, and the expertise she develops as a result tends to confirm her as the specialist.

In general, automation has brought about a discernible decrease in the strict division of work in at least some sections of the organization, although this trend is slight, considering the potential of the new system for integration of work. The organization has created one new specialized service unit - the Computer Systems Office. If we consider filing and file-maintenance work to be a craft, then advancing technology has reduced the need for craftsmen (as Presthus suggested). Those who once specialized in this craft now have rather more varied tasks.

The informal organization:

One conclusion to be drawn from our examination of the impacts of new technology on various dimensions of the formal structure of the University of Tasmania Library is that the impacts are neither extensive nor profound. The more open, adaptive or organic structure suggested by several writers has not developed. Traditional departmentation, lines of authority and division of work remain, albeit with minor adjustments. The two more significant changes we have observed are informal ones. Firstly, there is the informal growth of lateral communication mechanisms (subsequently replaced, in part, by formal committees) and the continuing informal, horizontal communication, which occurs between those organization members most vitally concerned with the implementation and operation of the various system modules. Secondly, there is the phenomenon of an informal centre of power, or influence which has emerged within the organization, separate from the formal lines of authority. To some extent this consists of a new technological elite, whose power arises from specialized knowledge, or expertise.

Informal relationships and networks of communication are a common enough feature of organizations. What actually happens in organizations is unlikely to be an exact replication of the formal structure. Human interactions, including conflicts and rivalries, as well as the more positive interactions exemplified by the lateral communications discussed in this chapter, are part of the informal organization. Roethlisberger and Dickson (1950) reported the existence of cliques and an intricate social organization in their pioneering studies at the Hawthorne Plant of the Western Electric Company from 1927 to 1932, and it seems that the informal organization is an inevitable phenomenon within organizations of all kinds. New technology, then, is not responsible for the existence of informal relationships within the University of Tasmania Library, but it does seem likely that automation has altered the informal organization.

It is not possible to gain an accurate picture of the informal organization which existed in the organization prior to automation. Staff turnover has reduced the number of people still in the organization who can recall those days. However, from discussions with long term employees, it seems that the cliques or social groups which existed before automation were based on the work groups created by departmentation. For example, the pre-automation monograph acquisitions employees formed a close-knit social group, with a high degree of informal communications both horizontal and vertical, within the group. This was, of course, a larger group before it was affected by the new efficiencies of automation. Other cliques which appear to have been quite strong were the professional cataloguers, and the sub-professionals in the Cataloguing section. In addition, quite a strong "them and us" attitude between members of the Reader Services Division and the Technical Services Division (and vice-versa) was evident.

If anything, and despite the integrated nature of the new system, this attitude seems to have increased with the arrival of automation. One explanation could be that the Reader Services Division has been much less involved with the computer than has the Technical Services Division. Another reason is the loss of the social contact which used to occur between cataloguers filing and checking cards, and Acquisitions staff checking order requests in the card catalogues, and Reference and Circulation staff using the catalogues. Technical Services staff no longer need to move out of their sections in order to consult and maintain the catalogue. Therefore, they are not seen so often in the Reader Services area, and less social contact occurs. Typical of the comments of people in Reader Services is "We hear very little about what is going on in Cataloguing these days". (This is despite the work of the committees set up to facilitate horizontal communication.)

The reduction in staff numbers due to automated acquisition procedures, together with a reduction in bulky manual files, has enabled a physical arrangement whereby Monograph Acquisitions and Serials staff (formerly separated) are now accommodated adjacent to each other on the same floor. This arrangement provides for greater social contact between the two groups, and the separate cliques are no longer very evident.

A new social factor which is becoming evident, however, is individual aptitude to terminal operation. Tensions grow between those who are at ease with the system, and those to whom it is difficult, alien and even frightening. This is one of the human aspects of automation which will be looked at more closely in chapter 6. For now, it is sufficient to observe that even within a small unit, supervisors have noted that one employee becomes impatient with another, and assumes an air of superiority, or even scorn towards those less comfortable with the system. It may be that expertise in the system - a library-wide, rather than a departmentalized skill - will become the basis for social cliques in the automated library. Certainly, the informal centre of authority made up of the middle and lower management people most interested in the automated system, is a social clique based on technological elitism.

To return to the proposition put forward at the beginning of this chapter, each structural dimension has been affected by the adoption of new technology, but not dramatically affected. There has not yet been any basic structural change. In fact, the traditional structure has been retained. Boundary spanning activities have been accommodated through lateral communication mechanisms, both formal and informal, and a new Computer Systems Office has been established. An informal centre of authority and a technological elite have emerged, and changes are occurring in the social system.

The fact that informal changes seem to be much more pronounced than formal changes might indicate that the organization is struggling against an unduly rigid traditional structure, including unnecessary interdepartmental barriers, and an inappropriate system of hierarchical relationships. Informal relationships and mechanisms are being used by organization members to avoid the potentially dysfunctional effects of the traditional organizational structure.

Alternatively, it might be argued that while the traditional formal structure is not particularly appropriate to the new technology, it nevertheless remains relevant to some important organizational goals.

The library management is not unaware of the informal communication which goes on, nor of the particular influence of the computer enthusiasts within the organization. It is a reasonable administrative strategy to tolerate an informal organization which clearly serves rational and beneficial purposes, while maintaining the traditional structure. Revolutionary changes to a traditional structure are always likely to upset the personal goals of at least some organization members. Such disturbances could be at least as dysfunctional as the retention of an apparently outdated structure.

Chapter 6

THE CONSEQUENCES OF NEW TECHNOLOGY: HUMAN IMPACTS

The purpose of this chapter is to find out how organization members - the employees of the University of Tasmania Library - have been affected by the introduction of new technology. Our fifth proposition is that:

> Introduction of new technology will have impacts on levels of job satisfaction, prestige and self-esteem, and the social relationships of University Library employees.

The literature survey (Chapter 1) pointed to some of the possible impacts. For example, it is suggested that displacement and uncertainty can occur when comfortable modes of work suddenly become obsolete (Presthus, 1970) and that the social changes which accompany technological changes can lead to anxiety and resistance (Malinconico, 1983, a). Gray (1983) voices concern about a possible Luddite reaction to rapid technological change in libraries:

> 'We are so enamored by the promises of the future applications and possibilities of technology that we lose sight of the human cataloguer, serials clerk and library patron. We promise increased control and a decrease in the rise of per unit costs of processing materials, but fail both to measure the human costs and to assess the reality of the new application of technology.'

McClure and Samuels (1982) are concerned about impacts on the dignity and self-respect of individuals. All of these writers recognize the possible unsettling human impacts of introducing new technology into an organization.

Sara Fine (1982) comments:

> 'The greatest marvel of technology is that if it breaks down, we can fix it; if it has flaws, we can debug it; if it doesn't work at all, we can ignore it; and if it works well, we can make it work better. No one has as yet figured out a way to debug the human factor. It is the most complicated aspect of any technological system, yet it's the one that gets the least attention, is least discussed, the least researched, and perhaps the least understood.' (p.209)

Without going into the debate about whether libraries can afford to ignore technology if (at first) it does not work, and thereby run the risk of being left behind in an increasingly unfamiliar and turbulent task environment, or whether, having spent large amounts of planning and development effort and funds on a new system, it is possible then to ignore it if it doesn't work well, I believe we can agree with Fine's general proposition. Enormous amounts of research and development go into the development of sophisticated technical systems. In comparison the efforts to understand and cater for the human problems involved in organizations which adopt the new systems tend to be incidental - even an afterthought.

That is not to say that the behaviour of people in organizations is an unexplored field, nor that the impact of changing technology on the attitudes and behaviour of people in organizations is not a widely discussed topic. Indeed, Fine points to the issues of management-employee relationships, changing social structures, cooperation, productivity, job satisfaction, and work-related stresses which have concerned writers in this field. Nevertheless, it seems fair to say that these issues have received less attention than the technical problems in the development and installation of automated systems into libraries.

It is important not to misconstrue Sara Fine's comment about 'debugging the human factor'. The purpose is not to discover some human inadequacy which is hindering the technology, but to gain an understanding of the human needs which must be catered for, when designing and introducing new technology.

In this study, the intention is to try to discover whether the introduction of new technology has affected employees in adverse or beneficial ways;

whether they regret the loss of the former manual work environment; whether they are satisfied or dissatisfied with the new work situations, and aspects thereof; whether they feel disrupted, deskilled and deprived of former informal contacts; whether they find the new systems interesting, challenging or even exciting; and whether they are generally happy with the new working environment, and with their own positions within it.

In considering the human impacts attributable to the introduction of new technology into the University of Tasmania Library, it is important to keep in mind the changes in the nature of the work carried out in the library. In Chapter 4 we concluded that although there was no uniform change, the tendency observed was towards increased routinization. That is, fewer exceptions occur, and problems are easier to solve. However, while work has become more standardized, the capabilities of the automated system have provided a new creativity and flexibility in important aspects of library work, such as the searching of data bases. While an increase in routineness in a work environment such as a factory production line might be expected to adversely affect human factors such as job satisfaction, self-esteem and prestige, the situation in the University Library appears to be more complex. Similarly, any organizational changes which accompany the introduction of new technology are likely to influence the impact on individuals within the organization. As observed in Chapter 5, no revolution or abrupt organizational restructuring has accompanied automation in this organization.

While retention of the traditional structure may not seem very appropriate to the new technology, it avoids the alienation and upset that might be caused by sudden structural disruption. At the same time, there are subtle and informal structural changes observable, and such changes are likely to affect the levels of satisfaction and the social relationships of organization members.

It is necessary to aim at some relatively measurable aspects of the complex topic of human impacts of new technology. Therefore this study concentrates on the following aspects: job satisfaction, prestige, self-esteem and social relationships. While each of these is a complex field of study in itself, it was felt that a carefully structured questionnaire should be capable of eliciting responses which would throw some light on the kinds of changes occurring in each area.

Satisfaction:

J.L. Price (1972) defines satisfaction as

> 'the degree to which the members of a social system have a positive affective orientation towards membership in the system'. (p.156)

A great number of factors influence this degree of emotional positivity towards an organization. In the case of an employee, general working conditions and environment, financial rewards, fringe benefits, degree of independence or autonomy, level of workload, participation in management, and opportunities for personal development are some of the factors which could influence satisfaction. According to Smith, Kendall and Hulin (1969) the five most important factors influencing job satisfaction are the areas of work, pay, promotions, supervision and co-workers. Clearly, then, the introduction of new technology, which is merely one element in the area of work, cannot be assumed to have an over-riding influence on the satisfaction level of employees. Nevertheless technology has a profound influence on the nature of work. (Its influence also tends to reach into other areas. Computers cause changes in the working environment, and introduce new ergonomic and health considerations. Promotion prospects may be altered according to individual employees aptitudes at the computer terminal, and relationships between co-workers may be changed or disrupted due to varying levels of proficiency in operating new systems. All such factors will affect the individual's feelings about new technology.)

As with any attempt to measure attitudes, the measurement of satisfaction is fraught with difficulties and imponderables. Blauner (1969) compares levels of job satisfaction in different kinds of occupations and concludes that those most likely to enjoy a high level of satisfaction are members of prestigious professions, with a high level of control over the timing and pace of their work, their physical movements and their work environment. Low levels of satisfaction are likely to occur in occupations where the employee's level of control is low. For example, assembly line workers have virtually no control over the timing or pace of their work, and their physical movements during the work process are highly constrained. The work is likely to be highly repetitive, with no end in sight. The University of Tasmania Library employees range from quite high level professionals, to clerical and non-professional workers in relatively routine jobs. Thus we might expect considerable variations in satisfaction levels, independent of any impacts of automation. We have observed a general increase in the routineness of work, and this might be expected to have an adverse effect on satisfaction. However, the new capabilities of the system might counteract this tendency, at least for some employees. Blauner also notes that

> 'Under "normal" conditions there is a natural tendency for people to identify with, or at least to be somewhat positively oriented toward, those social arrangements in which they are implicated.'

In addition there is the traditional work ethic which persuades people to work for work's sake, and to accept it, even if it is not particularly interesting. It was felt necessary to limit the study of satisfaction to some of the more important dimensions of the nature of work, rather than to attempt a wide ranging survey of all factors which might affect job satisfaction. An adaptation of techniques proposed by Smith, Kendall and Hulin (1969) was adopted for its simplicity, its avoidance of vague terminology, and its allowance for the different satisfaction requirements of individuals.

Employees were given a list of words and asked to indicate whether or not they felt that word to be appropriate to their jobs by answering 'yes' or 'no'. In order to assess each respondent's frame of reference (for different levels of experience, motivations, aspirations, expectations and attitudes will affect the satisfaction requirements of individuals) Smith, Kendall and Hulin's system of 'triadic scoring' was employed. This system involves asking respondents to indicate the appropriateness of each word on the list to the job he would most like to have (his 'best job') and to the job he would least like to have (his 'worst job') as well as to his present job.

Satisfaction with an aspect of work is indicated when the employee's response for his present job is the same as that for his 'best job' and different from that for his 'worst job'. Dissatisfaction is indicated when the response for his present job is the same as that for his 'worst job' and different from that for his 'best job'. A neutral response - the same answer for all three jobs - indicates that this dimension is not very important for the respondent's job satisfaction. Where the response for the present job is different from both the 'best job' and the 'worst job', it is not considered in the scoring.

This method avoids the problems which otherwise might arise, of wrongly assuming that a dimension such as routineness is a factor for dissatisfaction in the minds of all employees. It also avoids the variations in interpretation likely to occur when terms such as 'strongly agree' are used in scales designed to measure attitudes. Those employees who formerly worked with manual library systems and who now operate automated systems were asked to indicate how the same list of work dimensions has changed since the introduction of automation. Respondents to this part of the questionnaire were asked whether each dimension had increased, remained about the same, or decreased. For example, employees were asked whether their work had become simpler, remained about the same, or become less simple.

Thus the questionnaire provided data about satisfaction levels for dimensions of work for all employees in the organization. The data was capable of analysis by different employee groups, such as those who work with automated systems and those who do not; those who had previously worked with manual systems, and those who had not; those working in different divisions and sections of the Library; professional and non-professional employees. In addition, a picture of employees' views about the impacts of automation on various dimensions of their work was built up.

Prestige and self-esteem:

The intention, in this section of the questionnaire, was to discover how the individual employee feels about his position in the organization and the work he performs. It was not intended to examine prestige from the viewpoint of others, but from the respondent's own viewpoint. That is, if self-esteem means having a favourable opinion, or approving of one's self, prestige from one's own viewpoint means believing that others have a favourable opinion, or approve of one. These two concepts are tightly interconnected, and difficult to separate. Of course, prestige or status of a certain kind is recognized by the organization through such formal devices as positions, supervisory roles and salary levels. However, it is well known that different jobs and work groups in an organization have their own informal status and prestige levels, and the self-esteem enjoyed by an individual is likely to depend to some extent upon these informal values. One's self-esteem may be affected both by formal status and by informal status, as perceived by one's self, and by other members of the organization.

Employees who work with automated systems, and who had previously worked with manual systems in the University Library were asked questions about changes in factors affecting personal prestige and self-esteem, including: their views about the importance, status and autonomy of their jobs; the degree of their participation in decision-making; the ease of identifying their outputs; their feeling about the value of their work, and about how their work is valued by fellow employees.

As a basis for comparison, all employees were asked to answer questions about the same factors affecting personal prestige and self-esteem.

Social relationships:

All employees were asked to answer questions about changes in opportunities for social and personal diversions, informal relationships with other employees and the atmosphere of work in the University Library, following the introduction of automated systems. It was felt that all employees, including those who do not work with the automated systems, and even recent appointees, would be likely to have opinions in this area, and that there might be differences of opinion according to employee category.

Finally, all employees were asked questions aimed at indicating their acceptance or otherwise of automated systems, and to make any general comments they wished.

The Survey:

At the time of the survey (February 27 - March 11, 1985) the University of Tasmania Library employed 80 people (excluding bindery employees) of which three were on long-term (long-service or maternity) leave. Of the remaining 77 employees, 14 were either absent at the time of the survey (3) or declined to complete the questionnaire (11). The majority of the latter group simply felt the questionnaire was not relevant to them as they were not personally involved with automated systems. They included an administrator, a secretary, three attendants and several junior non-professionals recently recruited. The 63 completed questionnaires represent a response rate of 82%. Some 39 of the respondents (62%) reported that their positions involved working with automated systems, and 32 of this group had previously worked with manual systems in the University library. It is believed that these 32 respondents are in fact 100% of this category of library employee. The make-up of the respondent group, compared to total membership, is indicated in Figure 2.

Figure 2

UNIVERSITY OF TASMANIA LIBRARY EMPLOYEES AND RESPONDENTS TO 'HUMAN IMPACTS' QUESTIONNAIRE, MARCH 1985

	Reader Services		Tech. Services		Other		Total	
	Employees	Respondents	Employees	Respondents	Employees	Respondents	Employees	Respondents
Professional	9	9	13	10	6	5	28	24
Non-professional	32	26	14	12	3	1	49	39
Total	41	35	27	22	9	6	77	63

Job Satisfaction:

The questionnaire employed two main approaches to discovering indications of automation's impact on job satisfaction. Firstly, questions 8-20 of the questionnaire (Appendix 2) asked those respondents who currently work with automated systems, and who had previously worked with manual systems in the library, whether and how each of thirteen aspects of the nature of their work had changed since the introduction of automated systems. Secondly, all respondents were asked to answer questions 30-42, which enabled the use of triadic scoring to gain an indication of the respondent's satisfaction or dissatisfaction with each of the thirteen aspects of the nature of their work. This section was designed to give an indication of overall satisfaction with the nature of work, as well as with individual aspects, and to enable comparison of the satisfaction of those who work with automated systems with that of those who work with manual systems. These indications of overall satisfaction and dissatisfaction with the nature of work were gained by counting the number of aspects with which each employee was satisfied, and the number of aspects for which dissatisfaction was indicated. Figure 3 shows the distribution of total indications of satisfaction and dissatisfaction with aspects of the nature of work. There were more expressions of satisfaction (418) than of dissatisfaction (262). There is almost no difference in expressions of satisfaction between those working with automated systems and those working with manual systems. Expressions of dissatisfaction are slightly higher in the group working with automated systems, while neutral expressions are slightly higher in the group working with manual systems. However, these differences are small.

Figure 3

TOTAL EXPRESSIONS OF SATISFACTION AND DISSATISFACTION WITH ASPECTS OF THE NATURE OF WORK

	Employees who work with automated systems			Employees who work with manual systems			Total Employees		
	Satisfied			Satisfied			Satisfied		
	Yes	No	Neutral	Yes	No	Neutral	Yes	No	Neutral
Number	272	181	53	146	81	60	418	262	113
%	54	36	10	51	28	21	53	33	14

The number of aspects of the nature of work with which each employee was satisfied is indicated in figure 4, while figure 5 indicates the number of aspects for which each candidate indicated dissatisfaction. As can be seen from the bar graphs, only 9 respondents expressed satisfaction with fewer than 4 aspects of the nature of their work, while 13 were satisfied with 10 or more aspects. Of the 28 respondents who expressed satisfaction with 8 or more aspects of the nature of their work, some 19 were from the group working with automated systems, and 9 from the group working with manual systems. That is, the group working with automated systems includes significantly more employees with a high level of general satisfaction, than does the group working with manual systems.

On the other hand, of those employees who indicated dissatisfaction with a high number of aspects of the nature of their work (11 respondents were dissatisfied with eight or more aspects) the majority (eight) were from the group who work with automated systems. The 11 highly dissatisfied respondents were all non-professional staff, and the four respondents at the extreme of this group (one who expressed dissatisfaction with every aspect of the nature of work, and three who expressed dissatisfaction with 12 out of 13 aspects) were all non-professionals from the Technical Services Division, currently working with automated systems.

Figure 4

NUMBER OF ASPECTS OF NATURE OF WORK FOR WHICH SATISFACTION IS INDICATED (61 respondents)

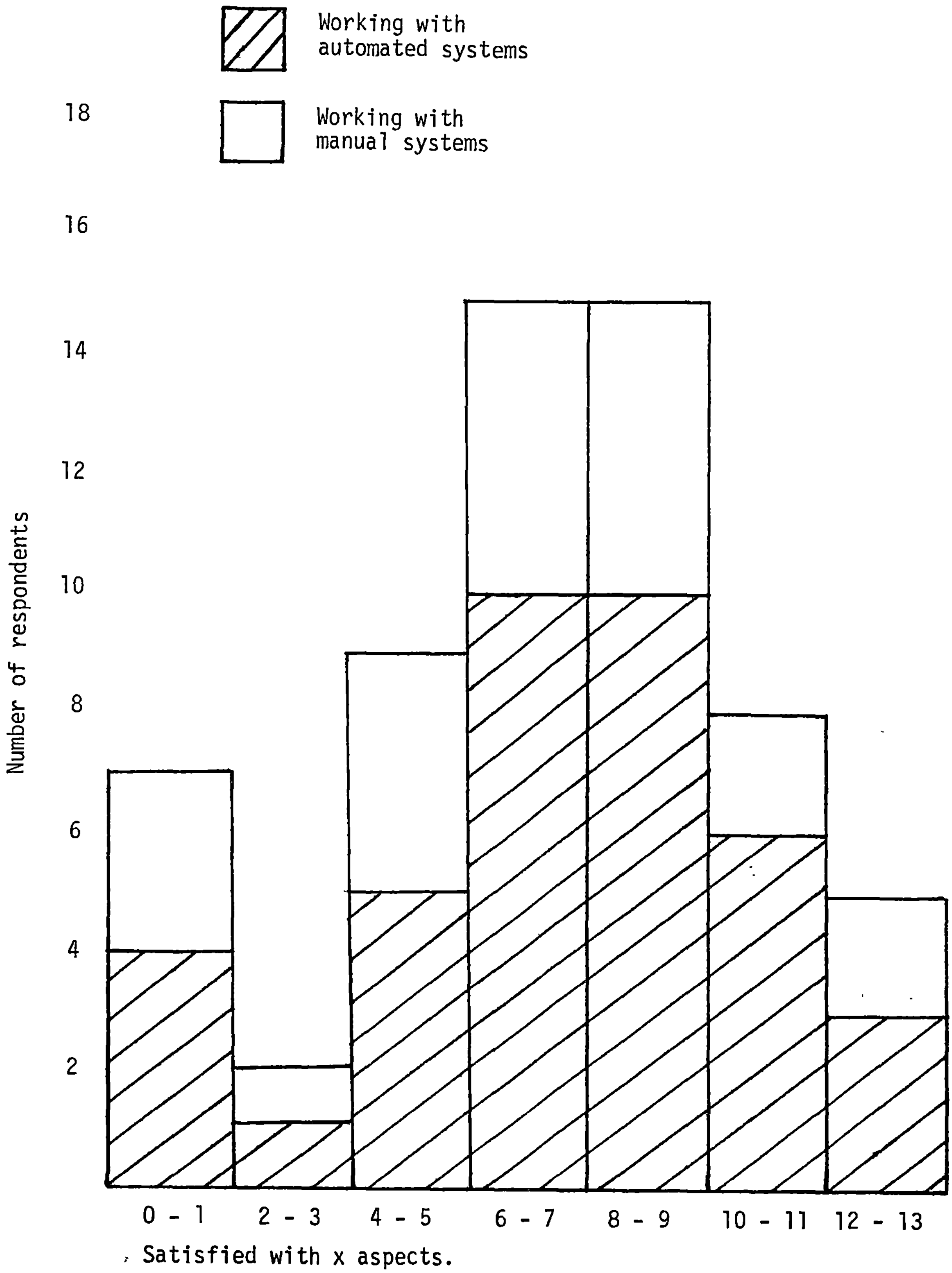


Figure 5

NUMBER OF ASPECTS OF NATURE OF WORK FOR WHICH DISSATISFACTION IS INDICATED (61 respondents)

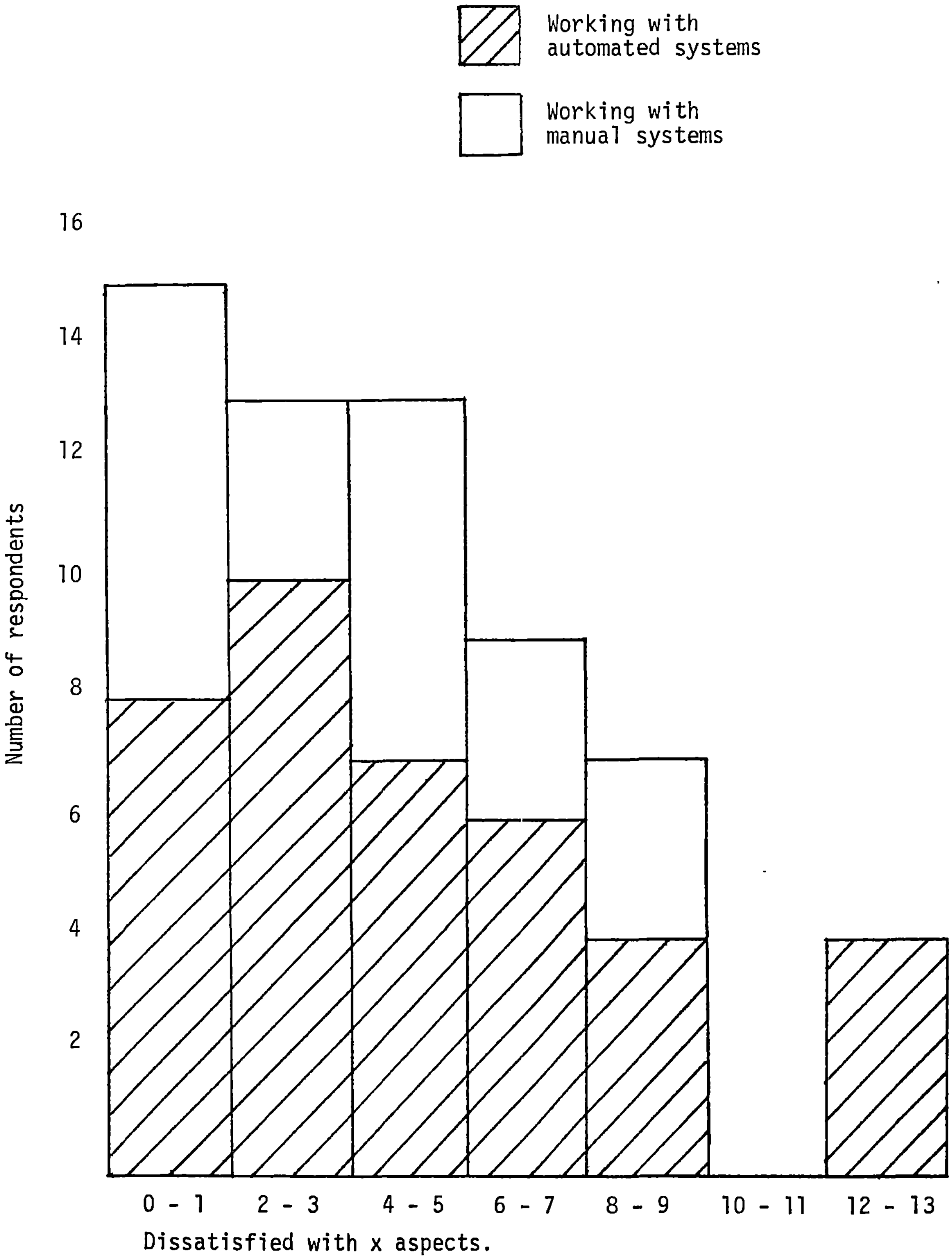


Figure 6 depicts what respondents think about the desirability of each of the thirteen dimensions of the nature of work. As explained earlier, every individual has his or her own frame of reference, and it cannot be assumed that a particular aspect of work such as its challenge or creativity is universally desired, or that routine or repetitive work is necessarily unsatisfying for all employees. As can be seen from the table, varied, interesting, challenging and creative work are almost invariably desired by the group. Independence and exciting work are also strongly desired. Predictably, employees do not want regimentation or close supervision, and almost none prefers repetitive work. A small proportion (10%) prefer work to be simple, while 19% are happy with routine work. Non-professional staff are fairly heavily represented in this minority. The only aspects for which there is no strong trend for or against are hectic work and fragmented work. In each case there are large minorities who prefer their work to be hectic or fragmented. Interestingly, non-professional employees are heavily represented in these minorities. In fact, 46% of non-professional staff indicated a preference for fragmented work, and 49% of non-professional staff indicated a preference for hectic work. In contrast, 25% of professional staff preferred fragmented work, and 21% of the professionals preferred hectic work.

Satisfaction with individual aspects of the nature of work ranged from 79% (respondents expressing satisfaction with the varied and interesting nature of their work, and only 16% expressing dissatisfaction with these aspects) to 66% dissatisfaction and only 28% satisfied with the creativity of their work.

Figure 7 shows the levels of satisfaction and dissatisfaction indicated for each of the thirteen aspects. The aspects are shown in descending

Figure 6

DESIRABILITY OR OTHERWISE OF THIRTEEN ASPECTS OF THE NATURE OF WORK
(Scores for respondents' 'best possible jobs')
(63 respondents)

	Prefer			Do not want			No strong preference		
	Professional	Non-professional	Total	Professional	Non-professional	Total	Professional	Non-professional	Total
Routine	3	9	12	19	29	48	2	1	3
Repetitive	0	3	3	21	35	56	3	1	4
Regimented	0	0	0	21	38	59	3	1	4
Closely supervised	0	1	1	21	37	58	3	1	4
Simple	2	4	6	18	34	52	4	1	5
Varied	22	39	61	0	0	0	2	0	2
Interesting	22	38	60	0	0	0	2	1	3
Fragmented	6	17	23	14	18	32	4	4	8
Challenging	22	37	59	0	1	1	3	0	3
Creative	21	37	58	1	2	3	2	0	2
Independent	20	35	55	2	2	4	2	2	4
Exciting	18	37	55	3	2	5	3	0	3
Hectic	5	19	24	17	18	35	2	2	4

order of satisfaction from left to right. Figure 8 divides the respondents into those who work with automated systems (on the left side of each column) and those who work with manual systems (on the right side). As can be seen, the patterns of satisfaction and dissatisfaction are roughly similar. In only five aspects of the nature of work is there any marked difference in the responses of the 'automated' and 'manual' sub-groups. The results for these five cases are tabulated in Figure 9. In the case of regimented, hectic, fragmented, simple or repetitive work there is a higher incidence of dissatisfied members in the group working with automated systems. The incidence of expression of satisfaction with the fragmented nature of work is very low (26%) in the group working with automation. In three of the other four cases (regimented, simple, or repetitive) expressions of satisfaction are only slightly lower in the 'automated' group than in the 'manual' group. Expressions of satisfaction with the hectic nature of work are almost equal in the two groups. It seems that there is a higher incidence of dissatisfaction with some aspects of the nature of work in the group which works with automated systems, but this dissatisfaction is by no means unanimous. Only in the case of the fragmented nature of work is there a strong indication that the level of satisfaction is low and the level of dissatisfaction is high in the group working with automated systems. Generally speaking, the patterns of satisfaction in the two groups are quite similar.

Figure 7

SATISFACTION AND DISSATISFACTION WITH 13 ASPECTS OF THE NATURE OF WORK. All Respondents (61)

	VARIED	INTERESTING	CLOSELY SUPERVISED	REGIMENTED	CHALLENGING	INDEPENDENT	SIMPLE	HECTIC	ROUTINE	FRAGMENTED	EXCITING	REPETITIVE	CREATIVE
% SATISFIED	79	79	72	70	59	52	49	44	41	38	38	36	28
% DISSATISFIED	16	16	20	23	34	34	25	28	36	33	52	46	66
% NEUTRAL	5	5	8	7	7	13	26	28	23	30	10	18	7

Figure 8

SATISFACTION AND DISSATISFACTION WITH 13 ASPECTS OF THE NATURE OF WORK. Respondents working with automated systems vs. those working with manual systems.

(automated: 39 Manual: 22)

	VARIED		INTERESTING		CLOSELY SUPERVISED		REGIMENTED		CHALLENGING		INDEPENDENT		SIMPLE		HECTIC		ROUTINE		FRAGMENTED		EXCITING		REPETITIVE		CREATIVE	
	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual	Auto	Manual
% SATISFIED	82	73	82	73	82	55	67	77	64	50	62	36	44	59	44	45	44	36	26	59	36	41	38	32	31	23
%DISSATISFIED	18	14	18	14	15	27	28	14	31	41	31	41	31	14	38	9	36	36	46	9	56	45	49	41	67	64
% NEUTRAL	0	14	0	14	3	18	5	9	5	9	8	23	26	27	18	45	20	27	28	32	8	14	13	27	3	14

Figure 9

SATISFACTION AND DISSATISFACTION WITH ASPECTS OF THE NATURE OF WORK:

5 CASES IN WHICH VARIATIONS TO THE GENERAL PATTERN OCCURRED

REGIMENTED	AUTOMATED		MANUAL		ALL	
	No.	%	No.	%	No.	%
SATISFIED	26	67	17	77	43	70
DISSATISFIED	11	28	3	14	14	23
NEUTRAL	2	5	2	9	4	7
	39		22		61	

HECTIC	AUTOMATED		MANUAL		ALL	
	No.	%	No.	%	No.	%
SATISFIED	17	44	10	45	27	44
DISSATISFIED	15	38	2	9	17	28
NEUTRAL	7	18	10	45	17	28
	39		22		61	

FRAGMENTED	AUTOMATED		MANUAL		ALL	
	No.	%	No.	%	No.	%
SATISFIED	10	26	13	59	23	38
DISSATISFIED	18	46	2	9	20	33
NEUTRAL	11	28	7	32	18	29
	39		22		61	

SIMPLE	AUTOMATED		MANUAL		ALL	
	No.	%	No.	%	No.	%
SATISFIED	17	44	13	59	30	49
DISSATISFIED	12	31	3	14	15	25
NEUTRAL	10	26	6	27	16	26
	39		22		61	

REPETITIVE	AUTOMATED		MANUAL		ALL	
	No.	%	No.	%	No.	%
SATISFIED	15	38	7	32	22	36
DISSATISFIED	19	49	9	41	28	46
NEUTRAL	5	13	6	27	11	18
	39		22		61	

Turning to the section of the questionnaire which sought information about whether and how aspects of the nature of work had changed since the introduction of automated systems (questions 8 - 20), 32 respondents completed this section. Generally speaking, the pattern which emerges is not one of drastic change. In fact, for nine of the 13 aspects there was a substantial body of opinion that there had been little change. In many cases, those who believed there had been a change were divided about the nature of the change. Figure 10 (a - m) depicts, for each aspect of the nature of work, the percentages of respondents who believe that aspect has increased, remained about the same, or decreased since the introduction of automated systems. Comparisons of the responses of professional and non-professional employees, and of Reader Services and Technical Service employees are also provided.

Figure 10

CHANGES IN THE NATURE OF ASPECTS OF WORK SINCE THE INTRODUCTION OF AUTOMATED SYSTEMS

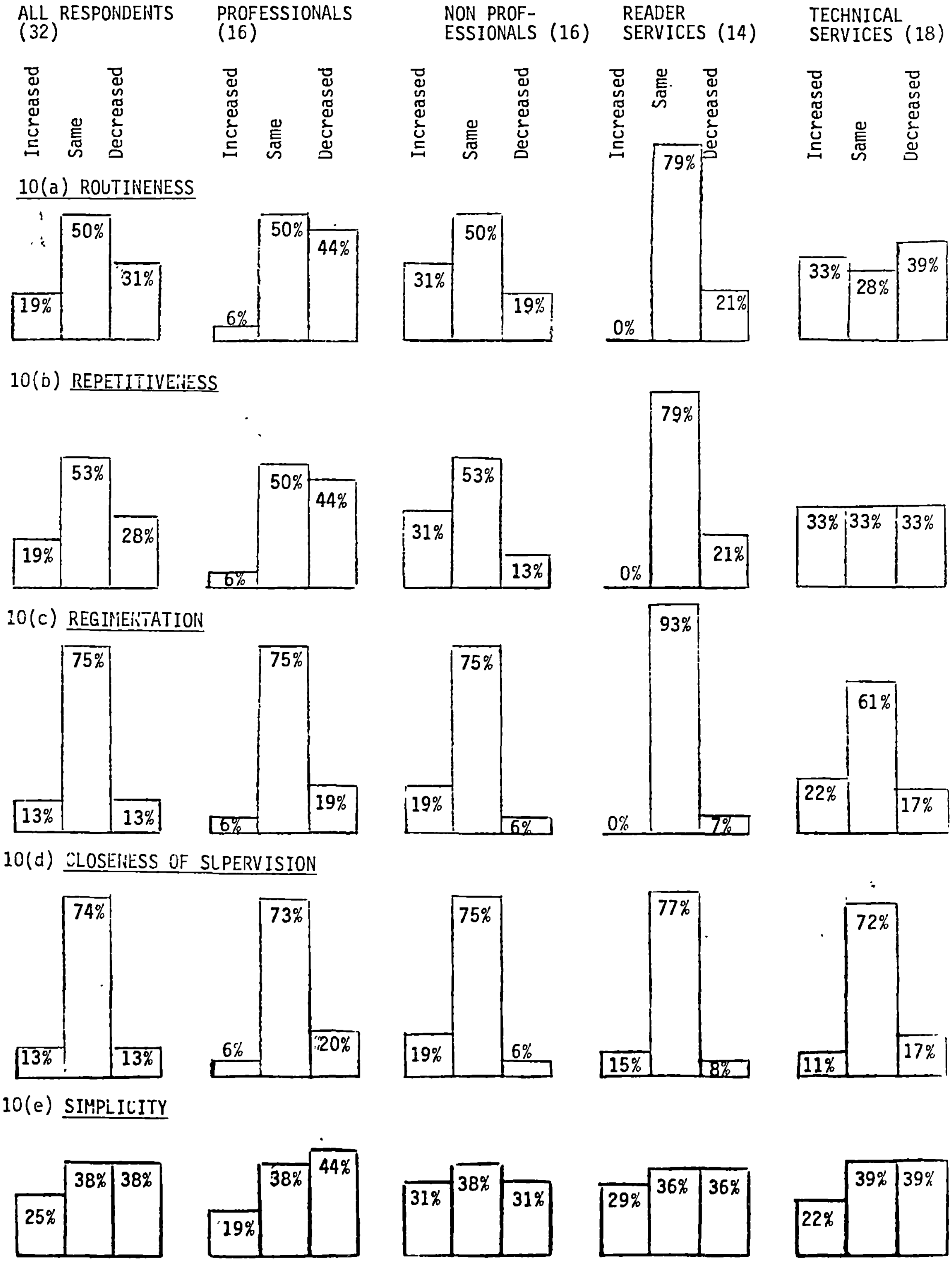
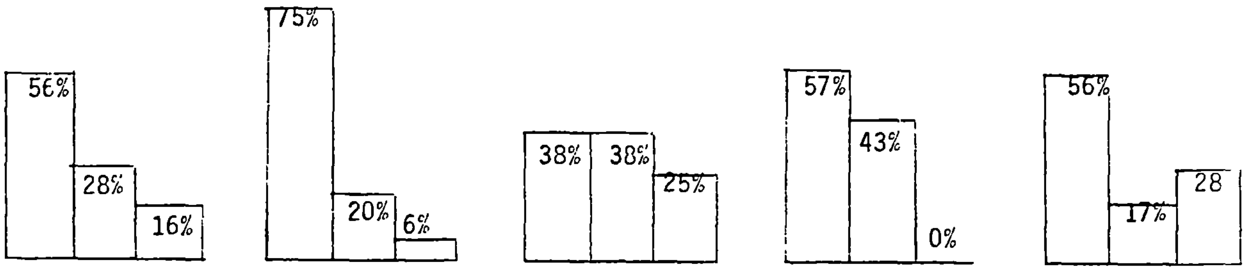


Figure 10
(continued)

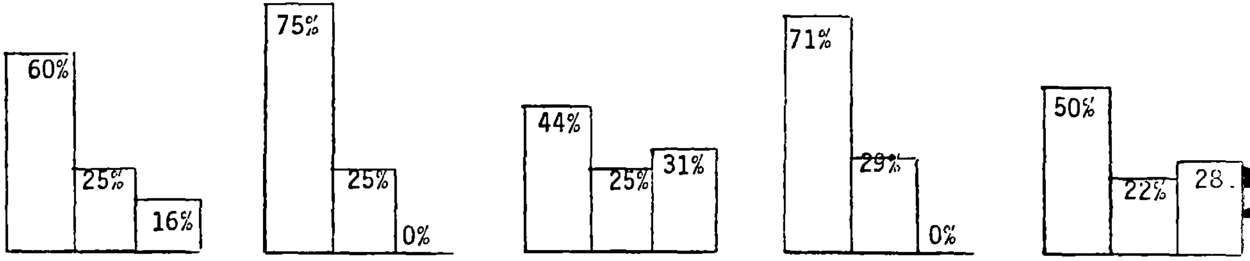
ALL RESPONDENTS (32) | PROFESSIONALS (16) | NON PROFESSIONALS (16) | READER SERVICES (14) | TECHNICAL SERVICES (18)

Increased Same Decreased

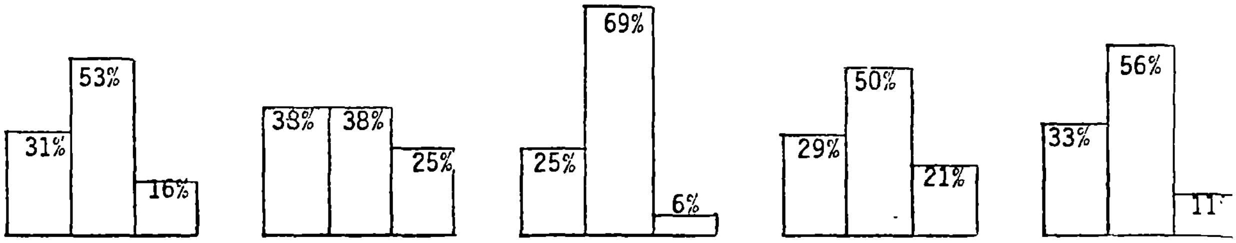
10(f) VARIABILITY



10(g) INTEREST



10(h) FRAGMENTATION



10(i) CHALLENGE

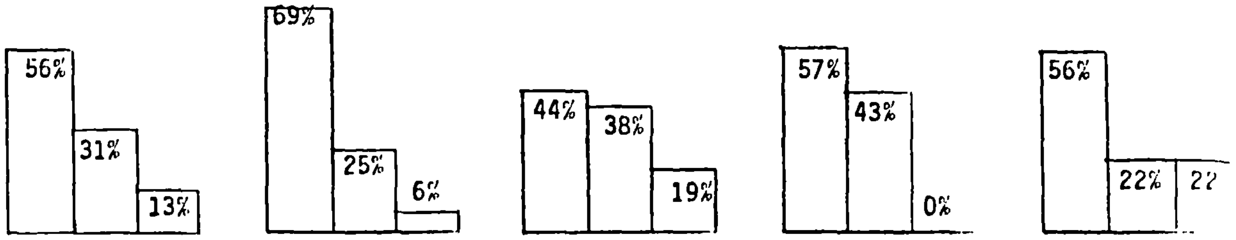
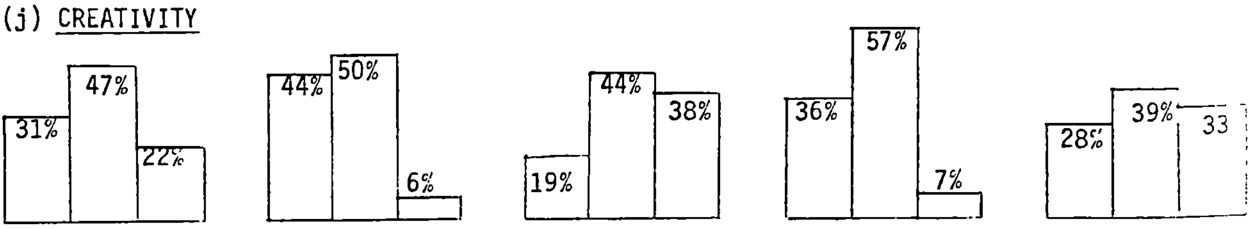


Figure 10
(continued)

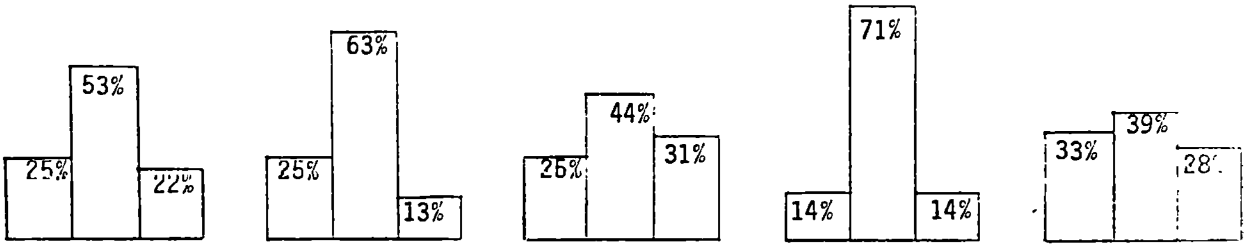
All RESPONDENTS (32) | PROFESSIONALS (16) | NON PROFESSIONALS (16) | READER SERVICES (14) | TECHNICAL SERVICES (18)

Increased Same Decreased

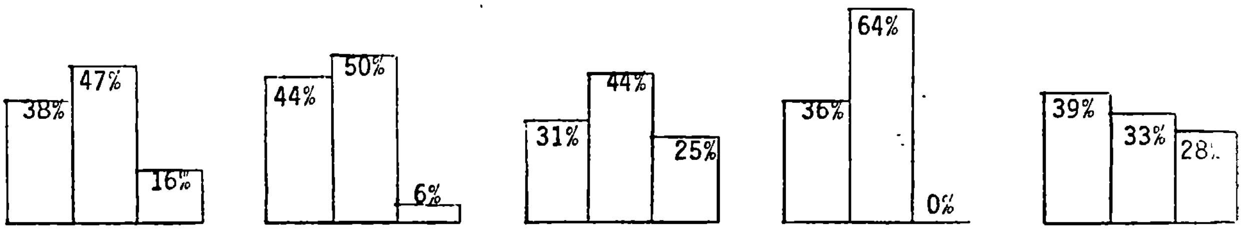
10(j) CREATIVITY



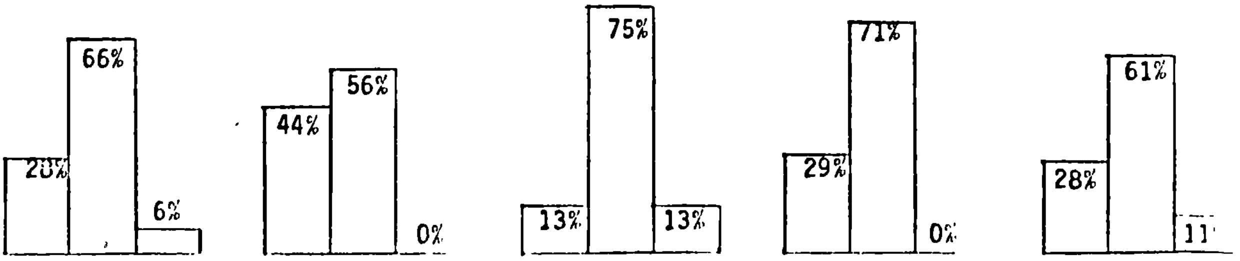
10(k) INDEPENDENCE



10(l) EXCITEMENT



10(m) HECTIC NATURE OF WORK



Routineness:

Question 8 asked whether the employee's work had become more routine, remained about the same, or become less routine. Exactly half the respondents believed their work had stayed about the same, while 19% believed their work had become more routine and 31% believed their work had become less routine.

As can be seen from Figure 10(a) both professionals and non-professionals were equally divided about whether the routineness of their work had changed. However, most of those professionals who believed it had changed, saw it as having become less routine, whereas 31% of non-professionals believed their work had become more routine. On the other hand, a majority (79%) of Reader Service employees felt the routineness of their work had not changed, 21% felt it had become less routine, and none felt it had become more routine

The groups which most strongly reported an increase in routineness were non-professionals, and Technical Service employees, but even in these groups, only about one third felt their work had become more routine. Generally speaking, most employees do not believe work has become more routine. Remembering that routineness is not generally desired by library employees (see Figure 6), the overall perception of stability in this aspect of work, with a slight tendency towards a decrease in routineness, provides an indication that this aspect of job-satisfaction generally has not deteriorated since the introduction of automated systems except from the point of view of a minority of non-professionals and Technical Service employees; and for professionals it has improved.

Repetitiveness:

In answer to question 9, 53% of respondents reported that this aspect of their work had remained about the same, and the remainder were divided about the nature of the change; 19% reported an increase and 28% a decrease. The results are very similar to those for routineness, indicating that routine work and repetitive work are seen as being closely related. Once again no Reader Services respondents felt that their work had become more repetitive, and the largest groups reporting an increase in repetitiveness (about one-third in each case) were Technical Services and non-professional employees.

Almost no library employees prefer repetitive work. Thus the relative stability of this dimension, with a slight tendency towards a decrease, also indicates no overall deterioration of job satisfaction. For some professionals, satisfaction ought to have improved, whereas for a minority of non-professionals and Technical Services employees it probably has deteriorated.

Regimentation:

A majority (75%) of respondents to question 10 believe that regimentation of their work has remained about the same. The remaining 25% were evenly divided about whether work had become more regimented or less regimented. A similar pattern appears for each subgroup (figure 10(c)). Reader Services staff were almost unanimous that this aspect of work had not changed. As regimentation is unanimously not preferred by Library Staff employees (see figure 6) the very small proportion of employees who reported an increase in regimentation (13% overall, 22% of Technical

Service employees and 19% of non-professionals) have probably experienced dissatisfaction with this change in the nature of their work. However, only four individuals fell into this catergory. Furthermore, it is interesting to note that 11 (34%) of this same group of respondents expressed dissatisfaction with the level of regimentation in their work, as compared to just 3 (14%) of the group who work with manual systems (figure 8) but now we find only 4 (13%) of the 'automated' group reporting an increase in regimentation due to automation. This seems to indicate that dissatisfaction with regimentation, when it exists, is not necessarily due to the introduction of automated systems. In fact, 8 of the 11 people in the 'automated' group who expressed dissatisfaction with regimentation were non-professionals working in Technical Services. We might reasonably conclude that work is more regimented for this group than for others in the library, independent of the fact that automated systems have been introduced there.

Closeness of supervision:

As might be expected, the results for this dimension (figure 10(d)) bear a very close resemblance to those for regimentation. Once again there is a very strong body of opinion that the closeness of supervision has not changed much since the introduction of automation. As with regimentation, most employees prefer not to be closely supervised (figure 6). Satisfaction with this dimension is relatively high (figure 7) and does not vary much between the 'automated' and 'manual' groups. Automation does not appear to have led to any change in satisfaction with this aspect of work in the University Library.

Simplicity:

A high proportion of library employees do not want simple work (figure 6). The pattern shown in (figure 10(e)) is one of greater change than for the various dimensions looked at so far, but of no overwhelming trend in the direction of the change. The proportion reporting that work had become less simple (38%) was slightly more than the proportion reporting that work had become simpler (25%). A slightly higher proportion of professional than non-professional employees find their work more complicated than before (many professionals have to help design, plan and supervise the operation of the new systems). The slight trend towards less simple work indicates that the general level of satisfaction with this dimension probably has increased slightly following the introduction of automation. However, there are substantial minorities in both divisions, and particularly of non-professionals, who are probably experiencing dissatisfaction with the increasing simplicity of their work.

Variation:

An overwhelming proportion of library employees prefer varied work (figure 6), and figures 7 and 8 show that more employees (from both groups) are satisfied with this than with any other aspect of work. Figure 10(f) shows that the majority of respondents and professional staff in particular, are enjoying more variation, and, presumably, greater satisfaction with this aspect of their work. However, a substantial minority of non-professionals (25%) and of Technical Service employees (28%) reported less varied work, which indicates a decrease in this aspect of job satisfaction for those people. Nevertheless, there is a very clear trend towards more varied work following the introduction of automation.

Interest:

Figure 10(g) indicates a strong trend towards more interesting work for University Library employees since the introduction of automation systems. As interesting work is almost unanimously preferred (figure 6) and as the reported satisfaction with this aspect of work is also high (figure 7 and 8) we can conclude that automation seems to have been a contributor to the interesting nature of library work and, therefore, to increased satisfaction in this area. Once again, however, minority reports of less interesting work for some non-professionals and Technical employees are evident.

Fragmentation:

A majority of respondents (53%) indicated no change in this work dimension (figure 10(b). In particular, most non-professionals reported no change, while the results for professionals were more enigmatic. Of those respondents who believe there has been a change, those who believe work has become more fragmented outnumber those who believe it has become less fragmented. Figure 6 shows that fragmentation is one of the few aspects of the nature of work about which employees are somewhat divided. Some 37% prefer fragmented work, while 51% do not like it and 13% have no strong inclination either way. A closer look at the 47% (15 respondents) who reported a change in fragmentation reveals that of the 10 respondents who believe their work has become more fragmented, 7 did not want fragmentation while 3 preferred it. Of the 5 respondents who believe their work has become less fragmented, 2 prefer fragmentation and 3 do not want it. Thus there are 9 individuals (28%) who feel there has been a change for the worse in this aspect of their work, 6 people (19%) believe it has changed for the better and the remaining 17 (53%) believe there has been no change. While there is no definite overall trend, it happens that 7 of the 9 employees reporting a deterioration in this aspect of their work are professionals, and 6 are professionals in the Technical Services Division. Fragmentation is one of the aspects of work in which the incidences of dissatisfaction is much higher in the 'automated' group than in the 'manual' group (figure 8). While 46% of the 'automated' group are dissatisfied with this aspect of their work, only 28% believe it has deteriorated since the introduction of automation. Thus, factors other than automation must contribute to this aspect of dissatisfaction.

Challenge:

Most library employees prefer challenging work (figure 6) and a majority (56%) reported that their work has become more challenging (figure 10(i)). This trend is rather less for non-professionals than for professionals. Only 13% (4 respondents) reported that their work has become less challenging. All of these are Technical Services employees, and 3 of them are non-professionals.

Creativity:

Once again, the great majority of library employees prefer creative work (figure 6). Figure 10(j) shows that almost half the respondents reported no change in the creativity of their work, while 31% believe their work has become more creative and 22% believe it has become less creative. Very few professionals reported a decrease in creativity, whereas 38% of non-professionals and 33% of Technical Service employees believed their work has become less creative. In this case, there are 7 respondents who experienced a decline in creativity, of whom 6 are non-professionals (5 of them from the Technical Services Division), whereas the remaining 25 respondents believe creativity has either increased or remained the same.

Independence:

More than half the respondents believe the independence of their work has not changed, and the remainder are evenly divided about whether it has increased or decreased (figure 10(k)). Independent work is strongly preferred (figure 6), therefore we can assume that most of the 25% experiencing increased independence see this aspect of their work as a cause for satisfaction whereas most of the 22% who have become less independent see this as a cause for dissatisfaction. Decreased independence occurred most for non-professional (31%) and Technical Services employees (28%). On the other hand 33% of Technical Services employees enjoy increased independence, whereas in Reader Services a large proportion (71%) see this aspect of their work as having remained the same, and only 14% believe it has increased.

Excitement:

Figure 10(l) shows that almost half the respondents reported this aspect of their work has remained the same, while 38% reported that their work had become more exciting and 22% that their work had become less exciting. A small minority (8%) of library employees do not want exciting work (see figure 6) so it is reasonable to assume that an increase in excitement generally implies an increase in satisfaction. Overall satisfaction with this aspect of work has either improved or remained about the same, except in the cases of a minority of Technical Services employees, 5 of whom are non-professionals.

Hectic nature of work:

Library employees are somewhat divided about whether they like hectic work (figure 6). It is preferred by 38%, while 56% do not want it, and 6% have no strong preferrence. This is one of the aspects of work about which many more of the 'automated' group (38%) than the 'manual' group (9%) recorded dissatisfaction (see figure 8). Figure 10(m) indicates a large proportion of respondents who believe there has been no change in this aspect of work and a very small proportion who believe it has decreased, while about one quarter of respondents believe their work has become more hectic. Most of those for whom work has become more hectic are professionals. A closer examination of the returns from employees who reported a change in this aspect of their work reveals that of 7 who feel work has become more hectic, only 1 prefers hectic work. Of the 2 who feel work has become less hectic, 1 prefers hectic work and the other does not. Thus 7 respondents (22%) have experienced a decrease in statisfaction with this aspect of work (six of this group are professionals).
This is another example of fewer people in the 'automated' group reporting a decrease in satisfaction following the introduction of automated systems, than reporting dissatisfaction with this aspect of work. As with regimentation and fragmentation, factors other than automation must contribute to the dissatisfaction of some members of the 'automated' group with this aspect of their work.

The introduction of automated systems does not appear to have brought any overall traumatic change to the level of satisfaction with the nature of work. In seven of thirteen aspects the majority of respondents reported that there had been no noticeable change, and in no aspect of work was there any suggestion that the overall satisfaction level had decreased.

Professional employees who reported changes in aspects of their work were generally more positive than were non professionals, with the exception of the fragmented nature of work, about which seven professionals reported dissatisfaction with the change. A majority of professionals find their work more varied, interesting and challenging since the introduction of automated systems. However, for a minority of respondents, particularly a group of about six Technical Services employees, work has become more routine, and less varied, interesting, creative and exciting. Some Technical Services employees also reported that the work was more regimented and closely supervised, but the data indicated that rather more Technical Services employees were dissatisfied with these aspects of their work than the number who attributed their dissatisfaction to automation. This was also the case for those experiencing dissatisfaction with fragmentation or hectic nature of their work.

Generally, speaking, the introduction of automation systems in the University Library has not been a force for job dissatisfaction for the majority of employees. For most there has been little change in satisfaction; for some, particularly professionals, various aspects of work have improved; but for a few individuals. most of whom are non-professionals, and nearly all of whom work in the Technical Services Division, there has been a clear deterioration in job-satisfaction.

Prestige and self-esteem:

Questions 43-49 sought respondents' views on dimensions of their work which might affect their levels of prestige and/or self-esteem. Figure 11 shows the results. Asked whether their work in the University Library is essential, quite important or not very important, 55% of respondents stated that their work was essential, 39% saw their work as quite important, while 7% felt their work was not very important. Professionals were slightly more likely to see their work as essential, while the few who rated their importance as low were all non-professionals. There is little difference between the 'automated' and 'manual' groups. In general, the respondents seemed to have quite a favourable self-image as far as the importance of their work is concerned. There was less enthusiasm about the levels of autonomy. Only 32% feel their job has a high level of autonomy, 47% feel the level is medium, and 22% believe it is low. As might be expected, professionals report a higher level of autonomy than do non-professionals. Employees who work with automated systems are much more likely than those working with manual systems to see the level of autonomy of their jobs as high.

Sixty-six percent of respondents reported that they find it easy to identify with the work they have produced, while only 7% found such identification difficult. This pattern was fairly consistent throughout the subgroups.

Forty-one percent of respondents feel that their efforts are very worthwhile, and 52% feel their efforts are quite worthwhile. Only 6% said that they felt their efforts not to be very worthwhile. This aspect of self-esteem was higher amongst Reader Service employees than Technical

Figure 11

FACTORS AFFECTING PRESTIGE AND SELF-ESTEEM

	DIVISION		QUALIFICATION		WORK WITH...		ALL RESPONDENT
	READER SERVICES	TECHNICAL SERVICES	PROFESSIONALS	NON PROFESSIONALS	AUTOMATED SYSTEMS	MANUAL SYSTEMS	
	%	%	%	%	%	%	%
(a) IMPORTANCE (N = 61)							
HIGH	62	50	64	49	53	56	55
MEDIUM	32	41	36	41	42	35	39
LOW	6	9	0	10	5	7	7
	(34)	(22)	(22)	(39)	(38)	(23)	(61
(b) AUTONOMY (N = 60)							
HIGH	25	32	63	11	44	10	55
MEDIUM	47	55	38	56	51	38	39
LOW	28	14	0	36	5	52	7
	(32)	(22)	(24)	(36)	(39)	(21)	(60)
(c) STATUS (N = 62)							
HIGH	21	18	50	8	31	13	25
MEDIUM	56	50	50	53	49	57	52
LOW	26	32	0	39	20	30	25
	(34)	(22)	(24)	(38)	(39)	(23)	(62)
(d) PARTICIPATION (N = 61)							
HIGH	47	32	88	19	49	41	46
MEDIUM	26	36	13	38	31	23	28
LOW	26	32	0	43	20	36	26
	(34)	(22)	(24)	(37)	(39)	(22)	(61)
(e) IDENTIFICATION (N = 59)							
HIGH	58	77	67	66	65	68	66
MEDIUM	36	18	24	29	24	30	27
LOW	6	5	10	5	11	0	7
	(33)	(22)	(21)	(38)	(37)	(22)	(59)
(f) WORTHWHILE (SELF VIEW) (N = 63)							
HIGH	51	32	46	38	33	54	41
MEDIUM	43	64	50	55	65	38	52
LOW	6	5	5	8	5	8	6
	(35)	(22)	(24)	(39)	(39)	(24)	(63)
(g) WORTHWHILE (VIEW OF FELLOW EMPLOYEES) (N = 61)							
HIGH	46	18	36	36	19	62	36
MEDIUM	51	82	64	62	81	33	62
LOW	3	0	0	3	0	4	2
	(35)	(22)	(22)	(39)	(37)	(24)	(61

Services employees, and higher amongst professionals than non-professionals. A higher proportion of the 'manual' group than the 'automated' group felt their efforts were very worthwhile, while a majority of the 'automated' group felt their efforts to be quite worthwhile. When it comes to their view of how others (their fellow employees) see their (the respondents) work, a majority (62%) feel their work is seen as quite worthwhile. Thirty-six percent believe their work is seen as very worthwhile, while only one respondent believes his work is seen as not very worthwhile.

This data suggests that Library Staff generally enjoy a satisfactory level of prestige and self-esteem. The only substantial low scores (about 25%) occurred for autonomy, status and participation. In each case, those who scored themselves low were all non-professionals, who might be expected to have lower levels than professionals in this aspect of their employment. In fact, the professionals rated themselves higher than did non-professionals in virtually every aspect examined. As far as the scores for those who work with automation are concerned, they are generally similar to those for the 'manual' group. Two exceptions are the relatively high proportion of the 'automated' group who see themselves as having a high level of autonomy - presumably a factor for superior prestige - and the relatively low proportion of the same group who believe their fellow employees see their (the respondents) work as being very worthwhile. At the same time none of this group scored themselves low in this respect, the majority (81%) opting for the "quite worthwhile" option.

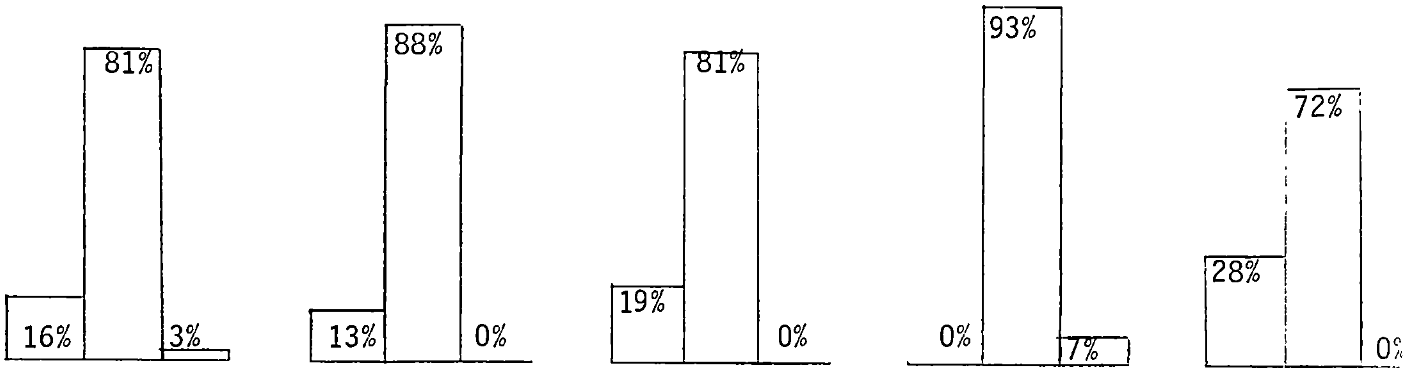
Turning to questions 21-27 which asked employees who work with automated systems and who previously worked with manual systems about the changes (if any) to those same aspects, the overall impression is one of stability (see figure 12).

Figure 12

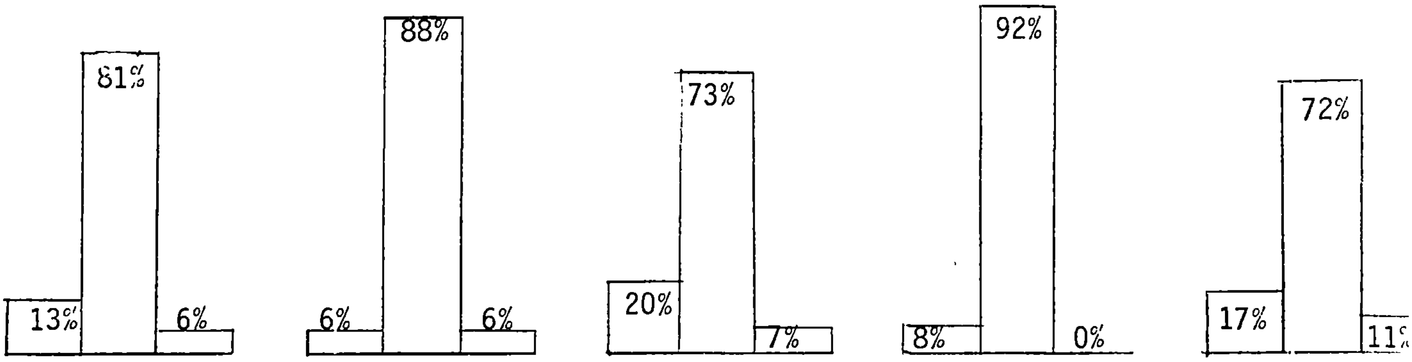
CHANGES IN FACTORS AFFECTING PRESTIGE AND SELF-ESTEEM SINCE THE INTRODUCTION OF AUTOMATED SYSTEMS

ALL RESPONDENTS (32)
PROFESSIONAL (16)
NON PROFESSIONAL (16)
READER SERVICES(14)
TECHNICAL SERVICES (18)
Increased
Same
Decreased

12(a) IMPORTANCE



12(b) AUTONOMY



12(c) PARTICIPATION

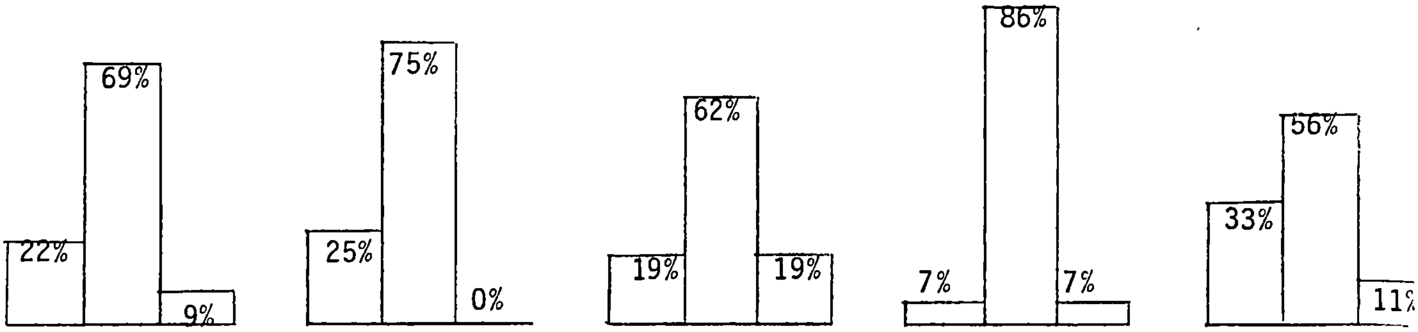
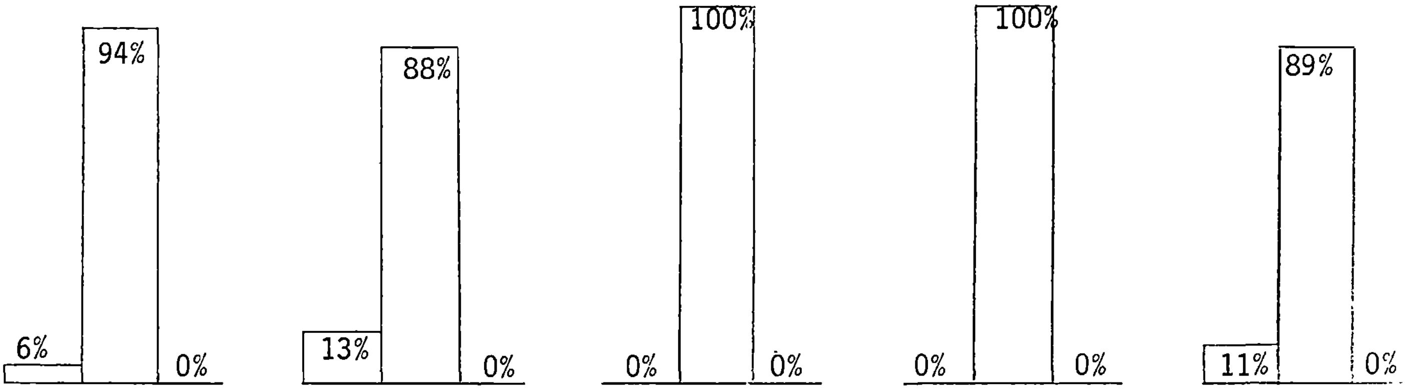
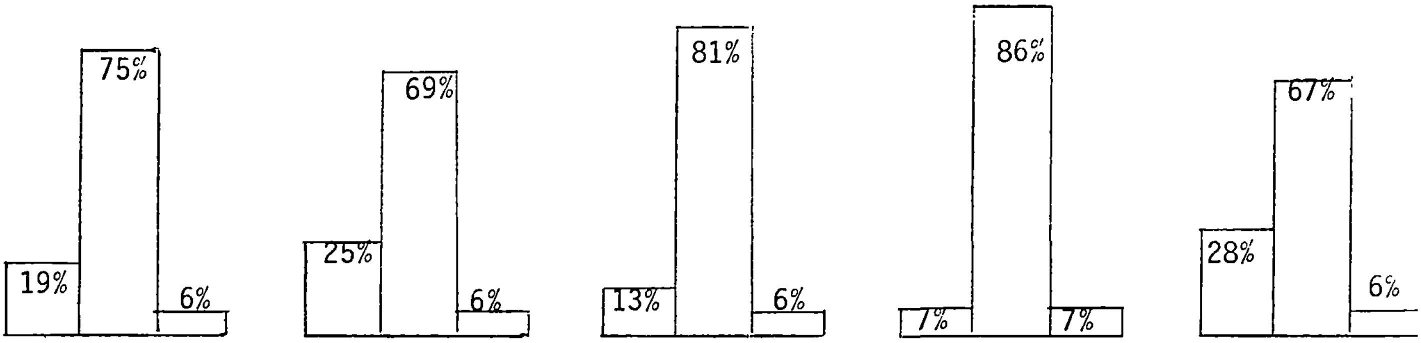


Figure 12
(continued)

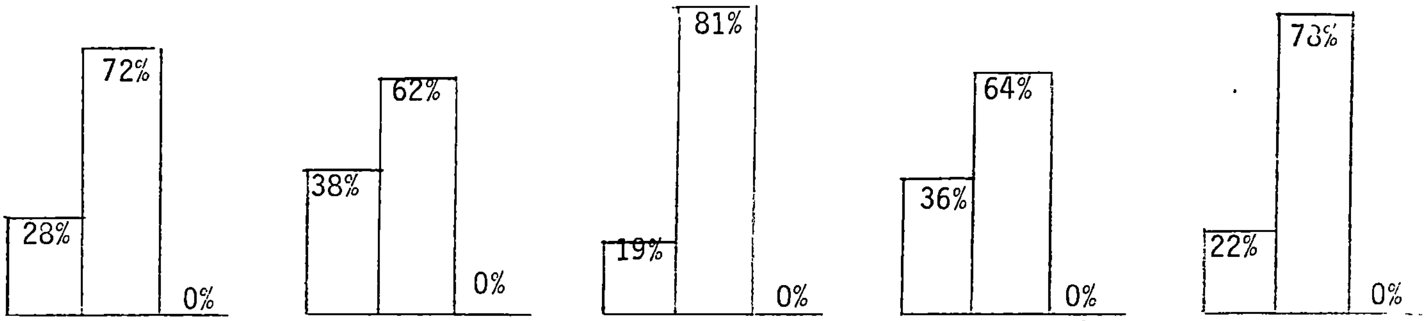
12(d) STATUS



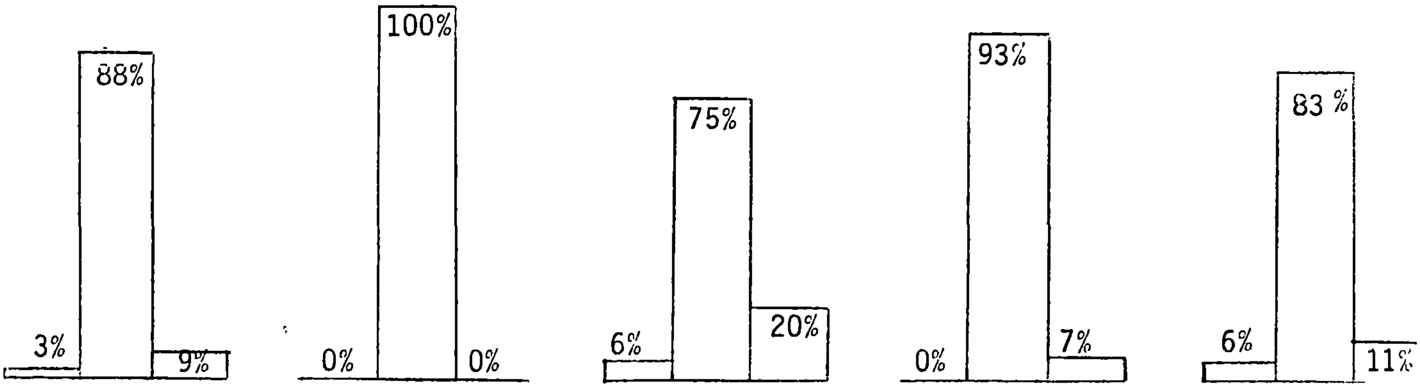
12(e) EASE OF IDENTIFICATION OF WORK



12(f) WORTHWHILE



12(g) WORTHWHILE (AS SEEN BY FELLOW EMPLOYEES)



What little change is reported is almost entirely towards an increase in prestige and self-esteem. The highest indication of change is 28% of respondents who believe their work has become more worthwhile. Twenty-two percent report increased participation, and 19% note that their output is easier to identify. The highest contrary indications are 9% of respondents who report less participation and also 9% who believe their work is not seen as very important by their fellow employees. The patterns for each aspect are remarkably similar, the largest variations being the 38% of professionals who believe their work has become more worthwhile, and the 33% of Technical Services employees who reported that their level of participation has increased. Taken together, the data displayed in figures 11 and 12 indicates that the impact of new technology on the prestige and self-esteem of University Library employees has been minor. In only one of the factors affecting prestige and self-esteem (ease of identification of output - see figure 11) did a higher proportion of employees working with automated systems than employees working with manual systems, indicate a low level. Employees working with automated systems indicated more positive feelings of autonomy, status and participation than did the 'manual' group. This 'automated' group were less positive about their importance, and the worth of their efforts (as seen by themselves, and by their collagues), but a large majority in each of these cases rated themselves 'medium' rather than 'low'. Almost none of the respondents who had changed from manual to automated systems noted any adverse change in any of the factors affecting prestige and self-esteem (figure 12). In every case, the great majority believe there has been no change, while in five of the seven cases a small minority (from 13%-28%) believe there has been an improvement.

Social relationships:

Questions 50-52 were aimed at identifying changes in the social or informal organization. It was felt that those who do not work with automated systems, as well as those who do, might have opinions about changes in this area, thus all respondents were asked to answer these questions. The results are tabulated in figure 13. Clearly, a large proportion of respondents who do not work with automated systems did not wish, or feel qualified to answer these questions, (only 14 (58%) of this group answered 50-52).

The almost overwhelming conclusion to be drawn from the answers to these questions is the stability of this segment of organizational life. In each case, large majorities feel that these aspects have remained about the same since the introduction of automated systems. The largest variation is the 21% who believe the working atmosphere has become less happy, but this result is at least partly counterbalanced by the 10% who believe the working atmosphere has become happier.

The 16% who believe there has been a change in their opportunities for social and personal diversions are evenly divided about whether opportunities have increased or decreased. The result for informal relationships is almost identical. Within the subgroups, it appears that more Technical Services employees than Reader Services employees believe there have been changes. In the case of informal relationships more of this group see an improvement then believe there has been a deterioration. However, the trend is towards a deterioration in opportunities for social and personal diversion. (A point of interest here is that of those who believe

Figure 13

CHANGES IN SOCIAL RELATIONSHIPS WITHIN THE LIBRARY SINCE THE INTRODUCTION OF AUTOMATED SYSTEMS

13(a) OPPORTUNITIES FOR SOCIAL AND PERSONAL DIVERSIONS (N=49)

	DIVISION		QUALIFICATION		WORKING WITH...		ALL RESPONDENTS
	READER SERVICES	TECHNICAL SERVICES	PROFESSIONAL	NON-PROFESSIONAL	AUTOMATED SYSTEMS	MANUAL SYSTEMS	
% BETTER	4	11	10	7	11	0	8
% SAME	96	72	75	90	77	100	84
% WORSE	0	17	15	3	11	0	8
	(25)	(18)	(20)	(29)	(35)	(14)	(49)

13(b) INFORMAL RELATIONSHIPS WITH OTHER EMPLOYEES (N=49)

	DIVISION		QUALIFICATION		WORKING WITH...		ALL RESPONDENTS
	READER SERVICES	TECHNICAL SERVICES	PROFESSIONAL	NON-PROFESSIONAL	AUTOMATED SYSTEMS	MANUAL SYSTEMS	
% BETTER	4	22	5	14	14	0	10
% SAME	96	67	90	79	77	100	84
% WORSE	0	11	3	7	9	0	6
	(25)	(18)	(20)	(29)	(35)	(14)	(49)

13(c) HAPPINESS OF WORKING ATMOSPHERE (N=48)

	DIVISION		QUALIFICATION		WORKING WITH...		ALL RESPONDENTS
	READER SERVICES	TECHNICAL SERVICES	PROFESSIONAL	NON-PROFESSIONAL	AUTOMATED SYSTEMS	MANUAL SYSTEMS	
% BETTER	8	12	10	11	15	0	10
% SAME	92	41	70	68	59	93	69
% WORSE	0	47	20	21	26	7	21
	(25)	(17)	(20)	(28)	(34)	(14)	(48)

opportunities for social and personal diversions have decreased, the majority are professionals, and all are Technical Services employees. This may well be due to the fact that checking the library catalogue no longer involves a trip to the card catalogue - formerly located in the reference area - but can be achieved at a desktop terminal).
A rather large majority (47%) of Technical Services employees believe the working atmosphere has become less happy. Those respondents who believe there have been changes in social relationships come almost entirely from the group working with automated systems.

In general, then, social relationships within the organization do not appear to have changed markedly. For about 10% of employees there have been improvements in this area. On the other hand for a few employees (6-8%) social and personal diversions have become more limited and informal relationships have deteriorated, and for 47% of respondents from the Technical Services Division, the working atmosphere has become less happy. Although we are talking about only 8 employees, this situation ought perhaps to be a matter of concern for the library management.

Deskilling:

In order to gain an impression of any incidence of deskilling as a result of automation in the University Library, respondents were asked whether, since the change to automated systems, they had acquired new skills (question 28) and whether their previous skills had remained useful (question 29).

Of the 32 respondents to these questions, all reported that they have learnt new skills, and 31 of the 32 believe their old skills have remained useful. It seems reasonable to conclude that there is no problem of deskilling as a result of the introduction of automated systems to the University of Tasmania Library.

General attitudes and comments:

Asked whether they would prefer to return to a manual library system, 44 of 47 respondents answered "no". Of the 3 who answered "yes", all were Technical Services employees: 1 professional and 2 non-professionals. Fifteen out of 39 respondents stated that they had been apprehensive about the change to automation, 6 of these (15%) believe their fears have proved to be justified. These six were all from the Technical Services Division.

Once again the indication is that the general attitude to the introduction of automated systems is a positive one, although there is a small group (from Technical Services) with misgivings. Seventeen respondents took the opportunity to write general comments about the impact of automation.

As might be expected, these comments are wide ranging. No particular pattern or consensus is discernible. Three respondents mentioned their enjoyment of a greater capability to provide services; 3 respondents commented on the annoyance caused by computer 'down' times; 2 mention decreased contact between members of the Library's two main divisions. Perhaps the most significant subject of concern is repetition strain injury (R.S.I.). Four respondents expressed anxiety about R.S.I. and two claimed to be suffering from this disease as a direct result of working at computer terminals. R.S.I. is currently a topic of some controversy in Australia, with conflicting medical opinions about whether it is a genuine disease. Whatever the truth of this matter, there is no doubt that sufferers experience pain and disability as a result of repetition strain, and the fact that 2 library employees are suffering in this way is a matter for concern. The proportion of work time spent at computer terminals by library personnel is likely to increase as the system is applied to more library tasks, and this could lead to an increase in R.S.I. problems.

The findings:

It should be reiterated at this point that this is a qualitative study. The case study involves a relatively small population, and the membership of some of the sub-groups is extremely small. The intention of the questionnaire survey was to provide indications of the occurrence of changes in levels of job satisfaction, prestige and self-esteem and social relationships within the organization. As mentioned in the introduction to this chapter, these concepts do not lend themselves to precise measurements. In this survey, respondents had to answer 'yes' or 'no' to questions such as whether the word 'routine' applies to their job. Obviously, the routineness of many jobs varies from day to day. Similarly, a statement of whether the routineness, autonomy or fragmentation of a particular job has increased, remained about the same or decreased, is not to be regarded as very precise information, but simply an indication of a trend, In these circumstances it would be inappropriate to attempt to create an air of precision by calculating degrees of statistical significance or levels of confidence.

What has been achieved is observation of some clear tendencies, such as the widespread opinion amongst organization members that many aspects of the nature of work and most factors affecting prestige, self-esteem and social relationships have not changed noticeably. As well, a minority group which does not conform to the general pattern has been identified.

To return to the proposition with which this chapter began, the levels of job satisfaction, prestige and self-esteem and the social relationships of University Library employees do not appear to have been greatly affected by the introduction of new technology. In each case, the general pattern of response to the questionnaire is one of little change. The most substantial incidences of responses indicating changes were in aspects of the nature of work. In 6 of 13 aspects (simple, varied, interesting, challenging, creative and exciting), more than half the respondents indicated there had been a change. While, there was no unanimity about the nature of these changes, the general trend was positive, in that more respondents indicated an improvement than indicated a deterioration.

Factors affecting prestige and self-esteem in every case were seen by a clear majority to have remained about the same since the introduction of new technology. Once again the trend amongst those who reported a change is one of improvement. A similar pattern is clear in the area of social relationships within the organization, with the exception of happiness of the working atmosphere, which 21% of respondents believe has deteriorated. The overall impression is that the possible losses of satisfaction, self-esteem and comfortable social relationships, disruption and displacements, anxiety and stress alluded to by the writers mentioned at the beginning of this chapter, have not generally occurred in the University of Tasmania Library. It seems clear, too, that deskilling is not a problem. There is, however, an identifiable group which does not conform to this general pattern. Of the 11 individuals who were dissatisfied with 8 or more aspects of the nature of their work, all were non-professionals, 8 worked with automated systems, and 6 were from Technical Services Division. This latter group of 6 also reported a deterioration in most aspects of the nature of their work since the introduction of automated systems, and most of them believed that the social climate of their work had deteriorated.

While the overall direction of the human impacts of new technology on organization members gives little cause for concern, it does appear that this minority group is experiencing the unsettling affects of technological change.

Chapter 7

SUMMARY AND CONCLUSIONS

The overall impression gained from this case study of the impacts of new technology on a particular organization is one of subtle rather than dramatic change. As Montague (1978) suggested of such organizations:

> "While there has been change, it has been evolutionary rather than revolutionary...."

and automation has been just one agent for change in this evolution. Although the organization has retained most of its previous structure, it has not ground to a halt. While the nature of work has changed in many respects, employees have not been overwhelmed by disorientation, deskilling, dissatisfaction or other adverse effects. The informal organization continues to operate as it did before automation, even though a new "technological elite" is observable.

Generally speaking, the major concerns of some of the writers referred to in the literature review (chapter 1) do not appear to have been borne out in the case of the University of Tasmania Library. For example, the Technological Change Committee of the Australian Science and Technology Council (1983) predicts impoverishment of the work experience, leading to low job-satisfaction for most employees, and suggests a need for radical structural change in order to cope with these adverse effects of automation. Hopwood (1983), Miller and Armstrong (1966), Jasinski (1959), Mann and Williams (1970) all voice similar concerns about possibly dysfunctional pressures from organizational structures which have been rendered irrelevant by technological change. These, or similar concerns are reiterated by writers on library automation such as Wassermann (1972), Pflug (1975), Gordon (1977), Montague (1978), and Shaughnessy (1982). Yet the organization under observation has not found it necessary to undergo serious restructuring.

Kaufmann (1971), Staw (1982), and Smith et al (1982) all focus on the problem of resistance to change as a major impediment to the successful introduction of new technology. Yet resistance, subtle or otherwise, does not appear to have been a major problem in the case under observation. Somce incidence of apprehension, or fears, at the time of introduction of new systems has been observed (chapter 6) but this has not led to widespread resistance. However, those employees who reported that their initial fears had proved to be justified (six members of the Technical Services Division, who also reported considerable dissatisfaction with the changed nature of their work, and general unhappiness) may well have been demonstrating a form of subtle resistance.

Champion (1967), Presthus (1970), Gross and Smith (1976) and Kast and Rosenzweig (1979) also point to the possible human problems of technological change, including deskilling, displacement, loss of identity with output, depersonalization, and other dysfunctional phenomena. Amongst writers on the human impacts of automation on libraries, Martell (1983) suggests that job-satisfaction is likely to suffer as tasks become rigidified and work becomes increasingly routine; Fine (1982) and Malinconico (1983 b) believe inter-personal relationships within the organization will suffer; McClure and Samuels (1982) suggest that members may lose dignity and self-respect. However, this case study reveals little evidence of any widespread occurrence of these suggested by-products of library automation.

There has been no drastic restructuring of the organization to counteract possible organizational and human impacts of new technology, yet the organization continues to function without too much apparent discomfort. Human trauma does not appear to be widespread, although a small minority does seem to be suffering from at least some of the frustrations and frictions predicted by many of the writers mentioned above.

How is it that this organization which has taken the risk of wholesale adoption of new technology seems to be able to continue operating with its traditional structure, largely free of the trauma and dysfunction so widely predicted for organizations which do not undergo radical restructuring to cope with the pressures of new technology. Why is there so little evidence of the adverse human impacts of automation? Partial answers may appear as we review the impacts of new technology as observed in the case study. In chapter 1 it was suggested that the particular circumstances of the organization are likely to affect the impacts of new technology. For example, factors such as the nature and history of the organization, the environment within which it operates, management styles, the proportion of professional staff, and pre-existing levels of job satisfaction will all bear upon the degree of disruption experienced when a new system is introduced. It was also suggested that impacts could vary throughout different levels and sub-units of the organization. The examinations of the routineness of work (chapter 4) and the human impacts of automation (chapter 6) in particular confirm that such variations do occur.

Thus we turn to a review of the case study. Chapters 2 and 3 provided a background of the nature, history, technology and environment of the organization. Chapter 4 pursued in more detail the nature of the technology employed by the organization and attempted to assess the impact of automation upon the routineness of that technology. Finally, chapter 5 and 6 looked at the observed impacts, organizational and human, of the introduction of new technology. We shall begin here by reviewing the main findings of chapters 4, 5 and 6. Then we shall return to chapters 2 and 3, to see whether they can provide us with clues which might help to explain what are, perhaps, the unexpectedly minor organizational and human impacts of the University of Tasmania Library's adoption of major new automated systems.

Organizational impacts (i) Routineness:

In chapter 4 we looked at the work of several writers in an attempt to predict the likely impacts of new technology on the organization in question. While most writers agree that new technology is an important agent for change, there is little consensus on just what that change might be. Indeed there are many different ways of classifying organizations and the technologies they employ, and predictions of impacts would depend upon the system of classification used.

Perrow's scale of routineness was chosen as perhaps the easiest system in which to place the university library. Allowing for the inevitable variations between sub-units, we concluded that the library employs a largely routine technology with a relatively low incidence of exceptions. Where exceptions and problems do occur, there are prescribed rules, procedures and techniques available for their solution. The library, then, can be placed towards the routine end of Perrow's scale.

Our third proposition:

> The level of routineness of the University Library's technology will be increased by automated systems. Standardization and formalization will increase, possibly with some loss of flexibility

was partially supported. To varying extents in different sub-units the work flow has been streamlined, tedious clerical tasks have been reduced or eliminated, exceptions have become fewer and/or easier to handle. In addition to this tendency towards increased routineness, standardization and formalization have also increased. The extent of these trends is only slight, as many library tasks have always required a fairly high degree of standardization and formalization. Bibliographic descriptions, and catalogues, must adhere closely to rules, authority files, standard forms of entry, and so on, if they are to be consistent and, therefore, reliable. Borrowing records have to clearly identify the borrower, and the precise item borrowed, or chaos will ensue. Similar requirements for consistency in describing bibliographic items apply to tasks like ordering new books and recording receipt of issues of periodicals. A slight tendency towards increased standardization and formalization is unlikely to cause great consternation in people carrying out tasks of these kinds.

On the other hand, loss of flexibility has not generally accompanied the trend towards increased routineness, standarization and formalization. On the contrary, automated systems have provided new opportunities for creativity, and new capabilities for enhanced flexibility, especially in areas such as accessing machine-readable bibliographic files. On-line access to remote data-bases as well as the existence of much more capable and sophisticated local catalogues are important counterbalances to constraints such as the necessity to observe standard procedures when operating automated systems.

Thus the picture is one of an organization whose technology is already relatively routine, moving slightly towards increased routineness as a consequence of introducing automated systems. Standardization and formalization, also already quite high, also tend towards an increase. However these trends are not accompanied by a loss of flexibility except in some specific areas of the work of sub-units, such as the loss of a permanent order record in the Monograph Acquisitions Section, which occasionally makes tracing a particular order difficult; and the inability of the serials module to anticipate and accommodate unusual variations in the frequency of publication of periodical issues.

Despite the fact that only 20% of respondents to the questionnaire prefer routineness in their work, (figure 6) the tendency towards increased routineness does not appear to have had a particular adverse effect on job satisfaction. In fact 31% of respondents who have changed from manual to automated systems, reported that routineness has decreased, 50% believe it has remained about the same, and only 19% believe it has increased (figure 10(a)). There seems to be some discrepancy between the findings of chapter 4, and employee perceptions as reported in chapter 6. Of course other factors may have intervened. For instance, the employee who has changed from a manual to an automated system is not necessarily still performing the same function, nor even still working in the same section. It is quite possible for an individual's work to decrease in routineness, while the technology of the organization at large becomes generally more routine. No doubt, the job satisfaction of certain members of the organization has improved because their particular jobs happen to be less routine than before.

We can explain the general lack of adverse reaction to an increase in routineness by noting that the increase has been slight, in an organization where a degree of routineness is the norm. Not only do employees accept an increase in routineness because it is expected in their experience of library work, but also they are likely to be positively affected by increased capabilities and flexibility; qualities which tend to counterbalance the negative impact of increased routineness. Once again, we should remember that for the small minority group who are generally dissatisfied, and who have not enjoyed the change to automated systems, increased routineness is one of several factors which increase their dissatisfaction. In general, however, the degree of the increases in routineness, standardization and formalization, especially when offset by improvements in some aspects of flexibility, have not been sufficient to create adverse human impacts across the organization.

It would be tempting to conclude that the organizational and human impacts of automation will be less on an organization employing a routine technology, but the findings of a single case study cannot be generalized. Perhaps it is reasonable to say that where the change in level of routineness is not great, there is less danger of organizational human disruption.

Organizational impacts (ii) Formal and informal structures:

Chapter 5 was concerned with the impact of automation on various structural dimensions:

> Adoption of new technology by the University Library is likely to affect various aspects of its structure, including departmentation, lines of authority, relative size of the administrative staff component, specialization and the informal organization.

It was found that formal structural changes were minimal, but that informal changes had occurred. Certainly, there is little evidence of the more open, organic, adaptive and flexible type of structure suggested in the literature.

In the case of departmentation, a new department - the Computer Systems Office - appeared in response to the need for systems expertise when the library first ventured into automation. Otherwise, formal departmentation has not been affected by the new systems.

However, a series of committees and working parties emerged, cutting across departmental lines, to enable specification and installation of the new systems to proceed.

Formal lines of authority have not changed since the introduction of automated systems, but a new informal power centre has been observed, wherein enthusiastic and expert middle managers make systems-related decisions of the utmost importance for the organization as a whole.

There has been a slight increase in the relative size of the administrative staff component, partly because of the elimination of some lower level tasks, and also through the creation of a Computer Systems Office.
A new element of task sharing and a reduction of specialization of individual jobs is evident in some sub-units, but this trend is minimal considering the potential of the new system for intergration of work. At the same time, a new class of specialist - the on-line search expert - has emerged.

A new social factor - aptitude at the computer terminal - has emerged in the informal organization, and it is possible that this will become a basis for social cliques. Nevertheless, cliques based on departmentation are still significant in the social organization. In addition, a new technological elite is discernible within the informal organization.

The conclusion we reached in chapter 5 was that each structural dimension mentioned in our fourth proposition has been affected by the introduction of new technology, but not dramatically affected. The fact that the organization has to work through temporary ad hoc internal relations mechanisms may be an indication of a irrelevant organizational structure.
On the other hand it is suggested that retention of the traditional structure may be a management strategy designed to avoid the upset which accompanies a revolutionary restructuring. This strategy (if, indeed it is such) of tolerating the operation of a beneficial informal organization, while maintaining a traditional formal structure which supports existing goals and status of organization members appears to be functioning successfully.
However, it could also lead to tensions, stress, and anomalies such as lack of formal recognition of the real contributions of certain members of the organization. While the potentially dysfunctional impact of radical

structural change is being avoided, there is always the danger that an outdated formal structure may also eventually be dysfunctional.
In discussing management strategies it is important to recognize the high level of participation which has been achieved through membership of the various committees and working parties which have emerged, since planning for the adoption of the URICA system began. These mechanisms arose through the enthusiasm and impetus of some key middle management personnel - the informal power centre. The degree of participation experienced by organization members working in these informal committees has surely increased their willingness to accept the changes inherent in adopting new systems, and contributed to the generally low level of adverse reactions and disruption as the systems have been introduced.

Human impacts:

Chapter 6 dealt with a survey of organization members, which sought indications of trends which might support our fifth proposition:

> Introduction of new technology will have impacts on levels of job satisfaction, prestige and self-esteem, and the social relationships of University Library employees.

Job satisfaction does not appear to have been affected greatly by the new technology. For 7 of 13 aspects of the nature of work examined, a majority of respondents believed there had been little change, and in no aspect of the nature of work was there any suggestion that the overall satisfaction level had decreased since the introduction of automation. Where change was reported, respondents were often divided about whether there had been an improvement or a deterioration. Generally, there were more positive responses than negative responses. In particular, professionals who reported changes in their work were happier with the changes than were non-professionals who reported changes. A small group of respondents, mostly non-professionals from the Technical Services Division, have experienced a decline in job satisfaction.

Prestige and self-esteem appear to have been affected very little by the new systems. Almost none of the respondents who have changed from manual to automated systems noted any adverse change in any of the factors affecting prestige and self-esteem. The great majority reported that their perceptions of the importance of their work, the worth whileness of their efforts, their levels of autonomy, status and degree of participation in decisions affecting their work, and the ease with which they can identify their output, have all remained about the same since the introduction of automated systems. Of the minority who believe there have been changes in these factors, most report a change for the better. Even the small group who consistently reported dissatisfaction with aspects of their work generally reported no change in their level of prestige and self-esteem.

Social relationships within the organization were also seen as having remained quite stable. Substantial majorities believe there have been no obvious changes in opportunities for social and personal diversions; in informal relationships with other employees; or in the happiness of the working atmosphere. Some Technical Services personnel report that opportunities for social and personal diversions have decreased, and 47% of Technical Services personnel believe the working atmosphere is not as happy as it was (a feeling shared by no Reader Services employees!) It must be remembered that the circulation module of the automated system had not been installed at the time of the survey, so that Reader Services personnel have had rather more limited experience of working with automation. We cannot say what effect the circulation module might have on the social relationships of Reader Services personnel. It may be that the new social factor reported in chapter 5 - aptitude at the computer terminal - is a contributor to the deterioration of social relationships for some Technical Services personnel. The possibility is that cliques form as some employees feel uncomfortable at the terminal, while others, who are more proficient, feel superior.

It is notable that the minority for whom social relationships have deteriorated, are to a large extent the same individuals (mostly non-professionals in Technical Services) who reported a deterioration in many aspects of the nature of their work.

It seems clear from the survey that employees do not see the new systems as having created any deskilling problems. However, from the general comments, the important new problem of repetition strain injury does emerge- even though it presently affects only a small number of employees.

The main conclusion from the survey is that the impacts of new technology on job-satisfaction, prestige and self-esteem and the social relationships of employees generally have been slight, with the exception of a small group, mainly in Technical Services, which has experienced adverse effects in several areas of job-satisfaction and social relationships.

The overall impression from chapters 4, 5, and 6, then, is one of relatively minor impacts. Routineness has increased slightly , the traditional structure has been retained, with the addition of a new systems department. Ad hoc internal relations mechanisms, a new informal power centre, and a technological elite within the informal organization have emerged. Human impacts have been slight, with a slight tendency towards improvements in most of the areas examined, though for a small minority group automation has brought both work and social problems. Now we turn to chapters 2 and 3, which provided a background for the case study, to see what light they might throw upon the nature of the impacts observed.

The nature, history and technology of the University of Tasmania Library: Chapter 2 looked at the nature and history of the organization, and noted that the University of Tasmania Library had finally achieved a period of substantial and consistent growth and support (from the late 1950's to the late 1970's) after a long period of impoverishment and inadequacy. However, by the end of the 1970's a new era of financial stringency, together with a bewildering array of technological developments was creating uncertainty for the library. Our first proposition suggested that to protect its hard-won position and avoid a slide back into the unfortunate circumstances of earlier days:

> The University Library will attempt to reinforce its niche within the parent organization through adoption of new technology.

Such a strategy would improve the capabilities, prestige and status of the organization. Coincidentaly, at the time the parent organization was expanding its boundariesto incorporate a rival organization - The Tasmanian College of Advanced Education.

By coalescing with the only other tertiary institution in the vicinity, the University was eliminating competition, increasing its potential 'market' and therefore reducing uncertainty and turbulence in its environment. This had the effect, for the library, of a sudden increase in resources (both material and personnel resources) as well as an increase in the size of the clientele.
The increased size of the library and the problems involved in merging the collections of two libraries were both bargaining points in persuading the parent organization to provide the necessary financial resources to enable purchase of computer hardware and software. Another important effect was the acquisition of a complement of employees from the Tasmanian College of Advanced Education who had just undergone a worrying period of uncertainty and disruption - not knowing whether or not they would lose their employment as a result of amalgamation. Thus there existed within the library a group of staff who were not only expecting change as they moved into the new institution, but were overwhelmingly glad to have retained their employment. Of course, it might be expected that some of these people might be disgruntled at the upheaval to their former comfortable existence. However, they had experienced some four years of uncertainty about their future before it was agreed that they should transfer to the University Library. In fact, for sometime their existence had been anything but comfortable. From my observations, the most common attitude of these employees was one of relief and thankfulness.

These factors were conducive to the introduction of a new work system. In addition, some of the existing University Library personnel had been introduced to new technology already, through the purchase of machine readable bibliographic data (since 1973), and the monograph acquisitions system which had been introduced in 1976. Importantly, too, the existence of an entrepreneurial Divisional Librarian, Technical Services, as well as a Systems Officer, provided an enthusiasm and inspiration for the adoption of new technology.

Chapter 1 concluded that the proposition that the library will attempt to reinforce its niche within the parent organization by adopting new technology was supported, insofar as the initiative to install the URICA system was concerned. It was also found that another aspect of new technology - the adoption of new formats of library material - was fairly consistently avoided, despite the inheritance of collections of such materials from the Tasmanian College of Advanced Education. The enthusiasm of former TCAE staff for these new formats was not successfully transferred to the University Library administration - possibly because the prospect of amalgamating even the collection of traditional materials, and that of taking on a large number of new employees, were daunting enough in themselves, without the additional problem of having to come to terms with unfamiliar materials. Unfortunately, this is likely to lead to the emergence of new competitors in the library's environment, thus creating a new element of uncertainty.

However, the adaption of the URICA system was a bold step by the University Library - particularly as the system was not fully developed at the time. While this enabled participation in the shaping of the final product, it also involved an element of risk. The implication was a considerable commitment of staff time and effort towards the development of a satisfactory system, and an element of uncertainty about the quality of the final product. The benefit, of course, is that those library employees involved in this development gain considerable expertise in the various modules of the system - an expertise which is invaluable when it comes to system operation.

Thus we have discerned a number of factors which are likely to assist the acceptance of the new system in this particular organization. These include a determination that the 'bad old days' not be revisited; the problem of processing a sudden influx of library materials from the TCAE; the existence of a new group of employees who may have been unusually tolerant of change; and the inspiration and enthusiasm of a group of staff with new expertise in the development of the new system. Add to these, the fact that this is a service-oriented organization with a large proportion of professional staff.

One theme that re-occurred continually in interviews with library employees was enthusiasm for the enhanced capabilities of the new systems, enabling an improved service to be offered to the library's users. This recognition helps to counterbalance any adverse impacts automation might have. Taking all these factors together, it becomes less surprising that pessimistic predictions of the human impacts of automation are not borne out in this case.

The task environment of the University Library:
An examination of the domain within which university libraries in Australia have to operate was the main concern of chapter 3.

The proposition

> "Turbulence and uncertainty are increasing in the University Library's task environment, and much of this turbulence and uncertainty is due to technological factors"

was generally supported, although it was argued that turbulence and uncertainty have not yet reached the "turbulent field" extreme in Emery and Trist's suggested scale. The ground is not yet in motion, the book is not dead, and the university library, for the forseeable future appears to have a continuing role as mediator between the scholar and the information he requires. Nevertheless, library administrators will need to watch the horizon with some vigilance if they are to anticipate changing needs, circumstances and technologies, and to plan their strategies accordingly.

The fact that the university library is a sub-system of the university, was noted. The parent institution is a dominating influence in the task environment. The university is a relatively close-knit organization, and there is considerable cross-membership of the main groups within the task environment - clients, suppliers, competitors and regulatory bodies. Some library employees have boundary spanning roles, and may be in closer contact with academic staff and students than with the library hierachy. The environment for the library is one where scholarship and individualism are valued more highly than output figures, where security of tenure is strong, where the emphasis is on flexibility and freedom, rather than constraint and regimentation. While these qualities of the working environment are less accessible to library employees than to academic staff, they do, nevertheless, affect the atmosphere of the entire institution.

As noted in chapter 6, Blauner (1969) expects job satisfaction to be high when employees have a high degree of control over their work environment and enjoy freedom and flexibility. While library employees generally are more constrained than academics, (and some library employees are more constrained than others) the influence of the academic environment is still strong. Thus we might expect the university library to be an organization in which the pre-existing level of job satisfaction is high. This is borne out, for the University of Tasmania Library, by the responses to the job satisfaction questions in the questionnaire used in this case study. Pre-existing job satisfaction is one of the factors likely to influence the impact of new technology on organization members. It is problematical just how this factor might operate. It may be that satisfied workers are more tolerant of changes imposed by administrators, or it may be that new technology presents such a threat to their happy status quo that they are more likely than less satisfied workers to resent change. I believe the former alternative applies in this case. To support this contention, figure 11 (chapter 6) shows that 74% of respondents to the questionnaire believe their level of participation to be either high or medium, whereas only 26% believed it to be low. Figure 12 (d) indicates that 33% of respondents feel their level of participation has increased since the introduction of automated systems, 56% believe it has remained about the same, and only 11% believe it has decreased. Very low percentages reported deterioration of any of the factors affecting self-esteem and prestige. Had there been a Luddite attitude, or over-anxiety to protect old ways of working, these results surely would have been different.

Thus we can surmise that the pre-existing level of satisfaction with such aspects of work as participation in decisions affecting one's work, was a positive factor towards buffering the possible adverse impacts of introducing automated systems in the University of Tasmania Library.

The fact that a large proportion (36%) of the library staff is professionally qualified has already been noted. Members of the library profession are well aware of the environmental challenges and changes facing libraries as a result of advancing technology and changing economic circumstances. This awareness is likely to be communicated to other library employees, at least some of whom are partially qualified and/or aspirants to the profession. This is another factor likely to have a positive effect on employee acceptance of change, as the library administration attempts to reduce uncertainty and increase capabilities through such strategies as adopting new technology.

The conclusion to be drawn is that an organization situated in an academic environment may be at least partially shielded from the adverse human impacts of the introduction of new technology because of the effects of the task environment on the attitudes and perceptions of its members. The fact that the library is a professional, service-oriented organization, and that many of its members have boundary-spanning roles, tend to reinforce this situation.

Conclusion:

This review has revealed several factors which may have contributed to the relative softness of the impact of the introduction of new technology as observed in the University of Tasmania Library in this case study. These include aspects of management strategy, aspects of the history, nature and technology of the organization, and environmental factors.

The Library's management has avoided the potentially disruptive impact of radical or revolutionary restructuring, despite the opportunity the new, integrated library system provides for adopting a more flexible organizational structure. Preservation of the status quo has the advantage of protecting the traditional positions, status and personal goals of organization members, and thereby diminishing some of the possible adverse human impacts of change. The danger is that the structure may become increasingly irrelevant to the library's operations - a dysfunctional anachronism. However, although some members of the organization find the structure unduly restrictive, they are able to turn to the informal organization in order to facilitate necessary activities, and the organization continues to function.

A feature of the informal organization has been the emergence of ad hoc internal relations mechanisms, some of which have been formalized. The existence of these groups indicates a recognition of the need for quite extensive employee participation in important management decisions. As noted, much of the impetus for this broadened participation, co-operation and co-ordination has come from a newly evolved informal power centre within the organization.

The history and nature of the organization have provided a readiness to tolerate automation and the changes it brings. In a professional organization, especially a service-oriented one, the increased flexibility and opportunities for creative and improved library services facilitated by the new automated system are factors which are viewed positively by organization members. Awareness of the recently achieved and hard-won status and support for the library within the University, and an anxiety not to allow this position to be lost, is also a factor likely to facilitate the acceptance of technological change within the organization. A reinforcing factor was the existence within the organization of a group, happy to have been transferred from an amalgomated institution, and expecting change in their work sisutation. In addition, at least some employees had already been introduced to automation through the library's earlier ventures into the acquisition of machine readable records, and a monographs acquisition system.

Because of the impetus and enthusiasm of an entrepreneurial Divisional Librarian and the Systems Officer, a number of organization members were involved in the final development of modules of the system, as well as the planning for its installation, and the involvement and expertise of these people was a positive factor in the acceptance of automation in the library.

The fact that the University Library can be placed towards the routine end of a continuum of routineness of technology employed means that the slight increase in routineness occasioned by automated systems does not constitute a dramatic impact. Routineness is part of the experience of employees in this organization. It is expected, and therefore tolerated.

Also, the reduction or elimination of many tedious clerical tasks is a benefit of automation welcomed by employees.

The pre-existing level of job satisfaction appears to have been a positive influence for the acceptance of technological change. The generally high level of satisfaction probably can be attributed partly to the professional nature of the organization, and also to the pleasantness of its environment. The working atmosphere in the University is not one of regimentation and constraint, but one of freedom, discretion and individuality. While this applies more to academics than to library employees, the working atmosphere for the entire institution is nevertheless characterized more by flexibility than by regimentation. It is contended that people in this kind of working environment are likely to tolerate a change perceived as beneficial for the organization.

The conclusion is that historical, typological, environmental and management factors have combined, to ease the progress of the University of Tasmania Library through a major programme of automation, with relatively minor organizational and human impacts. Of course, this is not the end of the story. We have been looking at the impacts of a recent event, and it may be that as the years pass it will become apparent that automation has been responsible for more profound changes than those we have observed in 1984/5. There has been no revolution, but the impacts we have seen may be part of gradual but continuing, long-term change.

Appendix 1

Extract from: Standard Description of Unicom URICA Library System.
Compiled by N. H. Wolmarans and J. M. Cormack. Randburg:
Unicom Ltd., 1980.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION TO URICA

URICA is a complete self-contained system consisting of hardware and software to cater for all aspects of Library operation. URICA is implemented on the REALITY mini-computer which has unique data base software particularly suitable for handling variable length bibliographic information.

There are great variations between the requirements of different libraries, but the introduction of the SAMARC format for the interchange of bibliographic information provides a common framework for all.

The URICA system has therefore been designed to handle bibliographic information in terms of the data elements defined by SAMARC. At the same time, as a major proportion of bibliographic works are imported, the system is designed to accept input of bibliographic information in the UKMARC format as well.

The examples in this report are taken from actual enquiries made on the UNICOM URICA development system utilising 48000 bibliographic records kindly donated by the University of the Witwatersrand. The bibliographic information was coded in the Wits sub-set of the UKMARC format. The information has been partialy reformatted to SAMARC, pending finalisation of the SAMARC specification The various data files and indexes take up less than 20 megabytes of disc capacity.

On the basis of the development system file statistics, it is projected that 100 megabytes of disc capacity will be required per 250000 bibliographic entries. This is only an approximate guide as the average storage requirements per bibliographic record will depend on the particular sub-set of SAMARC implemented by each library and the number of authority files required.

1.2 URICA SYSTEM CONCEPTS

URICA is an integrated data base system which allows many different users to work on the system at the same time. Each department can have its own terminals and printers and work independantly. All information in the system is stored so that it is immediately accessible from ANY terminal connected to the system. However, for security purposes, the user can restrict who is allowed to access or update any particular element of information.

The system is designed to be used by people who have no computer experience. All system procedures are initiated by plain language instructions at a terminal, frequently a one word command. Where a number of options are available, such as for information retrieval, the system will display a MENU of these options. When the system requires additional information, the user will be prompted for this.

The files are held on disc storage devices which provide immediate access to large amounts of information. All information is stored in variable length format to provide optimum utilisation of disc capacity. Unlimited off-line storage is provided on industry compatible magnetic tapes. Information may be exchanged with other computer systems, either on magnetic tape, or by use of telecommunications. Exchange of SAMARC coded magnetic tapes is a standard facility of URICA and is included in the software cost.

Capture of data is carried out through interactive video or printing terminals in conversational mode. A generalised data entry and update facility is provided which may be used to enter and validate information to any file without the need to write a program. This data entry facility and the enquiry facilities are controlled by the file dictionary. Where the data entered has to be checked against authority files, specialised programs are provided.

Enquiries are entered in plain language, either ENGLISH or AFRIKAANS, and reports are formatted by the system to fit on the screen or printer. The words used for enquiries are defined in dictionaries and may be varied to suit the terminology of the library.

The URICA system is designed as far as possible to be bi-lingual so that enquiries can be made in ENGLISH, AFRIKAANS or mixtures of the two. Other languages may be incorporated if required by entering the appropriate word equivalents in the dictionaries.

1.3 URICA SYSTEM MODULES

The system is described in terms of specific Modules which operate together as a completely integrated system with a common data base.

The five primary modules which make up URICA are:-

1. Information Retrieval
2. Order Processing
3. Administration
4. Cataloguing
5. Circulation Control

Information retrieval is treated as a separate module for convenience of documentation but is common to all the other modules with slight variations.

The first four modules may be implemented on a minimum REALITY configuration of 32Kbyte Central Processing Unit, 10Megabyte disc, matrix printer and video terminal. The circulation module requires a UNICOM 1600 data collection sub-system for real-time recording of loan transactions. The hardware may be expanded modularly to the full hardware configuration without changes to the software.

The following facilities of URICA are treated as separate modules although they are to a large degree extensions of the five primary modules described in this report.

6. Periodicals
7. Interlibrary Loans
8. Word Processing and Mailing
9. Remote Library Circulation Control
10. Sound recordings and Printed music
11. Projected Media
12. Cartographic Material

The URICA Library system was developed in South Africa by UNICOM for the specific requirements of the South African Library community. The UNICOM 1600 data collection system which provides for the on-line real-time circulation control facilities of URICA was designed and developed in South Africa and is manufactured locally.

2 The Data Base

The Data Base may consist of separate DATA BANKs for discrete applications. A Data Bank in this context is a set of files, indexes and programs relating to a specific application. Each Data Bank may have separate access and/or update locks at different levels.

Data Banks are held in separate ACCOUNTs within the Data Base. Each account is allocated specific access and update locks. Each user of the system may have a unique PASSWORD to gain access to the system and can be allocated specific access and update privileges. For example, certain users may access a Data Bank for enquiry purposes but not be allowed to alter any data.

1.2 On-line Storage Capacity

The Data Base is stored on magnetic disc for direct access. Data is stored as variable length character strings to provide efficient storage. The minimum on-line capacity is 10 million characters and this may be expanded modularly to 514 million characters.

1.3 Off-line Storage Capacity

Unlimited off-line storage is provided by industry compatible magnetic tapes. Files may be loaded to disc from magnetic tape and updated files written back to tape when no longer required on-line.

Tape files may be searched using an ENGLISH/AFRIKAANS enquiry. This is especially useful for archival information which is searched and accessed infrequently. It is also useful for mailing lists where names and addresses are to be selected and printed on self-adhesive labels.

2.1 URICA MAIN FILES

The URICA library system has one MAIN bibliographic file which has a unique entry for each discrete bibliographic work as defined by SAMARC. Each bibliographic entry has a unique record number assigned by the system at the cataloguing stage.

Each bibliographic entry contains the accession numbers of the library holdings to provide links to the LOAN circulation control file. Bibliographic enquiries may therefore access information on the actual availability of individual copies for loan.

The LOAN file contains an entry for each individual copy of a work identified by the accession number and it is in this file that issues, renewals, and returns are recorded. Each LOAN file entry contains a bibliographic record number to provide a link back to the bibliographic entry in the MAIN file. An enquiry on an individual copy may therefore access the bibliographic entry in the main file.

Each record in every file of the URICA data base is stored so that it may be retrieved directly on the record number or code. This method of file organisation is called 'random access' and ensures that the retrieval of a record takes only seconds whether the file contains a thousand items or over a million.

Where a record, such as a LOAN file entry, contains the key to another file, eg. The main file record number, the system can derive by translation all the elements in the other file. As far as the user is concerned, it is just as if the full bibliographic information was recorded against each individual copy.

For retrieval purposes, it is possible for the system to search through the main file, or any other file, for particular elements of information. In this sense, it is possible to use any element of bibliographic information as a search point. In practice there are specific elements of bibliographic information which are of particular interest for retrieval. URICA provides facilities for the generation and maintenance of Authority files for these elements which also act as indexes to the MAIN file.

Appendix 2

HUMAN IMPACTS OF AUTOMATION IN A UNIVERSITY LIBRARY

Researcher: David Waters, School of Librarianship (ext. 2212)

Note: This questionnaire is part of a case study on the impacts of new technology on university library administration, which is being carried out at the University of Tasmania Library as a higher degree research project.
All information collected will be treated as strictly confidential and will be used purely for research purposes. There is no intention to test or evaluate individual staff members in any way.
Naturally, there is no compulsion to answer all or any of the questions. However, it would be most helpful if you could attempt to answer all relevant questions. Please contact me if you need any assistance, or clarification of the questions.
Thank you for your co-operation.
David Waters.

1. State your position in the library (e.g. Library Officer 1).

2. In which section of the University Library do you work?

3. Year of appointment to the University Library?

4. Year of appointment to present position.

5. Previous position(s) held at the University Library:

POSITION	YEARS IN THAT POSITION

6. Does your present position involve working with automated systems?

(Please circle) YES/NO

If YES, please answer question 7

If NO, please go to question 30

7. Have you previously worked with manual systems in the University Library?

YES/NO

If YES, please answer questions 8-57

If NO, please go to question 30

Questions 8-27: Please tick the most appropriate alternative in each case.

Since the change to automated systems my work has:

8. become more routine... remained about the same... become less routine...

9. become more repetitive... remained about the same... become less repetitive

10. become more regimented... remained about the same... become less regimented...

11. become more closely supervised... remained about the same... become less closely supervised...

12. become simpler... remained about the same... become less simple...

13. become more varied... remained about the same... become less varied...

14. become more interesting... remained about the same... become less interesting...

15. become more fragmented... remained about the same... become less fragmented...

16. become more challenging... remained about the same... become less challenging...

17. become more creative... remained about the same... become less creative...

18. become more independent... remained about the same... become less independent...

19. become more exciting... remained about the same... become less exciting...

20. become more hectic... remained about the same...
become less hectic...

Since the change to automated systems my job has:

21. become more essential... remained about the same...
become less essential...

22. become more autonomous... remained about the same...
become less autonomous...

23. Since the change to automated systems the status of my job is:

higher... about the same... lower...

24. Since the change to automated systems, the degree of participation I have in decisions affecting my work has:

increased... remained about the same...
decreased...

25. Since the change to automated systems, identifying the work I have produced has:

become easier... remained about the same...
become less easy...

26. Since the change to automated systems, I feel my efforts have:

become more worthwhile... remained about the same...
become less worthwhile...

27. Since the change to automated systems, I believe my fellow employees value my work:

more... about the same... less...

Questions 28-29: Please circle YES or NO as appropriate.

28. Since the change to automated systems, I have acquired new skills.

YES/NO

29. Since the change to automated systems, my previous skills have remained useful.

YES/NO

Questions 30-42:

Column 1 - Please try to imagine the job you would most like to have - your ideal, or "best possible job". This need not necessarily be a University Library job, but any job you feel would ideally suit your abilities, temperament and preferences. Then indicate, by writing YES or NO in column 1, against each word in the following list, whether you feel that word would apply to your "best possible job".

In column 2, please indicate, by writing YES or NO against each word in the list, whether that word applies to your present job.

In column 3, please indicate by writing YES or NO against each word, whether that word would apply to your "worst possible job". (That is, the job you would least like to have. Once again, this need not be a University Library job, but a job you feel would be most unsuited to your abilities, preferences and temperament - a job you would really hate!)

	COLUMN 1 ("best possible job")	COLUMN 2 (present job)	COLUMN 3 ("worst possible job")
30. Routine			
31. Repetitive			
32. Regimented			
33. Closely supervised			
34. Simple			
35. Varied			
36. Interesting			
37. Fragmented			
38. Challenging			
39. Creative			
40. Independent			
41. Exciting			
42. Hectic			

Questions 43-52: Please tick the most appropriate alternative in each case.

43. My work in the University Library is:

essential... quite important... not very important...

44. The level of autonomy of my job is:

high... medium... low...

45. The status of my job is:

high... medium... low...

46. The degree of participation I have in decisions affecting my work is:

high... medium... low...

47. Identifying the work I have produced is:

easy... not very easy... difficult...

48. I feel my efforts are:

very worthwhile... quite worthwhile... not very worthwhile...

49. I believe my fellow employees see my work as being:

very worthwhile... quite worthwhile... not very worthwhile...

Since the introduction of automated systems in the University Library:

50. My opportunities for social and personal diversions have:

increased... remained about the same...
decreased...

51. My informal relationships with other employees have generally:

improved... remained about the same...
deteriorated...

52. The working atmosphere has:

become happier... remained about the same...
become less happy...

53. Would you prefer to return to a manual library system?

YES/NO

54. If you wish, note the main reason(s) for your answer to question 53.

55. (If applicable) Were you apprehensive about the change to automated systems

YES/NO

If YES, please answer question 56

If NO, go to question 57

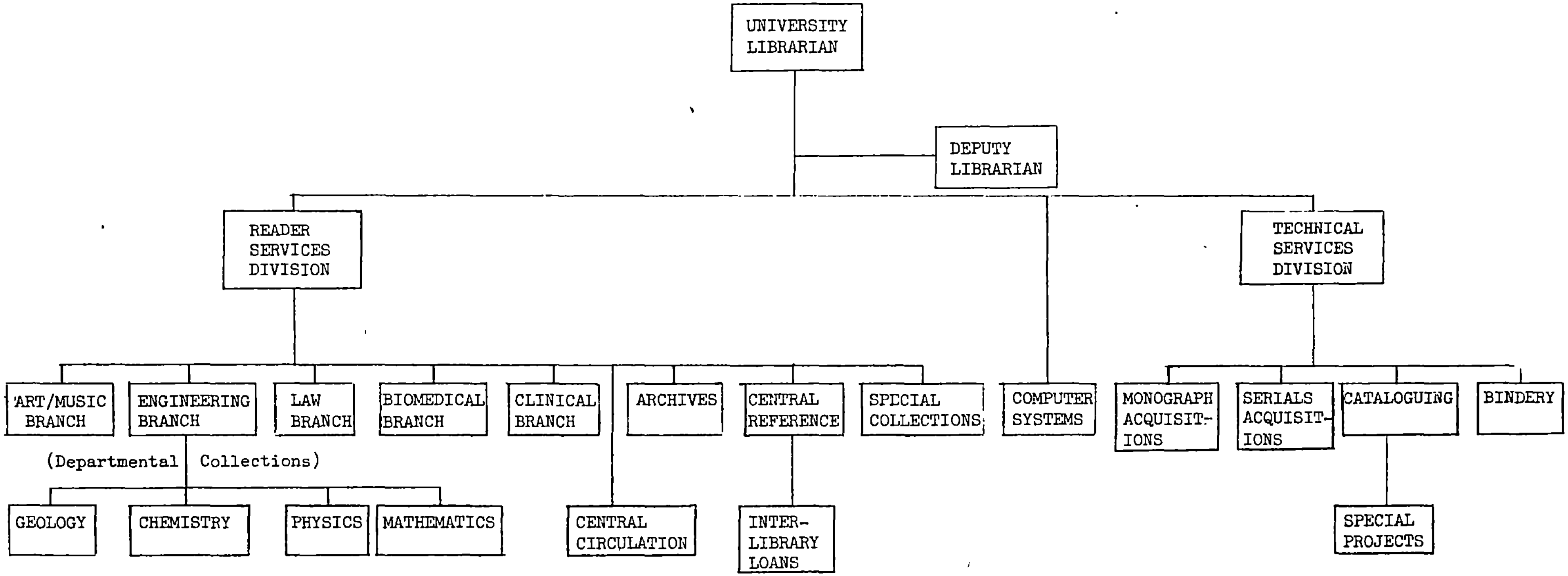
56. Did your fears prove to be justified?

YES/NO

57. If you have any general comments about the impact of automation on your enjoyment of your work or on the general working atmosphere or environment, please write them in the space below.

APPENDIX 3

UNIVERSITY OF TASMANIA LIBRARY: ORGANIZATION STRUCTURE


UNIVERSITY LIBRARIAN
DEPUTY LIBRARIAN
READER SERVICES DIVISION
TECHNICAL SERVICES DIVISION
ART/MUSIC BRANCH
ENGINEERING BRANCH
LAW BRANCH
BIOMEDICAL BRANCH
CLINICAL BRANCH
ARCHIVES
CENTRAL REFERENCE
SPECIAL COLLECTIONS
COMPUTER SYSTEMS
MONOGRAPH ACQUISIT-IONS
SERIALS ACQUISIT-IONS
CATALOGUING
BINDERY
(Departmental Collections)
GEOLOGY
CHEMISTRY
PHYSICS
MATHEMATICS
CENTRAL CIRCULATION
INTER-LIBRARY LOANS
SPECIAL PROJECTS

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