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Organizational Considerations Relating to the Implementation and Use of Management Information Systems

A management information system (MIS) is the process and structure used by an organization to identify, collect, evaluate, transfer, and utilize information in order to fulfill its objectives. It is a system that provides management with information to make decisions, evaluate alternatives, measure performance, and detect situations requiring corrective action.[1]

For library managers to utilize an MIS in their operations, precise and well-defined data categories are required as Runyon points out in his discussion of the need for systems to assemble elusive and fugitive library statistical measures.[2] Bommer and Chorba (1982) have described the use of MIS for academic and special libraries in a more highly evolved mode—that of a decision support system—with detailed consideration of management reporting as a means of better identification of the activities, problems and needs of users.[3] Dowlin (1980 and in these proceedings) has consistently presented examples of evermore refined "up-and-running" MIS in library settings with an emphasis on system components and decision-making.[4]

Most of the discussions addressing the use of MIS in libraries have, by necessity, focused on functional areas or subsystems which affect the dynamics of information and new knowledge in the following ways:

> (a) stored data relations, (b) system known logical relations, (c) program defined logical relations, (d) algorithm defined logical relations, and (e) end-user perceived logical relations. The intent of an MIS is to provide the knowledge (the correct knowledge) with which to efficiently/effectively operate a system. A system can be defined as a library, a private corporation, a local government, etc.[5]

This requisite focus on the integration of functional areas within a large system in the early stages of MIS implementation fails, somewhat, to consider impacts of an MIS on the organization *qua* organization and on those who work in it.

This discussion will focus on organizational aspects of MIS implementation and use rather than on technical or functional issues. Because few library examples of fully developed MIS exist we must turn to state-of-the-art analyses of these systems' impact on organizational structure and process which are lodged mainly in corporate or industrial discussions. However, just as many of the principles of administrative theory formulated for business enterprises are translatable, with modification, to the nonprofit sector, so much of what is known about MIS deployment can be similarly extrapolated for library considerations. In this respect we are fortunate perhaps in that the slowness of libraries to recognize the managerial implications of information generated by electronic data processing systems has meant that we should be able to anticipate the problems which will arise and work to circumvent them before library MIS systems are more fully developed.

Organization Variables Affecting MIS Acceptance

Before we examine the effect of MIS on organizations once they are in place, it is important to understand the organizational variables which may affect the initial acceptance of these systems. Ein-dor and Segev (1978) have characterized these variables as uncontrollable, partially controllable and controlled.[6]

Uncontrollable variables include organizational size, structure at the time of implementation, time frame, and the extraorganizational situation. Larger organizations have found greater success with MIS use than smaller ones. Libraries, even the largest, are relatively small organizations and much planning is required to initiate and gain acceptance of MIS. There will be more resistance in small organizations than in very large ones since the likelihood of a lesser degree of bureaucratization and traditional line and staff authority divisions are in place in such operations. The perception of the MIS as crystallizing these divisions may offset their initial acceptance.

The more decentralized the organization at the time of MIS initiation or consolidation of various components into a single system, the less likely there will be a warm reception to their consolidation. This situation is an important one for library planners. Independent systems for various functions are not easy to combine, and since each is accompanied in its own context by its own analysts, programmers and goals, the organization may face difficulty at the time the decision to merge the systems is made. That is,

separate acquisition, bibliographic control and circulation systems will not merge easily if they are already independent entities and may compete for funds. Incongruity between MIS and organizational time frames also militates against acceptance of the MIS. This is a problem for production-oriented organizations but may also be seen to occur in some library situations as well. Generally the more relaxed the organization in terms of time constraints, the easier MIS implementation will be. For example, the dreaded "closing of the catalog" proclamations made throughout the nation filled users and librarians with foreboding and doom. Such time-frame constraints create more dissension than a more relaxed initiation of systems that are more easily integrated at the organization's natural pace.

External factors such as the availability of resources for MIS implementation are also important. The organization with adequate data processing personnel or ease of access to these people will experience greater success than the organization that finds these resources difficult to marshall. The library that must hire programmers and data entry personnel from outside its own ranks will not only find difficulty in conveying its needs to these "outsiders" but may not be able to sustain upgrading and system maintenance. For those institutions outside of metropolitan areas it will most likely be necessary to shift some personnel to permanent posts in system maintenance—a reallocation of resources with possible negative personnel impact if done without adequate planning or anticipation.

Partially controllable variables include budgeting of organizational resources, organizational maturity and the psychological climate of the organization. Prior to implementation it is difficult for MIS to assume imaginable cost/benefit analysis. Since they may not clearly "cost out," they can only be initiated by managers with a great deal of insight. Rather than mount an entire system it has been easier, especially in libraries, to implement subsystems with the concomitant difficulties of consolidation at the time that the full-blown MIS is desired.

Maturity of an organization is usually defined as the degree to which systems are formalized, quantified and producing data appropriate to decision and control. They are rational and formal. The more mature an organization the more likely the MIS will be accepted since it will continue the generation of these data.

The psychological climate of an organization vis-à-vis MIS is the amount of expectation for the system. Most expect too much from such systems at the outset, and when magical formulas for decision-making do not spew forth, retreat from the system on the supposition that it has been oversold. Others have heard terrible stories about MIS and bring negative feelings to their implementation. The best environment for effective

organizational success with an MIS is one in which preconceptions are weak and realistic expectations can be developed.

Fully controllable variables include rank and location of the executive and advisory committees responsible for the MIS. The more highly placed the individual or committee to whom the MIS developers report, the greater the likelihood of organizational acceptance. It has been found that if this is more than two levels below the top of the organizational hierarchy the likelihood of success is reduced. A high level steering committee to guide MIS efforts, establish policy, identify potentially valuable projects, and recommend resource allocations has been viewed as fundamental to its acceptance.

The nature of library implementation of subsystem MIS, rather than overall systems developed for general decision-making, render it difficult to require that planners step back and examine the likelihood of success insofar as the above factors are concerned. Given the organizational variables which accommodate or impede MIS acceptance and success, it seems that libraries and systems with the following characteristics will find MIS most compatible: those which are large; centralized; have no tight time frames for the accomplishment of goals; can employ an adequate supply of system personnel; have few budget problems; are already formed and geared to statistics gathering and have no strong preconceptions of how an MIS should be. The top executive will be fully committed to the system which was planned by a steering committee and is monitored by and responsible to a highly placed individual within the organization. Although few libraries will fit this profile, recognition of these variables may increase the capacity of system planners to understand partial failures or resistance to acceptance of MIS.

MIS and Organizational Effect

The general literature of MIS and organizational effect takes two main viewpoints: (1) implications for organizational structure and processes; and (2) implications for managerial performance at various levels of administration. For each of these we will identify aspects of special pertinence to the library and information center context.

Implications for Organizational Structure and Processes

Change in the Shape of Organizations

Although there are many ways to describe organizational structure and many variants on the generally accepted pyramidal model, it is helpful to imagine such a model in order to discuss current thinking on the effect of MIS on traditional organizations. In such a model there are three basic

managerial levels: *top management,* whose tasks are development of the organization's domain, management of the interface with external environments, and establishment of the organization's administrative climate; *middle management,* which develops rules, procedures and policies in order to interpret them to fit day-to-day operations; and *technical management,* which sees that services are rendered and policies carried out. In addition to this vertical model, horizontal differential may also take place in varying degrees.

In libraries, horizontal specialization is nearly always functional since this provides for clear task assignments and the exercise of expert technical skills. A problem with this sort of horizontal development is the tendency of individual units to develop their own complex communication channels with no gangplank mechanisms among units. This usually forces coordination to the top of the organization where functional concerns merge. Given this tendency, there is a natural assumption that the implementation of an MIS system would concentrate greater power at the organization's upper strata and isolate individual units.

It is not a consideration here whether or not the way libraries are organized is efficient or effective. The main question is whether or not the implementation of an MIS will fundamentally alter whatever organizational model is in place at the time of implementation. As yet no clear consensus has emerged about the impact of MIS on organizational structure. In their review of the literature on organizational structure and MIS, Ignizio and Shannon (1971) identified two main camps: those who felt that MIS would cause development of an hourglass organization with more top managers, fewer middle managers and a greater ratio of skilled to unskilled workers; and those who felt that the pyramid structure would bulge with more management levels.[7] Not unexpectedly, more recent observers anticipate that the MIS will become the binding force in organizations as its use demonstrates the weaknesses of older structured forms and becomes the model for new organizational design.*

Centralization v. Decentralization

The most hotly debated question concerning the impact of MIS on organizational structure has been whether they will lead to more or less centralization. Since World War II, organizations have grown more complex and this, coupled with a human resources orientation on the part of management, has meant a tendency to decentralize. However, since MIS

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*As one interested in the professionalization process it gave me some cheer to see the MIS people struggling with the problems of more mature professions vis-à-vis their own status and prestige. The exhortations of management writers that MIS technologists become integrated into their organizations seems to be one these technicians are resisting—after all, once one has received holy orders is it ever possible to become one of the congregation?

provide the complicated organizational communication systems required to maintain control, and lessen the need to delegate authority through reduction of time needed to assimilate feedback information, it is likely that recentralization may occur. The reduction and regrouping of middle levels of management, usually accompanying MIS implementation, also contributes to recentralization.

Situational factors may be the critical component in this issue. While economy of operation may be gained through concentration of information at the top levels of the organization, resistance on the part of an educated work force for whom creativity may be a greater satisfaction than other motivational considerations, can slow this process. The initial desirability of concentrating information at the top of an organization may thus be outweighed by the need to develop a corps of managers-in-training who have had decision-making experience as well as by recognition of the demoralizing effects of inhibiting those at lower managerial levels from exercising discretion and judgment. In an organization of professionals such as a library, it is dangerous to hoard control over management information. The MIS is a tool which can be used as easily for centralization as for decentralization depending upon which direction the initiators of the system wish the organization to move. Given the strong indications of behavioral research that attest to the needs of professionals to maintain autonomy and decision-making capability in order to derive satisfaction from their work, it would seem unwise for any MIS system which totally circumvents those whose technical expertise is needed by the organization to be installed unless these individuals are seen as replaceable. It is not the MIS which creates consolidation of power but those in charge of developing the system's use patterns. Federico (1980) has pointed out, in his analysis of this issue, that the motivation and performance of middle managers can suffer if the shift in control toward the top is perceived as threatening the accountability and authority of middle managers.[8]

Change in Control

For those top managers with an inclination to share power and control of decisions, the MIS may actually make this process more palatable. Since an MIS allows monitoring of decisions, a manager inclined to share power may do so and continue to monitor the outcome with a capacity to determine if a subordinate has acted in an acceptable manner. Those reluctant to release authority could be apprised of the context in which decisions are made at lower levels and be reassured as to their appropriateness. Traditional organizational dependence on coercive power can be lessened with the implementation of an MIS since, theoretically, information could be shared by those in the best position to use it. Argyris (1982) has hypothesized the development of a project team or

matrix form of organization designed around relevant information rather than formal power.[9] Peer relationship might be emphasized and members of matrix groups assigned equal power to make decisions with the ultimate result a lessening of superior/subordinate identification. The potential for participatory management and maturity of the individuals in an organization could then be enhanced.

Such a development, however, will call for a new breed of executive officer at the top of an organization. If competence and technical knowledge replace formal authority, those top managers who maintain control by withholding information will find themselves less powerful and less essential. The MIS, if used openly, could cause a major organizational restructuring from arbitrariness to explicitness.

The three impacts of MIS on organizational structure so far discussed: (1) change in shape of the organization, (2) centralization *v.* decentralization, and (3) change in the control and authority structure of the organization do not happen in isolation. As we have already pointed out the attitude of top management toward the use of MIS may alter the direction taken vis-à-vis these three impacts.

Alteration of Organizational Processes

MIS alter organizational processes as well as organizational structure. The large general literature on "change" and change agents is helpful in understanding means to mitigate the effects of MIS installation. Foresight into potential organizational transformation is difficult, but Federico discusses axioms of alteration such as those developed by Benne and Birnbaum to mitigate the negative affects of MIS implementation. These include:

1. changing of all relevant aspects of the system (not just obvious ones);
2. *complementary* and *reinforcing* changes on all levels;
3. introduction of change at stress points since these are the areas most amenable to modification;
4. consideration of informal as well as formal organizations; and
5. inclusion of those affected in the planning of the change.[10]

Organizational acumen is a key factor in MIS implementation. Anticipation of the variety of organizational impacts and action to develop balances in the new system are crucial.

Change in organizational processes introduced may be examined at both the individual and general personnel levels. At the individual level, Coleman and Riley (1972) have noted that change caused by MIS creates conflict and stress which generates resistance arising from inaccurate perceptions of the effect of the MIS on the organization—fear of the

unknown; anxiety arising from enlarged responsibility; threat to position and stature; and disruption of personal relations.[11] Petroff (1973) has added the fear of more precise personnel evaluation.[12]

The literature concerning the effects of MIS on general personnel issues includes discussion of changes in job content, task requirements and retraining. While upper management may experience broadening and increased responsibility, jobs lower in the organization may become more routine and reduced in content. In fact, those higher in the organization have indicated more satisfaction with MIS than those lower.[13] At clerical and supervisory levels, interpersonal relation skills become less important while at the higher levels more openness is required. These effects may find the organization with a highly efficient MIS to have two different administrative philosophies in operation: a near return to Taylorism at the lower levels and an extreme case of human resources orientation at the higher levels. Since these styles tend to be antithetical, very real personnel problems may develop. A number of MIS analysts agree that personnel problems associated with MIS implementation cause more disappointments and failures than technical problems. In an organization composed of a great many professionals, the need for creativity and individuality are high. Insofar as an MIS may concentrate these job requirements at a few levels, important motivators may be removed from the workplace.

The threat of depersonalization and personnel perceptions that their positions have been reduced to MIS—created niches reflecting only the needs of the system rather than the employee, rank high in the list of problems which face the organization attempting to implement an MIS. Libraries are particularly susceptible to this problem since low salaries mandate that those employed derive greater nonhygienic benefits in order to sustain motivation. Removal of motivational factors, most libraries' only means of providing job satisfaction, may undermine the rationale for staying on the job. Finally, one rather short-term effect of the MIS on organizational processes must be noted. In the introductory stages an MIS will cause lags in the organization's progress. Routines that were relatively efficient, or seemed to be so, will be disrupted as new ones are introduced.[14] While this effect should be overcome as the system becomes familiar to employees, short-term major disruptions will generate ill will toward the new system unless they have been well prepared for.

The three main impacts of MIS on organizational processes are: (1) radical change, (2) individual and general personnel dissatisfaction as job content is revised and new task clusters evolve, and (3) disruption of routine. If anticipated and planned for, these can be minimized, but if MIS are introduced without adequate attention to these factors the system may have difficulty due to personnel resistance.

Implications of MIS for Management

The most salient question regarding MIS and its effect on management is whether an MIS will fundamentally alter managerial functions as they are practiced. If an erosion of traditional management responsibilities occurs with MIS implementation, the general conception of what comprises management skills may well change. Most researchers agree that the effects of MIS will be very different on different levels of management. At the highest levels, managers with the support of an MIS should be able to focus more intensely on innovation and change, develop alternative simulations for problems to be solved, investigate up-to-date research findings, avoid routine decision-making, and shunt organizational loyalty considerations in favor of more rational concerns with difficult problems.[15] Middle managers, on the other hand, could find their work more highly structured and reduced in status. The truncation of the middle manager role would require more specialization and less scope of action. We have already seen in our discussion of the effects of the MIS on the structure of the organization that the role of the middle manager could go either way.

This potential change in the practice of management is ironic in the face of recent investigations of the styles of administration in Japanese firms with their focus on maximization of human resources. Since a central factor in the success of these firms is in their commitment to the consultative style of decision-making, structured to involve the whole group rather than a few individuals, the implementation of MIS in terms of organizational behavior and shifts in managerial style may move us farther from the successful modes of management and back into an earlier more centralized phase.

Elsewhere in these proceedings, Olsgaard addresses factors involved in top management's use or nonuse of information so we will comment here primarily on effects of an MIS at lower levels in the organizational hierarchy.

The horizontal effects of MIS implementation are of special importance when trying to assess the role of the MIS at lower levels of management. The MIS as an integrated computer-based system for providing information to support operations and decision-making tends to be quite useful at middle-management levels if in fact a more flexible view of an MIS is understood in its operational mode.

The more information available to a manager, the more involved she/he will be in her/his commitment to the organization's goals. The traditional functional division of library operations without solid interdepartmental communication gangplanks can cause isolation and power hoarding in individual units. Since an integrated MIS could conceivably open a system and enable qualified users to peruse various aspects of the

operation tangential to the designated area of concern, the context of individual decisions might be made with a better understanding of where the organization is at any given point. An MIS will facilitate horizontal communication since it will force consistent definitions and formats. Interdependence of units should increase.

In a library setting all this is speculation since, in a service organization with rather pure missions and goals, considerations of unit power and control should be moot. Ideally there would be no need to wrest power or importance for a particular unit since goals should be kept in mind more consistently through such devices as the planning process for public libraries or frequent analyses of objectives via MRAP (Management Review and Analysis Program)[16] in academic settings.

However, the rise of MIS has seen a shift, perhaps a short-term one, but nevertheless a shift, in perceptions of unit power in larger libraries. Prestige and status accrue to those who work in departments with greater MIS capabilities. The old technical/public services dichotomy, with the implicit emphasis on public service, has blurred and the action, the excitement, the pioneering edge of librarianship seems now to be the realm of technical services. The increase of public service literature focusing on online searching or computer-assisted instruction (CAI) underscores this observation. The cachet which comes with synergistic innovation with a CRT seems to add prestige to those who work plugged into an electric keyboard. For the time being the technical services' development of MIS, both locally and through networking, is far ahead of those in the public services. These events may create a short term imbalance of departmental power and tempt units into competition—a dysfunctional situation for the organization's mission.

Saunders's examination of MIS and departmental power has some applicability to libraries. She defines power as the capability of a subunit through formal position or actual or perceived participation in organizational activities to exert influence on another subunit to act in a prescribed manner.[17] If subunits vie for scarce organizational resources, especially personnel, there must be mutual assessment of power bases. The ability of one department to exert influence on another is determined to the extent to which it participates in organizational decision-making on key organizational issues. These may change over time or be different for any given institution. An ARL library with its concentration on collection development and maintenance may find that the bibliographic units are more important than the public service units, especially if the administration is more committed to number of volumes and depth of collection than service. A library serving a research and development function, on the other hand, may be so committed to the support of research that the public service function takes precedence.

The use of an MIS may affect the power of units in three ways: (1) increased access to information may allow subunits greater influence in organizational decision-making on key issues; (2) the capacity to cope with uncertainty may also grant greater power within the organization to the degree to which the unpredictability ensuing from lack of information about future events may be reduced; and (3) the nonsubstitutability or difficulty with which the activities of a unit may be performed by an alternate department. These affect pervasiveness and number of linkages with other units.

Task criticalness and the degree to which the activities of a unit affect the achievement of the main goals of the organization is a mediating variable.[18] Depending upon the library's long term goals, task criticalness may shift and create deceptive short-term power imbalances within units. A good example is closure of the catalog. While one of the ultimate goals is provision of multiple access points, achievement of that goal has involved a series of changing power bases within the library. Hardware developers, software programmers, catalogers, and ultimately public service librarians have all participated in effective use of this tool. As tasks critical to the goal's success have changed, so has the relative power of units associated with each step. While this shift has short-term disruptive effects, the long-term goal will be met and, insofar as units subscribe to the organization's mission, competition avoided. Those responsible middle managers who experience shifts in power as various subunits rise and fall in their power base, must be ready to accept the changing perceived measure of status.

Since MIS can enhance the power of organizational units, another administration consideration must be how important power may be to managers. Job satisfaction studies which have demonstrated a positive correlation between employer performance and perceived status of the manager and the power of the unit should be considered in terms of changing unit dynamics due to the better availability of information. An MIS capacity to generate too much information, alluded to in the keynote speech, is also a determinant of employee satisfaction. O'Reilly (1980) has shown that perceptions of over- or underload correlate with satisfaction depending upon the manager's style.[19]

For the middle manager attuned to organizational goals, the effect of MIS can be quite positive. New communication patterns can be established, better decisions can be made, and more shared knowledge can be available. These factors could prove disruptive to the empire builder, however, since, in the long range, MIS should function to streamline the overall organization to the detriment of unit power, although short-term and somewhat misleading expansion of unit power may take place. From the larger organizational perspective, this evolutionary and dynamic

nature of MIS's effect on middle management should be anticipated and planned for.

Conclusion

The potential of MIS for better organizational decision-making and better deployment of organizational resources is great. However, in libraries this capacity has generally been discussed without adequate attention to the complex factors of organizational structure and processes or the resultant effects on individuals; restructuring of institutional personnel policies; resultant shifts on the demands of top and middle management; or changes in unit to unit communication, power and satisfaction.

The voluminous literature on these aspects of MIS implementation in the general management literature are inconclusive and confusing. On either side of any issue a number of studies support the direction in which each of these organizational factors might move. However, as with any new innovation, the addition of MIS capacities to organizational life requires careful consideration of the human element in individual and group interaction. The lure of precision through information, economy through better understanding of quantifiable variables and efficiency through clearer analysis of service and production may so alter the organization that those in charge of the organization's direction may find its workers (both professional and support staff) confused, less satisfied and alienated.

Sterling (1980) has observed that MIS systems and their concentration of feasibility, workability and minimization of costs have failed to focus management concern on the antihuman aspects of such efforts.[20] Since automation of any management system codifies the rigidity of practice and expands it to ever larger circles, the prerogative to formulate questions important to the human element of the organization is diminished. In conclusion, I would like to caution that the glamour of MIS and their capacity for variant simulations of organizational outcomes be considered carefully in light of the human factors in an organization. The paucity of service organization studies makes their advancement into MIS implementation even more uncertain than in those that are profit based. We simply do not know what will happen but we must recognize that the human factor has played a role of great importance in libraries to date and not forego our investment in the development of a highly skilled and technically competent corps of professionals in favor of efficiency and streamlining of operations.

At this critical stage of MIS innovation, with seemingly unlimited technological opportunities, it is more important than ever before that the organizational and individual consequences be attended to, analyzed, and considered as major managerial adjustments involving MIS are undertaken.

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