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M. Lynne Markus

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CISR No. 78
Sloan WP No. 1261-81

Center for Information Systems Research
Massachusetts Institute of Technology
Alfred P. Sloan School of Management
50 Memorial Drive
Cambridge, Massachusetts, 02139
617 253-1000

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ABSTRACT

Although accounting and control systems have increased in both their sophistication and importance as resource allocation decisions have moved more within organizations, resistance and system failure are both common, and there is little evidence that system sophistication is associated with effective performance. Three consonance hypotheses are advanced to explain resistance and system difficulty: accounting and control systems will be implemented easily to the extent that they are a) consistent with other sources of power in their implications for the distribution of power; b) consistent with the dominant organizational culture and paradigm in their implications for values and beliefs; and c) consistent with shared judgments about technical certainty and goal congruence in their assumptions about the degree of certainty about the organization's goals and technology. These sources of resistance are fundamentally structural, and process-based strategies (such as user involvement in design) are largely ineffective in overcoming these problems. This result suggests that power structures and organizational paradigms must be considered in both research and practice dealing with accounting and control systems.

In spite of the increasing importance of organizational accounting and control systems and in spite of the increasing sophistication of the decision-making and information technology embedded in them, the record for successfully implementing these systems has been modest at best. The increased importance of these systems derives from the fact that many decisions about the allocation of resources, formerly made across organizations through the operation of markets, are now made within organizations using administrative mechanisms (Pondy, 1970; Pfeffer, 1981). Indeed, the multidivisional organization substitutes for capital markets an intraorganizational process involving centralized strategic planning units and capital budgeting systems linked with accounting and control systems (Williamson, 1975). Whether or not this internal allocation is more efficient than market mechanisms, the fact that the multidivisional structure is easily the most popular among the largest organizations (Rumelt, 1974) indicates the pervasiveness of internal capital allocation and the accompanying financial reporting and control systems.

The sophistication of accounting and control systems has grown, along with their importance, through the use of advanced computer hardware and software, such as data base management, and through the application of new management techniques, such as PPBS, Management by Objectives, and Zero-Base Budgeting. Underlying these changes have been the premises of rational decision making, or at least bounded rationality (March, 1976; Allison, 1971). Consequently, the implicit assumptions have been that a) more detailed information is preferred to less detailed (e.g., information on strategic business units is better than information on divisions, and information on the costs and sales of individual products is better

yet); b) more timely information is preferred to less timely (e.g., monthly reports are better than quarterly reports, and weekly reports are better still); and c) quantitative information is preferred over qualitative.

The apparent success rate of accounting and control systems has not kept pace with the increasing sophistication, however. The literature is filled with instances of resistance to the implementation of these systems and with cases of system failure (e.g., Markus, 1979; Stewart, 1971). Furthermore, the evidence does not support the statement that investment in information systems invariably affects organizational performance favorably. For instance, Lorsch and Allen (1973) studied a sample of conglomerates and found that lower performers were distinguished from higher performers by limited information flow downward in the hierarchy. Sophisticated control mechanisms, such as monthly budgets and periodic revisions to plans, facilitated upward communication, but had no effect on the downward transmission of information.

Thus, the application of computer technology has contributed only occasionally to the successful accomplishment of the important tasks of allocating resources and controlling diverse, often geographically dispersed, activities. The issue addressed in this paper focuses on one source of difficulty in the design and implementation of computer-based accounting and control systems - the neglect of the organizational realities of power and politics. We first consider the close relationship between accounting and control systems and organizational power distributions. Then, three hypotheses are advanced to explain the conditions under which resistance or successful implementation would be expected.

Cases consistent with the hypotheses are presented, illustrating instances of both success and failure. The implications of this approach both for research on accounting and control systems and for practice are discussed in the concluding section of the paper.

ACCOUNTING AND CONTROL SYSTEMS AND INTRAORGANIZATIONAL POWER

Bariff and Galbraith have noted that "...the design and operation of an organization's information system...will affect the distribution of intraorganizational power" (1978: 15). Considering first the operation of accounting and control systems, at least three uses to which they are commonly put are related to the acquisition or exercise of power: decision making, altering organizational performance, and conferring legitimacy.

Accounting and control systems are related to intraorganizational power because they collect and manipulate information used in decision making. The old maxim that information is power implies that those with access to and control over information have power in the organization. Pettigrew (1972) has demonstrated how someone strategically located with respect to the organization's flow of information was able to influence a decision about a computer purchase so as to favor his preferred choice. Pfeffer (1981) has argued that those subunits with the ability to determine which information is to be used in evaluating various alternatives have increased power. Because of the use of accounting and control systems in decision making, those who have control over information flows in the organization come to have increased power.

Accounting and control systems are related to intraorganizational power also because they are used to change the performance of individuals and the outcomes of organizational processes. A secondary purpose of many accounting and control systems is to evaluate and reward the performance of managers. Evaluating and rewarding are key dimensions of formal authority in organizations (Dornbusch and Scott, 1975); carrying out these activities through the use of an accounting and control system entails the exercise of power. Furthermore, those groups or individuals whose performance is rewarded tend to gain power through this recognition.

Another dimension of formal organizational authority is the ability to initiate action, and when that action leads to enhanced performance or the solution of some organizational problem, the power of the action initiator is enhanced. Hickson, et al. (1971) have argued that power accrues to organizational subunits with the ability to successfully cope with critical uncertainties in the environment or in the production process. Accounting and control systems play a key role in coping with uncertainty. First, they support analyses of the source of undesirable variations in performance, allowing the successful initiation of corrective action. Second, they absorb uncertainty (Cyert and March, 1963) through standard operating procedures permitting work to go on in the face of ambiguity. Because of the use of accounting and control systems in individual performance evaluation and action initiation, those who have access to the information in the systems obtain increased power.

Accounting and control systems are related to intraorganizational power because they can be used to enhance the legitimacy of individual and

group activities, regardless of any substantive impacts on individual or organizational performance. Because they embody the ideology of rational decision making, accounting and control systems and their associated decision-making technology can provide power to units with access to and control over these systems through the social legitimacy conferred on the choices made, whether or not such choices were actually affected by the systems. Meyer and Rowan (1977) have provided examples of institutionalized practices in school systems, in which there is enormous standardization of and adherence to various bureaucratic forms of operation. At the same time, there is little evidence of consistency within districts or even within schools in terms of teaching technology. Meyer and Rowan argued that bureaucratic school structures existed not to affect the performance of schools but to demonstrate to sources of support that rational procedures of administration were being followed. Succeeding in this demonstration ensured continued support for the school systems.

The use of information and control systems in just such a fashion has been documented in several instances. Kling (1978) found an increase in the power of administrators in a welfare agency which used an automated case tracking system. However, he noted that this power came, not because the tracking system enabled administrators to improve internal operating efficiency, but because it enabled them to attract more funds from various outsiders who found the system itself evidence of good performance. As another example of this effect, Sapolsky (1972) argued that the power of the administrators of the Polaris missile program came from their ability to convince others both inside the defense department and in other agencies that they were unusually effective and

rational managers. They did this through the implementation of PERT and other sophisticated management techniques - techniques that were not actually employed in making many of the critical decisions, however. As Wildavsky (1978: 79) noted:

> Construction of Polaris is an example of brilliant management, and one instance of this brilliance was to be known as an organization with brilliant management so that external agencies would leave it alone. When asked if they would use PERT, Polaris' managers said they would not use a formula for anything important. Rather they told somebody to develop a method that would look scientific so innovative management could be cited as a rationale for escaping outside control.

These examples demonstrate that accounting and control systems are symbols, suggesting images of the organizations in which they exist. Consequently, while power derives from the ability to influence substantive organizational outcomes through impacts on decision making and organizational action, power also derives from the ability to influence attitudes and beliefs about the legitimacy and rationality of decisions made and actions initiated, regardless of the actual use of the accounting and control system in the process.

The use of accounting and control systems in decision making, changing organizational performance, and conferring legitimacy can affect the distribution of power within an organization. In turn, other key aspects of organizational life may be affected: the organizational structure (Pfeffer, 1978; 1981), resource allocation (Pfeffer, 1981), and career paths (Kanter, 1977; Pfeffer, 1981). One need not subscribe to such notions as the power motive (McClelland, 1961) to believe that potential changes to the distribution of power in an organization will be hotly contested. Those who care about either their own careers or

the well-being of their organization are likely to fight against some changes and for others. For this reason, the designing of accounting and control systems, not simply the use of them, is associated with intraorganizational power.

One critical issue in the design of accounting and control systems is what is to be measured (Pfeffer, 1978). First of all, as Ridgway (1956) has noted, what is measured gets attention, and what is not measured tends to be ignored. This can be especially problematic since the use of different criteria may yield different evaluations of performance. Thus, the head of a manufacturing division may appear more or less successful depending on whether he or she is evaluated on the ratio of profit to sales, profit to assets, market share, or growth. Further, many criteria can be measured in several ways, each yielding different numbers. Caplan (1971) has shown this to be the case for return on investment (ROI), the classic yardstick of financial evaluation. Finally, Kahneman and Tversky (1973) have reviewed evidence indicating a bias toward availability in individual information processing: information that is readily available, because of its accessibility in the processes of perception, memory, or construction from imagination will be used more in decision making and judgment regardless of its applicability or validity.

As a consequence of these issues of measurement, accounting and control systems focus attention on those people and subunits who work directly with the aspects of the organization being measured. Those who perform well against the measured criteria are rewarded and gain power. It thus becomes a matter of personal self-interest as well as organizational well-being for individuals to try to control the nature

of the information collected and the choice of the measures designed into accounting and control systems. Those who obtain control over key system design variables will ultimately determine the impact of the systems when they are used in decision making.

HYPOTHESES: THE CONSONANCE OF ACCOUNTING AND CONTROL SYSTEMS WITH OTHER DIMENSIONS OF ORGANIZATIONAL POWER

Accounting and control systems, through their organizational uses, imply a distribution of power among those who design, use, and are affected by others' use of them. The extent to which an accounting and control system matches other aspects of the organization in which it is used will affect its ease of implementation and its ultimate success. Three other organizational aspects are important: a) the distribution of power from sources other than the accounting and control system; b) the organization's culture and system of shared values and beliefs; and c) the extent to which there is agreement about technology and goals in the organization, because of either the nature of its technology or the development of a strong dominant culture. For each of these aspects of an organization, a consonance hypothesis is proposed, linking the degree of fit or the match between it and the accounting and control system to implementation ease and success.

Power in organizations has, of course, other bases than the formal accounting system. Such bases include a person's or subunit's position in the formal hierarchy of authority, the ability to bring in critical resources required by the organization (Salancik and Pfeffer, 1974; Pfeffer and Moore, 1980), and various kinds of political skills.

Important political skills are facility with the use of political language (Edelman, 1964; Pfeffer, 1981: Ch. 6), the ability to identify and build coalitions with other interests (Bucher, 1970), knowledge of the distribution of power (Pettigrew, 1973), various personal characteristics (Allen, et al., 1979), and the ability to argue for one's position selectively using the information that is available (Pfeffer and Salancik, 1977).

In the first hypothesis, it is argued that to the extent the power distribution implied by the accounting and control system does not correspond to the distribution of power implied by other determinants, there will be greater difficulty in implementation, including more resistance and more instances of system termination. Bariff and Galbraith (1978) noted that systems can be implemented with one of two goals in mind: improvement in current operations entailing minimal change in the existing power structure, or substantial change in the social structure with the system as the vehicle of change. Clearly, in the second case, there is greater potential for conflict, resistance, and system failure.

A second aspect of an organization is its paradigm (Brown, 1978), which encompasses the values, culture, and climate that uniquely identify an organization. Frequently, these cultures are transmitted to new members and maintained through the use of specific language, ceremonies, symbols, settings, and organizational myths and sagas (Martin, in press). Important dimensions of an organization's culture or paradigm may include the time horizon over which goal accomplishment is measured (short versus long term), analytic versus intuitive decision making, and individual effort and responsibility versus teamwork. For example, Ouchi and

Jaeger (1978) have distinguished between those organizations that use primarily few, implicit qualitative controls and those that rely on numerous, explicit, quantitative measures.

In the second hypothesis, it is argued that accounting and control systems have associated language and symbolic content. To the extent that the language and symbols of the accounting and control system do not correspond to those of the dominant organizational paradigm and culture, more resistance and instances of systems failure would be expected. Efforts to introduce elaborate multi-indicator controls into an organization stressing qualitative evaluation will encounter resistance and potential failure. Systems stressing dimensions of the operation not previously emphasized in the culture will encounter difficulties. And, systems predicated on a philosophy of long-range planning will run into trouble in ad hoc, present-oriented organizations.

A third dimension of organizations is the degree of agreement about goals or preferences and the degree of certainty or agreement about the technology (the connections between actions and consequences) required for achieving those objectives (Thompson and Tuden, 1959; Lodahl and Gordon, 1972). In the third consonance hypothesis, it is argued that accounting and control systems imply both organizational objectives and a definition of technology. To the extent that the goal and technology assumptions of the accounting and control system do not correspond to those widely held in the organization, the system will encounter resistance and risk possible failure.

Wildavsky (1978) has argued that information systems of all types presume some theory of the organization, some connection between actions and

consequences. Often the theory is quite implicit, but it is there nevertheless. If there is little or no agreement on a theory of the organization's technology, there can be little or no agreement on a management accounting and control system. Pfeffer (1981) argued that the conditions under which power and politics were likely to be employed could predict difficulties in the application of normative choice technologies, such as those frequently encountered in management accounting and control systems. This is the argument made here, also. Comprehensive and detailed financial information is consistent with widely shared agreement on the goals and values being pursued in the organization and with well-understood means-ends connections. But in a pluralistic and loosely coupled organization, where goals conflict and technology is uncertain, there will be resistance to the implementation of a highly structured, single-indicator accounting and control system, except and unless such a system is used solely for purposes of external legitimation.

Although none of these consonance hypotheses is particularly startling, they help make sense of many instances of both success and failure in the implementation of management information and accounting and control systems. In spite of this heuristic explanatory power, these hypotheses have not been frequently advocated as principles of system design or implementation.

EXAMPLES

The data are not yet available that would permit a comparative, quantitative test of the hypotheses. However, a number of cases collected by both ourselves and others can be used to illustrate and illuminate the

arguments. These examples offer some support for the reasonableness of our hypotheses, as well as providing data on the specifics of the processes we have described.

Congruence Between Information System-Based Power and Other Determinants

In several instances involving both hierarchical and interdepartmental power issues, there is evidence that resistance to information system implementation occurs when the power distribution implied by the system is incongruent with that determined by other sources of power, and that such resistance is less likely to occur in cases of congruence. Markus (1979) described the case of Golden Triangle Corporation, a major chemical and energy product manufacturing concern located in the Midwest with sales exceeding $3 billion. Golden Triangle operated from a divisionalized structure, with four operating groups having relative autonomy over marketing strategy and investment decisions. Each division had its own accountants who reported directly to the divisional general manager, but who also had a dotted line relationship to the corporate accounting group, whose role was to provide "broad policy guidelines." Golden Triangle had engaged in an aggressive acquisition program in the 1960s and 1970s, including the acquisition of operations which eventually constituted their largest group. Thus, one would expect the customary conflict between headquarters and divisions to be worse in this case, since many of the persons in the divisions had been used to operating as part of independent entities.

In 1975, GTC initiated the use of a financial information system, FIS, in its largest division. The system immediately encountered implementation problems which persisted at least until the time of data

collection, some four years later. Prior to the FIS system, divisional accountants had collected and stored transaction data however they saw fit, but reported summary data to corporate accountants in a standardized format. FIS sought to standardize transaction reporting throughout the corporation and to create a database accessible from headquarters. Divisional accountants would enter their transactions into the system, identified and retrievable by a 24-digit account code, which specified type of transaction and place of origin. The information system automatically summarized these data into reports for corporate accountants and the relevant division. The information managed by FIS was primarily used for external reporting purposes, although profit and loss information useful for managerial decision making could also be derived.

It is clear that a major change in hierarchical power was implied by the new information system. Power would shift from the divisions and their accountants to headquarters and the corporate accounting staff. Prior to FIS, divisions had retained control of their own data and exercised substantial discretion in summarizing it. This allowed them to "account for" unusual situations before reports reached corporate accountants or even divisional general managers. After FIS, all data were in a single database under the control of corporate accountants. At any time, these accountants had the ability to "look into" the database and analyze division performance, as well as to analyze reporting inconsistencies or other problems. Needless to say, those who gained power, the corporate accountants, supported the system. Those who lost power, the divisional accountants, resisted its implementation. In August 1977, more than two years after its implementation, an accountant at the largest division wrote a memorandum in which he stated:

> After being on FIS for several months, I expressed the opinion that the system was basically of little benefit. After two years and seven months, my opinion has not changed. Even worse, it seems to have become a system that is running people rather than people utilizing the system.

Resistance took a number of forms. Constant complaining from the divisions forced the formation of numerous task forces to investigate and modify the technical problems that were alleged to plague FIS. One division persisted in using its old accounting methods after it started using FIS, even though this required twice the effort in recording data. Whenever, as frequently occurred, there were discrepancies between the two sets of books, this division argued that its system, thick manual ledger books, was accurate. The division persisted in keeping the manual books for two years, until the old ledgers were actually physically removed. Needless to say, the divisions were far from cooperative in helping overcome the technical problems or in providing support for the further development of FIS.

It is important to note that resistance occurred in the FIS case not simply because a change had taken place or because a shift in power was being attempted through the information system. Rather, resistance occurred because the system implied a shift in power such that a lack of consonance was created between the system and the existing power bases in the organization. It is possible that the manual systems replaced by FIS could have been incompatible with the basic organizational power structures. If FIS had created a better correspondence than had previously existed, the hypothesis would predict that the system would not have been resisted.

In the present case, GTC was pursuing a consistent policy of decentralization to the heads of its operating groups and divisions. GTC's most profitable year to date was 1975; no crisis loomed which might justify recentralization. The FIS system, which centralized divisional data, altered the traditional relationship of divisions to headquarters, at least within the accounting function, and this change was incongruent with the power distribution implied in the formal organizational charts.

A second case illustrating power incongruence between the information system and organizational structures occurred at JHM, Inc. In one division, there were two plants, Capital City and Athens, each located, as was divisional headquarters, in a different city. The new divisional general manager, deciding in late 1973 that he lacked the data and procedures to manage the division effectively, began the development of a system which was to be known as 3PA, or the Production Planning and Profit Analysis System. In addition to forecasting and planning production, the system also had financial reporting capabilities. In this case, both plants were encouraged to participate in the design process, but only the Capital City plant availed itself of the opportunity. The Athens plant failed to participate and subsequently resisted the implementation of the system.

Again, there were various forms of resistance. The data submitted to the system by the plant were frequently bad. And Athens continued to operate, in parallel, a system that it had used since 1971 for inventory and production scheduling. Managerial directives aimed at securing the plant's compliance failed. Ultimately, data quality problems were resolved by linking the old and new systems in such a way that Athens' habitual behavior automatically updated the 3PA system.

One might have expected resistance at both plants, because it appears that divisional headquarters had gained power over both. This was not quite the case. At Capital City,

> ...Old Oscar has been the production controller for 20 years. He keeps all the numbers in his head, and he calls all the shots. No one can argue with him when he says, "We need this," or "We only have that." Oscar's vacations are events to be planned for months in advance.

Originally, Oscar was concerned that divisional salesmen would have direct access to the data in 3PA which would tell them what the plant was really able to produce. This might encourage salesmen to ask for more than they needed, giving themselves a margin to the detriment of the plant. But Oscar soon realized that the salesmen would only have access to the data he entered into the system. And, thus, he could maintain his power:

> I got to have my kitty. But you see that number? What is it? A 500? Well, I know that 500 is really a 1,000. Now, is that a kitty or isn't it?

Thus, through the use of 3PA, Capital City was able to maintain its power vis-a-vis headquarters. Athens was not, because instead of a strong centralized production control function as at Capital City, production controllers were distributed among four product line groups where their influence was sharply curtailed by engineers and product line managers. An additional factor in the resistance at Athens and the acceptance of the system at Capital City was that the system altered the power relationships not just between the plants and headquarters, but also between the plants themselves, in ways that were incongruent with other bases of power.

Capital City was on the downstream side of Athens, sequentially interdependent with Athens (Thompson, 1967). Athens' technology was

highly uncertain and the scrap rate was high, about 40%. It was difficult for Athens to meet delivery dates since many parts had to be reworked. But Capital City, like other customers of Athens, had little choice but to wait, for there was no substitute for the capital-intensive operations performed at Athens. Capital City, on the other hand, used a reasonably substitutable technology. Thus, Capital City was in a poor power position compared to Athens. Athens was able to maintain its power by controlling access to information about its scheduling and its progress in meeting delivery dates. Furthermore, Athens had been an autonomous company until acquired by JHM in 1960; even after its acquisition, it had been allowed to operate reasonably autonomously until the late 1960s. Capital City, on the other hand, had always been a part of JHM.

After the introduction of 3PA, however, Capital City had access to data about Athens, which, once the quality of the data had been assured, would allow it to cope more effectively with its dependence on Athens. This would reduce the power of Athens compared to Capital City. Thus, 3PA would reduce the power of Athens both with respect to headquarters and Capital City, whereas Capital City managed to maintain its power with respect to headquarters (because of how the production control function was organized) and increase it with respect to Athens. These differences help explain the differential success and resistance to the same system in two apparently similar plants.

It is important to note that resistance is not inevitable and often does not occur when the system being implemented is congruent with existing power relationships. Stewart (1971: 29-39) detailed the introduction of computers into branches of a large clearing bank in England.

The use of computers in bookkeeping at the branch level "was made necessary by the difficulties in recruiting suitable staff from a shrinking labor force to handle increasing work loads" (Stewart, 1971: 30). Stewart reported that the implementation was accomplished smoothly and with good relationships. There was no evidence of resistance, sabotage, memorandum-writing, or maintaining duplicate hand ledgers, as was evident in the two cases already described and in several others reported by Stewart. Stewart noted:

> The managers interviewed were unanimous that their job had not changed at all...branch managers see their job as attracting and controlling accounts. These basic tasks have not changed. Some of the organization of information has changed, and its accuracy has improved, but there is not much change in its content. The main effects of branch computerization are on the clerical process, but while the manager is responsible for the smooth running of the branch, the clerical organization is the concern of the manager's assistant (formerly called the chief clerk) (1971: 37).

This system, which merely automated clerical tasks, did not change the power of the branch manager with respect to other branches or with respect to headquarters. Thus, the system did not disturb the existing alignment of bookkeeping systems with power distributions, and consequently, resistance did not occur.

Consonance Between Information System-Based Power and Organizational Paradigm and Cultures

The FIS system at Golden Triangle also provides an example of an attempt to implement an information and control system that involved a conflict of paradigms. The FIS system had been designed by the corporate accountants and reflected their interests and concerns; the system was oriented around the tasks of financial accounting and external reporting.

The divisional accountants, reporting to divisional general managers, saw their task as one of managerial accounting. The distinction is relevant, because, although the divisional accountants might have accepted a system intended only to support external reporting, they were more likely to resist a system intended to alter their managerial accounting activities. And the evidence suggests that this latter change was both the result and the intention of the system.

Analysis of interview notes, internal memoranda, and task force minutes indicates that difficulty in using FIS was secondary in importance to complaints about changes in the way in which managerial accounting was to be done. Although the FIS system was intended to enhance managerial accounting activities by providing performance indicators on a product line and plant basis, the divisional accountants disagreed:

> FIS does not provide us with the data we need to prepare profit center reports. To prepare profit center reports we must maintain a separate system, the PGP system.... They tell us we can use FIS for profit center reports! That's garbage! You could do it, but I've already told you how you have to enter data into FIS. To get a profit center report, you'd have to enter each transaction by commodity code. There are a thousand commodity codes. This would be a horrendous job. Besides, PGP does this for us already with no extra work. PGP is our product gross profit report. We've had this system unchanged for almost 10 years.... Naturally, the profit figures from this and the FIS should reconcile, but they never do, so we have to make the necessary adjustments....

When a second task force was appointed to study FIS, the minutes clearly reveal the concern about the system's impact on divisional management accounting:

> During the sessions we have had thus far, one complex question already surfaces: is the system capable of being any more than a giant bookkeeping system; e.g., can it ever effectively serve divisional needs for budgeting, reporting, allocations, etc.?

Different paradigms hindered the communication between the corporate, financially oriented, and the divisional, managerially oriented, accountants. A system designed to take over both types of functions brought differences in perspectives on accounting into sharp focus. These differences in views of the activity and its associated technology exacerbated difficulties in system implementation and design.

Another instance of the conflict between paradigms can be seen in the attempt to implement a computerized information system in the cardiology division of a major teaching hospital. HYDRA (History Yielder for Data Research and Analysis) was installed at Henry Moore Teaching Hospital in late 1976 (Locke, 1980). It collected data on patients suffering from coronary artery disease into a database on which it was possible to perform research analyses. The system also supplied predictions of how an individual patient would perform under either medical or surgical treatment by comparing the patient's data aginst the other cases tracked in the database. Initially, it was believed that the system would be a useful tool both in academic research and in improving patient care. But implementation problems occurred over a two-year period and, in 1979, the Cardiac Catheterization Laboratory, which supplied data to the system, withdrew from the project, essentially ending it.

Prior to HYDRA, the catheterization report, including patient data and physician interpretation, had been typed, entered into the patient's permanent medical record, and copied to the referring physician. With HYDRA, the Fellows filled out a data collection form which did not provide room for interpretation of the results; these collection forms were entered directly into a computer terminal by clerks, and HYDRA automatically produced an interpretation of the results for medical records and the referring physician.

HYDRA was implemented in the context of an experiment in physician decision making. Hospital Fellows (residents) in Clinical Cardiology were asked to predict the performance of their patients and to recommend medical or surgical treatment. They were then required to request that HYDRA produce a prognostigram, which compared the diagnostic data on that patient with those in the data base and recommended a course of treatment on that basis. The experiment recorded the course of treatment actually chosen by Senior Cardiologists and the Fellows in joint conference; inferences were to be made regarding the degree to which the prognostigram improved the unassisted decision-making ability of the Fellows.

Implementation problems appeared in three areas - entering data into the system, ordering the prognostigrams, and retrieving data from the system for research purposes. The head of the Catheterization Laboratory, in his enthusiasm for data collection, had arranged for the collection of far more data than previously. Little attention was paid to the issue of staffing for the data entry process, and a backlog of reports waiting to be entered into the system grew to over 300 at one point. Fortunately, since the information of importance was communicated orally, these delays had few consequences for patient care. However, the referring physicians became vocal in their concern about the lateness of the reports. And, without timely data entry, HYDRA could not effectively assist in the choice of therapy. But the Cardiology Fellows balked at filling out the forms to order the prognostigram. Repeated requests for compliance had little effect; the issue was ultimately resolved by the expedient of paying a small sum of money for each prognostigram ordered, hardly an indicator of the system's effectiveness. The system was finally abandoned when it was discovered that much of the data had been entered in a free-text

form; it was almost impossible to answer questions relating diagnostic data to patient history. Because the system was, therefore, of limited use as a research tool, it was dropped.

Analysis shows that it was the symbolic aspects of the system which led to system failure. The HYDRA system was designed in the spirit of statistical epidemiology, which is sharply at odds with the ethos of clinical care. HYDRA had been designed by people from the associated university's School of Public Health. At its core was the notion that a statistically "typical" patient could be compared against the actual one to enhance diagnosis and treatment choices. The ethos of clinical practice is that each patient is unique. The heads of both Clinical Cardiology and Cardiac Catheterization were explicit in spontaneously describing themselves as "not the epidemiology type." This difference even affected the style of research conducted. HYDRA was designed to support statistical analysis, whereas most of Henry Moore's cardiologists did research on the nature of the disease process and the mechanisms of the therapeutic process. At best, HYDRA proposed to fine-tune existing methods of diagnosis and therapy, minor concerns for those searching for fundamental medical discoveries.

Even the nature of the computer-printed catheterization report was troublesome. The report conveyed an image at odds with what the laboratory wished to project. Locke (1980) pointed out that the physician's product is a service which requires tangible clues about its intangible quality. By violating the image Cardiology wished to project, and by portraying a clinical practice in terms of an epidemiological model, the system was in conflict with the basic paradigm. Its subsequent failure was, therefore, not surprising.

Consonance Between Information System and Goal and Technology Agreement

The third form of consonance, between the assumptions implied in the accounting and control system and the amount of agreement and certainty about the goals and technology of the organization, is not unrelated to the issue of organizational paradigms and cultures. Whether or not a technology is well understood may be as much a matter of shared belief within the organization as an objective reality. In that sense, the imposition of an information system with optimization modeling on a decision process which is viewed as uncertain and unstructured produces a conflict of decision paradigms as well as an attempt to rationalize a nonrationalizable process. This can be seen in the HYDRA example, in which the two paradigms of clinical or epidemiological medicine were as much matters of taste and preference as they were of scientific fact. The attempt to quantify clinical judgments produced resistance not only because of the conflict in symbols and values but also because, from the point of view of the cardiologists, it was not possible to use the information system to make the kind of decisions they were making.

Stewart (1971) reported on the computerization of production planning and control in four companies. Her description of the efforts reveals, first, a conflict in organizational paradigms between the production managers and the systems analysts, but also, second, the unsuccessful attempt to develop a system for optimizing a problem that was not amenable to precise quantitative analysis;

> Managers in general, and production managers in particular, have usually been brought up to cope with a situation in which there is poor information, considerable complexity, and frequent short-term changes. In production, the manager tends to spend much of his time dealing with day-to-day changes and problems.... This kind of managerial outlook is quite different

> from the approach implicit in computer system development. Systems analysts...will assume that they are dealing with problems for which reasonably stable long-term solutions can be found. Because of the intensity of short-term problems and localized pressures in production, it may be particularly difficult to close the gap between the managerial tradition and the systems approach (Stewart, 1971: 125-126).

The problem lies in the fact that production scheduling involves more than minimizing production costs, subject to inventory, delivery time, and machine utilization constraints. The constraints themselves change over time, and which are most pressing depends on a variety of factors that most scheduling algorithms are not capable of quantifying. Production schedulers can, of course, weigh these factors qualitatively. Stewart concluded:

> The conclusion may be...that, because of the uncertainties and unknowns in production, particularly in batch production, the computer is unlikely to offer any overall solution.... Rather it may enable parts of the system to be improved gradually, and it may also stimulate management to a greater awareness of the assumptions on which its sales and production policies are based (1971: 127).

Clearly, a system designed to perform these latter functions of sensitivity analysis and assumption exploration may have different characteristics than one designed both to assist in the planning and scheduling as well as to provide evaluation and control of the production managers. To the extent that Stewart's conclusions are correct, a system designed for the evaluation and control purpose will meet more resistance than an analytic system alone, as was the case in her four firms, because the data and theory implied in the information and control system are inconsistent with the actual characteristics of the production decision situation.

IMPLICATIONS

The ease with which we located instances of implementation problems for accounting and control systems indicates that system designers have frequently sought to effect substantial organizational change but have paid relatively little attention to the organizational context in which these systems are used. The evidence of these cases suggests that the failure to consider contextual factors, such as power distributions and organizational cultures and paradigms, has hindered the practice of designing and implementing systems and limited the research perspectives on these systems.

To advance research in this domain, three things are needed. First is the recognition that accounting and control systems are inextricably entwined with organizational decision-making processes and that adequate conceptualizations of decision making must go far beyond merely considering rational models of choice. Available evidence and theory lend increasing weight to the view that decision making is much less ordered and prospective (March and Olsen, 1976), and much more political (Pfeffer, 1981), than the assumptions of rationality underlying most accounting and control systems. Accounting and control systems need to be analyzed and investigated both from the perspective of decision process models of organizational behavior (Cohen, March, and Olsen, 1972) and from the perspective of organizational power and politics (Bacharach and Lawler, 1980; Pfeffer, 1981).

Second, research in this domain requires specification of ways to measure the impacts of accounting and control systems on intraorganizational power. This is a difficult task, and, to date, more progress has been made toward the measurement of power distributions (Pfeffer and Moore,

1980; Pfeffer and Salancik, 1974) and the assessment of the determinants of power than toward the measurement of power itself. Until a better technology is in place for assessing the implications of a given accounting and control system for intraorganizational power, various surrogate indicators may have to be employed. Measures of centralization could be employed to assess the vertical changes in intraorganizational power; concepts from the communication network literature (Mackenzie, 1978) might be applied to the measurement of implied changes in the horizontal distribution of power.

Third, once appropriate measures have been developed, testing the consonance hypotheses across many systems and organizations remains to be accomplished. A benefit of this empirical testing can be to unite and improve two streams of research in the accounting and control literature which are currently too disparate. These are the descriptive approach to research in accounting, which focuses on the behavioral implications of accounting practices, and the prescriptive approach which focuses on the improvement of practice. The systematic empirical testing of the consonance hypotheses may benefit both research and practice.

The implications of these hypotheses for practice are fairly self-evident, but sharply divergent from those suggested by the majority of prescriptive research on accounting and control systems. To the extent that these consonance hypotheses are correct, it is possible to predict a) the intraorganizational circumstances under which resistance and potential system failure will occur; b) the likely sources of such resistance; and c) some alternative strategies for ameliorating the resistance and opposition. If the goal of the people implementing the system is to minimize resistance and maximize system success, accounting and control systems

can be designed to be consonant with organizational power distributions and cultures. If, however, the goal is to effect significant organizational change, the issues of resistance and potential system failure will need to be addressed explicitly. Under these circumstances, various political strategies and tactics (Pfeffer, 1981) will need to be employed in order to achieve effective implementation.

Another implication of the case examples presented is the fact that resistance is fundamentally a result of structural factors, such as power distributions and organizational cultures, rather than a result of processual factors, such as the strategy and tactics of system implementation. These latter factors, like the oft-cited user participation in the design process, may alleviate resistance, but the failure to perform them does not necessarily cause resistance. As Markus (1981) argued in a more detailed analysis of the 3PA system, the causes of resistance can be found in threats to the existing power distributions: user participation can help ensure that the system does not threaten power arrangements, but it is not, by itself, a determinant of system success. Power distributions and organizational paradigms and cultures are long-lasting and taken as facts by organizational participants. Designers and implementers of accounting and control systems must either conform the system to these factors or change the factors themselves. The available evidence certainly indicates that unless design and implementation efforts address these structural features of organizations, they will not be successful, whether or not they employ process strategies.

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