

MANAGEMENT CONTROL SYSTEMS AND DEPARTMENTAL INTERDEPENDENCIES: AN EMPIRICAL STUDY

N. B. MACINTOSH

School of Business, Queen's University, Kingston, Canada

and

R. L. DAFT

Department of Management, Texas A & M University

Abstract

Behavioral accounting research suggests that (1) the design and use of a management accounting system is related to overall characteristics of the organization, and (2) a management accounting system is one element in a package of control systems. The research reported here investigated the relationship between the organizational characteristic of departmental interdependence and the design and use of three elements in a package of management controls — the operating budget, periodic statistical reports, and standard operating policies and procedures. The findings support the hypothesis that departmental interdependence is related to the emphasis placed on each management control system. Standard operating procedures were an important control device when interdependence was low. The budget and statistical reports were used more extensively when interdependence was moderate. When interdependence among departments was high, the role of all three control systems diminished.

The literature on accounting control suggests that the design and focus of management accounting systems may be related to overall characteristics of the organization. From this perspective accounting systems are intertwined with the way organizations function, and they can be studied in conjunction with their organizational setting (Waterhouse & Tiessen, 1979; Otley, 1980; Ewusi-Mensah, 1981; Birnberg *et al.*, 1983; Burchell *et al.*, 1980; Merchant, 1981; Hopwood, 1983; Gordon & Narayanan, 1984; Govindarajan & Gupta, 1985). The purpose of the research reported here is to explore the relationship of one such characteristic — departmental interdependence — and control system design.

DEPARTMENTAL INTERDEPENDENCE

The design of organizations and internal sys-

tems is related to factors such as the external environment (Duncan, 1972; McCann & Selsky, 1984), technology (Fry, 1982; Daft & Macintosh, 1981) and interdependence among departments (Thompson, 1967). Although a growing body of research supports the relationship between organization design and environment or technology, interdependence among departments is an area of potential new insight into the design of control systems within organizations. Interdependence is the extent to which departments depend upon each other and exchange information and resources to accomplish their respective tasks (Van de Ven *et al.*, 1976; McCann & Ferry, 1979). The concept of interdependency is proposed as an organizational variable relevant to control systems for two reasons. First, interdependency reflects workflow and hence the amount of coordination and feedback needed among departments. The data available

for coordination and feedback may be available from the management systems used to manage and control those departments (Thompson, 1967; Van de Ven *et al.*, 1976; Tushman, 1977). Second, several accounting researchers have identified interdependency across departments as a potentially important organizational variable for future management accounting studies (Watson & Baulmer, 1975; Hayes, 1977; Ginzberg, 1980; Otley, 1980; Kilmann, 1983; Emmanuel & Otley, 1985; Merchant, 1985; Chenhall & Morris, 1986).

Thompson (1967) first proposed the role of interdependence in organizational design, and defined three types that are widespread in modern organizations — pooled, sequential and reciprocal. Each of these place unique and identifiable demands on management systems and processes. Pooled is the lowest form of interdependence. Departments are relatively autonomous and little work flows between them. This occurs when departments are self-contained, or when they provide services to geographically distributed clients. Branch banks and stores are examples of units that operate independently of each other. Operating units share resources (e.g. financial, advertising) from a common pool. The low level of interdependence leads to standardized coordination through rules and procedures.

Sequential interdependence involves the linkage of organizational departments in serial fashion. The output of one department becomes a direct input to the next department. Each department completes its work by depending on work from preceding departments. Breakdowns and disruptions in this work flow do occur and place greater coordination and control demands on the organization than does pooled interdependence. Here accounting and control systems may be used to facilitate planning and scheduling, and also encourage feedback to coordinate workflow between departments.

The third and highest form of interdependence is reciprocal. It is characterized by the movement of work back and forth among departments in reciprocal fashion. Organizational departments featuring reciprocal interdependence typically work jointly on the same project

or customer. Services are customized and coordinated on the basis of feedback about the project and mutual adjustment among the specialized departments. In a hospital, for example, a patient may move back and forth among departments (X-ray, surgical, psychiatric) on the basis of the most current information and feedback about the patient's health. Reciprocal interdependence places a heavy demand on management for coordination. Standardization and accounting information often are not sufficient for coordination, so face-to-face interaction and mutual adjustment may be required.

MANAGEMENT CONTROL SYSTEMS

The role of management accounting systems in organizational control traditionally has been studied in isolation from characteristics of the total organization and from other non-accounting based control systems (Young, 1979; Flamholtz, 1983; Macintosh, 1985). Recently a few researchers have argued that this narrow view is part of the reason that we still do not have a good understanding of how management accounting systems function (Gordon & Miller, 1976; Otley & Berry, 1980; Daft & Macintosh, 1984).

The reason accounting systems alone represent a narrow view is that the package of formal controls in an organization typically includes: accounting reports, the budget, formal hierarchy and supervision; job descriptions; rules and standard operating procedures; statistics for measuring performance; organization structure; employee performance appraisal systems; and corporate culture (Lawler, 1976; Flamholtz, 1983). These controls may seem an *ad-hoc* collection of techniques and mechanisms, but in many cases they are the tangible elements of a strategy to create an integrated organizational control package (Otley & Berry, 1980; Otley, 1980; Flamholtz, 1983). In this research we propose to investigate the way three control sub-systems interrelate with one another as well as the way the package fits the organizational setting.

Operating budget

The operating budget schedules and records department revenue and expenditures for salaries, noncapital equipment and other operating expenses. The budget is considered a crucial component of the control system package (Horngren, 1982; Kaplan, 1982). Usually a detailed operating budget is drawn up for the forthcoming year and then periodic budget reports are issued (usually monthly) to provide information to department managers and upper management about progress toward budget targets.

Statistical reports

In addition to the budget, most organizations rely on periodic operational reports that provide upper management with information on departmental outputs and performance (Daft & Macintosh, 1984). These reports are composed of statistical data such as number of personnel, number of new customer contracts, volume of orders received and on hand, machinery down time and other statistics relevant to the department. Most of the data in these reports are nonfinancial and are issued in weekly, monthly or quarterly reports. The specific content of these reports may differ across departments. These reports normally originate in staff units other than accounting or finance, such as MIS or computing services.

Standard operating procedures and policies

The set of written rules, procedures, policies and operating manuals (SOPs) are used to guide managers as they administer their departments. The SOPs also include general policy guidelines, job descriptions and prescriptions for how managers should handle operational situations that might arise.

that includes target setting, monitoring of performance, and feedback for correction. Management control systems should theoretically assist managers to perform the control cycle. Control systems also help managers evaluate employees and coordinate across departments. Depending upon the emphasis given to a control system within the organization, its scope and frequency may vary, and so may the emphasis given to each control function, such as target setting, monitoring, and coordination. Moreover, control systems have the potential to exert a motivational force on employees who are affected by the system (Hopwood, 1976; Brownell, 1982; Daroca, 1984; Merchant, 1985). Management control systems can vary in terms of many characteristics including: scope; reporting frequency; influence in target setting; importance for key functions (planning, coordination and measurement); emphasis, response to variances, and influence on day-to-day operations. The three interdependencies (pooled, sequential, reciprocal) are expected to be related to the design and use of budgets, statistical reports and SOPs along these dimensions. The overall research model is illustrated in Table 1. The reasons for the hypothesized relationships are as follows.

Under conditions of pooled interdependency, organizations rely on standardization for controlling operating departments (Van de Ven *et al.*, 1976; Mintzberg, 1979). Standardization makes possible the operation of the independent tasks over time by assuring that segments of the organization are operating in compatible ways. "It is in such situations that the bureaucratic techniques of categorization and impersonal application of rules have been most beneficial" (Thompson, 1967, p. 17). Thus SOPs are expected to be a primary control medium when interdependence is pooled and consequently the scope, function and motivational impact of SOPs are expected to be high. Most control and coordination needs can be met through SOPs. Other forms of control, such as budgets and statistical reports, are not expected to be important when interdependence is low. Hence budgets and statistical reports are expected to receive less emphasis than SOPs when organizational depart-

THE RESEARCH MODEL

The theoretical question to be addressed concerns the relationship between the design and use of these management control systems and the type of interdependence among departments. Control is typically a three-stage cycle

ments experience pooled interdependence. These arguments are summarized in the following hypotheses.

Hypothesis 1a. The use of SOPs for control will be positively correlated with the extent of pooled interdependence among departments.

Hypothesis 1b. The use of operating budget and statistical reports for control will be negatively correlated with the extent of pooled interdependence among departments.

For sequential interdependence, performance in a department depends on the work of other departments in the chain. Planning and scheduling are critical to ensure that departments provide necessary resources for other departments in the work flow. Measurement of output is important so that management can monitor whether activities are on schedule and can respond to any exceptions or deviations that arise. The pressure to run interdependent departments without interruption can lead to a strong control mentality from the top to coordinate differences among departments (Mintzberg, 1979). The primary control systems used by managers under these conditions are expected to be the budget and statistical reports. The budget provides for the planning and scheduling of resources into each department and statistical reports measure and monitor outputs from each department.

The greater coordination and control demand of sequential interdependence is expected to mean that budgets and statistical reports will receive greater control emphasis than SOPs as a mechanism of management control. SOPs provide standardization when interdependence is low, but they are not expected to be emphasized or to provide sufficient control when interdependence is sequential because each department in the chain is performing a different task. These relationships are reflected in the following hypotheses.

Hypothesis 2a. The use of the operating budget and statistical reports for control will be positively correlated with the extent of sequential interdependence among departments.

Hypothesis 2b. The use of SOPs for control will be negatively correlated with the extent of sequential interdependence among departments.

When departments experience reciprocal interdependence, organizational performance is based on the ability to fuse diverse departments into a joint effort. Coordination and control come from rapid mutual adjustment and face-to-face communication among departments, and feedback from the customer or client (Thompson, 1967). The transformation process is difficult to quantify, and performance tends to be based on whether the joint activities produce the best outcome rather than on schedules or ef-

TABLE 1. Proposed relationship between department interdependency and use of management control systems

| Departmental interdependency | Preferred means of control | Hypothesized relationship of interdependency with use of control system |
|------------------------------|----------------------------|---|
| Pooled | Standardization | (+) SOPs (-) Operating budget (-) Statistical reports |
| Sequential | Planning and measurement | (-) SOPs (+) Operating budget (+) Statistical reports |
| Reciprocal | Mutual adjustment | (-) SOPs (-) Operating budget (-) Statistical reports |

(+) positive relationship.

(-) negative relationship.

iciency. Control systems such as standardization, rules, procedures, planning, budgets and formal reports are expected to be less important for control when interdependence is very high. The impersonal control of SOPs and the data in the budget and statistical reports tend not to capture the dynamic nature of mutual adjustment (Hayes, 1977). Professional norms, supervision and other forms of personal, decentralized control become more important under conditions of reciprocal interdependence. Thus the scope, function and motivational impact of formal management control systems such as SOPs, budget and statistical reports are expected to be low under conditions of reciprocal interdependence.

Hypothesis 3. The use of SOPs, budget, and statistical reports for control will be negatively correlated with the extent of reciprocal interdependence among departments.

RESEARCH METHOD

Sample

The main criterion used to guide sample selection was the need to include a wide range of departmental tasks to have variation in interdependencies. To accomplish this, twenty five firms representing each industrial and commercial category in a directory of industrial and commercial enterprises were selected at random and contacted to see if they would participate in the study. Organizations from the service and public sectors were also included to ensure that the sample represented a cross section from both the private and public sectors.

Eighty percent of the organizations contacted agreed to participate in the study. During the preliminary visits, the control systems in each organization were discussed with the corporate controller or his counterpart. Within each organization every attempt was made to obtain a diverse cross-section of departments. The main criteria for inclusion in the sample was that the department managers had a clearly defined responsibility for meeting their operating budget.

In one company, for example, plant, marketing, personnel and engineering departments were selected. The final sample included 90 major departments from twenty organizations in five sectors of the economy. The organizations were located in the U.S.A. and Canada. Details of the sample are given in Table 2.

Data collection

The primary method of data collection consisted of a personal interview with each department manager. A preliminary interview format had been pre-tested on managers in several organizations, after which the final questionnaire was developed. Personal interviews were used because they eliminated some of the distortions ascribed to mail questionnaires when used to measure organizational phenomena.

The interviews were conducted in the offices of the department managers. They were asked to pull out the actual budget and statistical reports under investigation, and these documents remained in front of the managers as they responded to the interview questions. The SOPs were also on hand, usually in the manager's office or nearby.

Two types of measurements were obtained. First, actual physical counts were taken of the number of books, pages and lines of standard operating procedures and practices. The second measurement involved asking managers for their perception of how the controls were used, such as for motivational impact. The managers were asked, for example, to rate the level of difficulty of budget targets, using a nine point scale ranging from "very easy to achieve" to "almost impossible to achieve". For the interdependence variables the managers were shown diagrams (Appendix A) and asked for their perception of the work flow between their department and other departments. This instrument was developed and validated by Van de Ven *et al.* (1976).

FINDINGS

The statistical tests of the hypotheses about

TABLE 2. Sample composition

| Sector | Main activities of each organization |
|-----------------------|--|
| 1. Manufacturing | a. Machinery (6) b. Electronics (6) c. Wood products (3) d. Textiles (4) e. Oil, gas, and petrochemicals (3) f. Wine (4) g. Spirits (7) h. Telephone and telecommunications equipment (5) |
| 2. Merchandising | a. Large, general department store chain (7) b. Specialty department store chain (3) c. Clothing retail chain (3) |
| 3. Consumer marketing | a. Food products (5) b. Personal, food, and grocery products (4) |
| 4. Service | a. Advertising (3) b. Telephone and telecommunications (6) c. Bank (3) d. Finance (2) e. Trust and banking (4) |
| 5. Health care | a. Hospital (9) b. Faculty of medicine (3) |

Figures in parentheses represent the number of departments sampled in each organization.

the design and use of control system and the extent of interdependence are shown in Tables 3, 4 and 5. The tables report partial correlation coefficients that control for department size. The departments varied widely by size, and a substan-

tial literature indicates that size is associated with greater use of bureaucratic rules and other forms of impersonal control (Child, 1972; Khandwalla, 1974; Bruns & Waterhouse, 1975; Waterhouse & Tiessen, 1979; Merchant, 1981;

TABLE 3. Partial correlations (controlling for size) of standard operating procedures and departmental interdependence

| Characteristics of the standard operating procedures | Pooled | Interdependencies | |
|---|--------|-------------------|------------|
| | | Sequential | Reciprocal |
| 1. Number of books | 0.33* | — | — 0.22† |
| 2. Number of pages | 0.31* | — | — 0.30* |
| 3. Percentage of departmental work covered | 0.29† | — | — 0.24† |
| 4. Percentage of time necessary to follow SOP's to do work well | 0.22† | — | — 0.21† |
| 5. Adherence to SOP's used to evaluate performance | — | — | — |
| 6. Influence of SOP's on department activities and operations | 0.27† | — | — 0.32* |

* $p < 0.01$.

† $p < 0.05$.

— Not significant.

TABLE 4. Partial correlations (controlling for size) of budget characteristics and departmental interdependence

| Budget characteristics | Pooled | Interdependencies | |
|--------------------------------|---------|-------------------|------------|
| | | Sequential | Reciprocal |
| Frequency | 0.22† | — | — |
| Target difficulty | — 0.26† | — | — |
| Influence in target setting | | | |
| Upper management | — | 0.23† | — 0.23† |
| Department manager | — | — | — 0.32* |
| Department employees | — | — | 0.18‡ |
| Importance for | | | |
| Planning | — | — | — |
| Coordination | — | 0.18‡ | — |
| Measure and monitor | — 0.18‡ | 0.24† | — 0.23† |
| Emphasis on meeting targets | — | 0.25† | — 0.19‡ |
| Response to negative variances | — | — | — |
| Influence on daily activities | — 0.25† | 0.29† | — |

* $p < 0.01$.† $p < 0.05$.‡ $p < 0.10$.

— Not significant.

TABLE 5. Partial correlations (controlling for size) of statistical reports characteristics and departmental interdependence

| Statistical reports characteristics | Pooled | Interdependencies | |
|-------------------------------------|---------|-------------------|------------|
| | | Sequential | Reciprocal |
| Frequency | — 0.33* | — | — 0.22‡ |
| Target difficulty | — 0.37* | 0.33† | — |
| Influence in target setting | | | |
| Upper management | — | 0.19‡ | — |
| Department manager | — 0.33* | — | 0.21‡ |
| Department employees | — 0.28* | — | 0.22‡ |
| Importance for | | | |
| Planning | — | — | 0.36‡ |
| Coordination | — 0.28* | — | 0.21‡ |
| Measure and monitor | — 0.29* | — | — 0.29* |
| Emphasis on meeting targets | — | 0.25‡ | — |
| Response to negative variances | — | — | — |
| Influence on daily activities | — 0.22† | 0.20‡ | — |

* $p < 0.01$.† $p < 0.05$.‡ $p < 0.10$.

— Not significant.

Kimberly, 1983; Daft, 1986). Otley (1978) found that operating unit size had a significant impact on budget behavior. Controlling for the

effect of size should provide a better test of whether systematic differences in interdependence are related to control system scope and

use. The overall tendency of controlling for size is to weaken the correlations slightly, although a few small correlations for the budget and statistical reports disappeared.

The findings in Table 3 support Hypothesis 1a that the use of SOPs will have a positive correlation with pooled interdependence. Five of the six SOP characteristics are significantly associated with pooled interdependence, including the quantity and coverage of SOPs, the necessity to follow them to do the job well, and SOP influence on daily operations.

Table 3 also indicates that the extent of sequential interdependence has no relationship with standard operating procedures, but that the extent of reciprocal interdependence has a negative relationship. These findings are consistent with the theoretical argument that as the level of interdependence increases, the size and use of SOPs as a primary control device will decline.

The results in the first column of Tables 4 and 5 provide modest support for Hypothesis 1b that the operating budget and the statistical reports will be negatively correlated with pooled interdependencies. Four budget and seven statistical reports characteristics were negatively associated with pooled interdependence. The overall finding is that the use of SOPs appears to be an important control for departments having pooled interdependencies while the budget and the statistical reports are less so.

Hypothesis 2a proposed that under conditions of sequential interdependence organizations will emphasize the operating budget and statistical reports for control. The results in the second column of Tables 4 and 5 provide some support for this relationship. Five budget characteristics and four statistical report characteristics were positively associated with sequential interdependence. In general, for sequential interdependency it appears that top management have a lot of influence in setting targets, and these controls have motivational force on employees. This is consistent with Mintzberg's (1979) idea that a strong top-down control mentality prevails in sequentially interdependent departments.

Hypothesis 3 stated that managers in reciprocally interdependent departments will rely less on the three formal control systems than managers in departments with low interdependence. The data generally support this hypothesis for the SOPs and the budget. Five of the six SOP characteristics (Table 3, column 3) and four budget characteristics (Table 4, column 3) are negatively associated with reciprocal interdependence. SOPs and budgets thus are reported to be used less as the level of interdependence increases.

Contrary to Hypothesis 3 some characteristics of the statistical reports are positively associated with reciprocal interdependence (Table 5, column 3). Statistical reports appear to be used more for planning and coordination when interdependence is high. Department managers and lower level employees also have more influence in target setting. Thus SOPs and budgets are used less under conditions of reciprocal interdependence while the statistical reports seem to play an expanded role in planning, target setting and coordination. Planning and target setting also seem to entail more participation from lower level employees.

DISCUSSION AND IMPLICATIONS

The research reported here gathered data from 90 departments in 20 organizations to examine the relationship between departmental interdependence and control systems. The hypothesized pattern was that increasing levels of interdependence would be associated with differential use of SOPs, the budget and statistical reports. All three control systems were used in the organizations, but the scope and extent of use did differ by extent of departmental interdependence.

Under conditions of pooled interdependence, the organizations in the sample seemed to rely more on SOPs and less on budget and statistical reports. A requirement of pooled interdependence is that departments operate in compatible ways, but frequent adjustments are not needed. For example, Daft (1986) cites the McDonald's

fast-food chain as an example of pooled interdependence where each component used procedures and reports as a way of standardizing outcomes.

For sequentially interdependent departments the findings indicated that managers tended to use budgets and statistical reports more than SOPs. The sequential linkage among departments appears to require more emphasis on resources, targets, scheduling, monitoring and feedback, which are accomplished with budgets and periodic operational reports. Management accounting systems and statistical reports are well-suited to measuring the performance of departments when internal variables are the major explanators of effectiveness (Hayes, 1977), and in large, process dominated organizations (Bruns & Waterhouse, 1975).

The findings also indicated that under conditions of reciprocal interdependence the budgets and SOPs were used less than when interdependence was low. Reciprocal interdependence increases uncertainty, and managers used statistical reports for planning and coordination. Statistical reports probably were used less for measuring and monitoring because work flow is hard to quantify and measure under reciprocal interdependence. Management accounting tools and other traditional controls seem to lose their primacy under the uncertainty and rapid adaption needed for reciprocal coordination. The findings are consistent with Mintzberg's (1979) suggestion that the need for quick response and sophisticated innovation, with different departments joining forces around specific projects, means the organization cannot rely on rules, standardization and all the regular bureaucratic trappings. Expert knowledge, mutual adjustment, and full-time project managers replace formal reporting systems, SOPs, and emphasis on hierarchical arrangements (Thompson, 1967). Formal controls are still used, of course, but more often for help with planning and coordinating by lower managers than for top level performance monitoring.

Reciprocal interdependence appears to pose the greatest challenge to formal management control systems. Financial data and budgets ap-

parently do not play as large a role for departments such as R&D and Marketing in which reciprocal interdependence dominates (Hayes, 1977). Our findings indirectly support Govindarajan's (1984) finding that business units facing higher environmental uncertainty rely more on subjective performance evaluations than on formula-based ones. A basic tenet of management accounting is that managers should be held accountable for aspects of performance, such as costs, over which they have control. Yet this tendency may not fit reciprocal interdependence. The task of each department is highly dependent on the on-going work of several other departments (Hayes, 1977). Formal reporting systems may be used for planning, but they are not emphasized for current detailed data for coordinating or measuring the effectiveness of highly interdependent groups (Hayes, 1977). Although we did not test mutual adjustment directly, the requisite coordination and control seems to be achieved through personal interaction, frequent communication, and mutual adjustment by the various managers and employees involved (Van de Ven *et al.*, 1976; Daft & Macintosh, 1978; Cheng, 1983).

In conclusion, we want to address the questions raised at the beginning of this paper — do management control systems vary with departmental interdependence, and do accounting systems fit within a larger organizational control package? Watson & Baumler (1975), Bruns & Waterhouse (1975), Hayes (1977), Ginzberg (1980), and Otley (1980) proposed that departmental interdependence may be a design parameter that influences the use of accounting and information systems as integrating and control devices. The findings reported in this paper support this line of thinking and indicate how each of three control systems are used depending upon the level of departmental interdependence.

One interpretation of the findings is that the role of each control system reflects a fit between the need for information created by interdependence and the supply of information provided by the control system. SOPs are a standing body of knowledge that is appropriate for specifying

standard behaviours across relatively stable and independent departments. Sequential interdependence creates a need for more data to schedule, plan, and monitor the flow of material and activities between departments. Budgeting and statistical reports, which can provide data on a monthly, weekly, or even a daily cycle, provide data that are more current and more relevant than SOPs for the short time horizon needed for coordination. When interdependence among departments is reciprocal, the information requirements begin to outstrip the data supplied by formal control systems. These systems may be used for planning and scheduling, but special emphasis is given to face-to-face coordination and mutual adjustment. Since managers cannot predict in advance the problems that may arise and the information required, the data contained in formal reports will not cover all problems, and hence will receive less emphasis than in the case of pooled and sequential interdependence. Thus as interdependence increases, data are needed that are current, timely, and pertain to unpredictable events. These data are supplied in turn by SOPs, budgets, statistical reports and by direct managerial involvement in face-to-face coordination.

The question of an organizational control package also seems to have received a partial answer from our analysis of the data. Although we can't say whether managers consciously designed each control system to play a different role, we did find that control systems were used in different yet complementary ways. SOPs were used to direct behaviour for stable, independent departments, while budgets and statistical reports were used to plan, monitor, and correct activities associated with resource inputs into departments and outputs from those departments. Although we focused on only three control systems, we found that all three were related to management functions, and had a good deal of

motivational force. Moreover, department managers reported a high degree of satisfaction with all three control systems.

One realistic implication of the control package concept is that accounting systems designers may want to consider the management accounting system as part of a larger organizational control system. The presence of SOPs and periodic statistical reports may influence how the accounting system is used. Accountants tend to focus on the financial aspects of the organization, and pay less attention to other control information needed by managers. If management accountants are aware of the unique control problems posed by organization characteristics such as pooled, sequential, and especially reciprocal interdependence, they will be in a position to provide leadership in the selection of the requisite control framework.

In conclusion, this research attempted to increase understanding of control within the organizations by examining a package of control systems and comparing their use to departmental interdependency (Otley, 1980). Previous studies have found that forces such as environmental uncertainty, technology, business strategy and decentralization are related to overall structure and control processes. Interdependence among departments seems related to the use of control systems at the department level. Taken together the accumulated findings suggest an agenda for future research: begin to combine separate models into a larger theory, and undertake new empirical studies that integrate several organizational variables and management control systems into a unified framework. Although a single study cannot assess all variables, efforts to integrate past empirical findings may provide both new theoretical knowledge and normative applications for control system design.

BIBLIOGRAPHY

- Birnberg, J. G., Turopolec, L. & Young, S. M., The Organizational Context of Accounting, *Accounting, Organizations and Society* (1983) pp. 111-129.

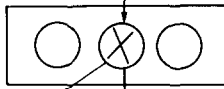
- Brownell, P., Participation in the Budgeting Process: When it Works and When it Doesn't, *Journal of Accounting Literature* (1982) pp. 124–153.
- Bruns, J. C. & Waterhouse, J. H., Budgeting, Control and Organizational Structure, *Journal of Accounting Research* (Autumn 1975) pp. 177–203.
- Burchell, S., Clubb, C., Hopwood, A. G., Hughes, J. & Nahapiet, J., The Role of Accounting in Organizations and Society, *Accounting, Organizations and Society* (1980) pp. 5–27.
- Chenhall, R. H. & Morris, D., The Impact of Structure, Environment, and Interdependence on the Perceived Usefulness of Management Accounting Systems, *The Accounting Review* (January 1986) pp. 58–75.
- Cheng, J. L., Interdependence and Coordination in Organizations: A Role-System Analysis, *Academy of Management Journal* (1983) pp. 156–162.
- Child, J., Organization Structure and Strategies of Control: A Replication of the Aston Study, *Administrative Science Quarterly* (1972) pp. 163–177.
- Daft, R. L., *Organizational Theory and Design* (Saint Paul, MN: West Publishing, 1986).
- Daft, R. L. & Macintosh, N. B., A New Approach to Design and Use of Management Information, *California Management Review* (1978) pp. 82–92.
- Daft, R. L. & Macintosh, N. B., A Tentative Exploration into the Amount and Equivocality of Information Processing in Organizational Work Units, *Administrative Science Quarterly* (1981) pp. 207–224.
- Daft, R. L. & Macintosh, N. B., The Nature and Use of Formal Control Systems for Management Control and Strategy Implementation, *Journal of Management* (1984) pp. 43–66.
- Daroca, F. P., Informational Influences on Group Decision Making in a Participative Budgeting Context, *Accounting, Organizations and Society* (1984) pp. 13–32.
- Duncan, R. B., Characteristics of Organizational Environment and Perceived Environmental Uncertainty, *Administrative Science Quarterly* (1972) pp. 313–327.
- Emmanuel, C. & Otley, D., *Accounting for Management Control* (New York: Van Nostrand Reinhold, 1985).
- Ewusi-Mensah, K., The External Organizational Environment and Its Impact on Management Information Systems, *Accounting, Organizations and Society* (1981) pp. 301–316.
- Flamholtz, E. G., Accounting, Budgeting and Control Systems in Their Organizational Context, *Accounting, Organizations and Society* (1983) pp. 153–169.
- Fry, L. W., Technology-Structure Research: Three Critical Issues, *Academy of Management Journal* (1982), pp. 535–522.
- Ginzberg, M. J., An organizational Contingencies View of Accounting and Information Systems Implementation, *Accounting, Organizations and Society* (1980) pp. 369–382.
- Gordon, L. A. & Miller, D., A Contingency Framework for the Design of Accounting Information Systems, *Accounting, Organizations and Society* (1976) pp. 59–69.
- Gordon, L. A. & Narayanan, V. K., Management Accounting Systems, Perceived Environmental Uncertainty and Organizational Structure: An Empirical Investigation, *Accounting, Organizations and Society* (1984) pp. 33–47.
- Govindarajan, V., Appropriateness of Accounting Data in Performance Evaluation: An Empirical Examination of Environmental Uncertainty as an Intervening Variable, *Accounting, Organizations and Society* (1984) pp. 125–135.
- Govindarajan, V. & Gupta, A. K., Linking Control Systems to Business Unit Strategy: Impact on Performance, *Accounting, Organizations and Society* (1985) pp. 51–56.
- Hayes, D. C., The Contingency Theory of Management Accounting, *The Accounting Review* (January 1977) pp. 22–39.
- Hopwood, A. G., On Trying to Study Accounting in the Contexts in which it Operates, *Accounting, Organizations and Society* (1983) pp. 287–305.
- Hopwood, A. G., *Accounting and Human Behavior* (Englewood Cliffs, NJ: Prentice-Hall 1976).
- Horngren, C. T., *Cost Accounting: A Managerial Emphasis* 5th edn. (Englewood Cliffs, NJ: Prentice-Hall 1982).
- Kaplan, R. S., The Evolution of Management Accounting, *The Accounting Review* (July 1984) pp. 390–418.
- Kaplan, R. S., *Advanced Management Accounting* (Englewood Cliffs, NJ: Prentice-Hall, 1982).
- Khandwalla, P. N., Mass Output Orientation of Operations Technology and Organizational Structure, *Administrative Science Quarterly* (March 1974) pp. 74–97.
- Kilmann, R. H., The Costs of Organization Structure: Dispelling the Myths of Independent Divisions and Organization-Wide Decision Making, *Accounting, Organizations and Society* (1983) pp. 341–357.
- Kimberly, J. R., Organizational Size and the Structuralist Perspective: A Review, Critique and Proposal,

- Administrative Science Quarterly* (1983) pp. 571–597.
- Lawler, E. E., III, Control Systems in Organizations, in Dunnette, M. D. (ed.), *Handbook of Industrial and Organizational Psychology*, (Skokie, IL: Rand McNally, 1976).
- McCann, J. E. & Ferry, D. L., An Approach For Assessing and Managing Inter-unit Interdependencies, *Academy of Management Review* (1979) pp. 113–119.
- McCann, J. E. & Selsky, J., Hyperturbulence and the Emergence of Type 5 Environments, *Academy of Management Review* (1984), pp. 460–470.
- Macintosh, N. B., *The Social Software of Accounting and Information Systems* (Chichester: John Wiley, 1985).
- Merchant, K. A., The Design of the Corporate Budgeting System: Influences on Managerial Behavior and Performance, *The Accounting Review* (October 1981) pp. 813–829.
- Merchant, K. A., Budgeting and the Propensity to Create Budgetary Slack, *Accounting, Organizations and Society* (1985) pp. 201–210.
- Mintzberg, H., *The Structuring of Organizations* (Englewood Cliffs, NJ: Prentice-Hall 1979).
- Otley, D. T., Budget Use and Managerial Performance, *Journal of Accounting Research* (Spring 1978) pp. 122–149.
- Otley, D. T., The Contingency Theory of Management Accounting, *Accounting, Organizations and Society* (1980) pp. 413–428.
- Otley, D. T. & Berry, A. J., Control, Organisation and Accounting, *Accounting, Organizations and Society* (1980) pp. 231–244.
- Thompson, J. D., *Organizations in Action* (New York: McGraw-Hill 1967).
- Tushman, M. L., Special Boundary Roles in the Innovation Process, *Administrative Science Quarterly* (December 1977) pp. 587–605.
- Van de Ven, A. H., Delbecq, A. L. & Koenig, R. Jr., Determinants of Coordination Modes Within Organizations, *American Sociological Review* (1976) pp. 322–338.
- Waterhouse, J. H. & Tiessen, P., A Contingency Framework for Management Accounting Systems Research, *Accounting, Organizations and Society* (1979) pp. 65–76.
- Watson, D. J. H. & Baumler, J. V., Transfer Pricing: A Behavioral Context, *The Accounting Review* (July 1975) pp. 466–474.
- Young, D. W., Administrative Theory and Administrative Systems: A Synthesis Among Diverging Fields of Inquiry, *Accounting, Organizations and Society* (1979) pp. 235–244.

APPENDIX A. INTERDEPENDENCIES QUESTIONNAIRE FORM

1. Independent work flow

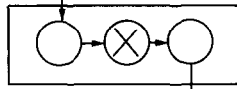
Work enters organization



Work Leaves organization

2. Sequential work flow

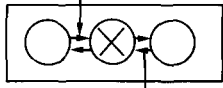
Work enters



Work leaves

3. Reciprocal work flow

Work enters



Work Leaves

How much work normally flows between your unit and other units in this manner?

| Almost none | Some | About half | A lot | Almost all | | | | |
|-------------|------|------------|-------|------------|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|