Strategy, Structure and Information-Based Control Systems: A Theoretical Integration and Empirical Investigation

John W. Hill
Marya Leatherwood

College of Commerce and Business Administration
Bureau of Economic and Business Research
University of Illinois, Urbana-Champaign
Strategy, Structure and Information-Based Control Systems: A Theoretical Integration and Empirical Investigation

John W. Hill
Indiana University

Marya Leatherwood, Assistant Professor
Department of Business Administration
ABSTRACT

While organization and agency theories have different perspectives of controls, both bring important contributions to a theoretical marriage. This study integrates these theories to develop and test predictions about the use and configuration of information-based controls. Controls are shown to be a function of the influence of strategy and structure on uncertainty and task observability. A diversification strategy that increases organizational uncertainty is linked to the use of real-time accounting information systems. Internal auditing is associated with a formalized structure that creates the need to enforce rule compliance on the part of employees. Outcome controls, in the form of responsibility accounting measurement systems, are tied to structural characteristics that limit the effectiveness and efficiency of behavior controls and increase uncertainty about subordinate managers' behavior. Finally, dependencies between the controls appear to arise because of their complementary capabilities. In this study, outcome and behavior controls are found to be conjunctive as opposed to being substitutes. The results have implications for the design of information-based control systems and future controls research.
One of the many industries deregulated during the Reagan years was the financial industry. Deregulation authorized savings and loan associations (S&Ls) to provide the same services previously reserved for commercial banks and relaxed restrictions on interstate and intrastate branching. The competitive forces unleashed by deregulation placed increasing pressure on S&Ls to a) change their strategy by expanding their array of client services and b) change their structure by increasing the number of locations at which those services were offered.

Prior to deregulation, the primary business of S&Ls consisted of residential mortgage lending. These loans have lower risk than other types of loans due to the nature of the collateral, and, accordingly, provide a lower rate of return to the lender. Following deregulation, S&Ls were permitted to expand into new services, many of which offered higher returns but carried greater risk (e.g., consumer loans and credit cards). Concurrently, S&Ls gained increased operational latitude from regulators and experienced opportunities to expand their markets into new locations geographically dispersed from their main facilities. Thus, S&Ls were faced with both opportunities for strategic and structural change and the accompanying problems associated with obtaining information to 1) reduce uncertainty about new services and 2) retain control over subordinates' actions.

This paper examines the effects of strategy and structure in the post-deregulation period on the types of information-based internal control systems used by S&Ls. Integrating organizational (Eisenhardt, 1985; Green, Wlesh and Baker, 1987; Green and Welsh, 1988; Ouchi and Maguire, 1975; Ouchi, 1977) and economic (Demski, 1980; Jensen and Meckling, 1976; Ross, 1973) perspectives on control, we predict that diversification into new and high risk services with greater outcome uncertainty will be related to the use of real-time information
systems of control that provide richer, finer and more timely information to the firm. These cybernetic control systems enable the S&L's primary manager to exercise a greater degree of control over the organization's activities despite the increase in outcome uncertainty that results from such diversification. In addition, we predict that internal auditing and responsibility accounting controls will be related to structural factors that create a need to enforce rule compliance and increase uncertainty about the actions of subordinate managers. Finally, we predict that these information-based control systems will be conjunctive, a condition that should result in an ordered pattern of control configurations.

Comparison of Organization and Agency Perspectives on Control

The means by which management controls subordinates' behavior is of concern to both academics and practitioners. Most control studies have taken either an organizational or an economic approach. However, Eisenhardt (1985) and Jones (1984) demonstrate that integrating agency theory with extant organizational research furthers our understanding of internal controls.

Eisenhardt (1985) compared organization and agency perspectives on control noting that, while both approaches had commonalities, each makes unique contributions to a theoretical marriage. Both theories are concerned with the determinants of control characteristics and the role of information in exercising control. Organization theory is concerned with goal congruence between the organization and its members. Agency theory is concerned with alignment of the principal's (owner's/superior's) interests with the agent's (subordinate's) interests. Both theories are concerned with efficiency, assume rationality, and distinguish between behavior and outcome controls. However, in several respects, each theory makes explicit what the other leaves implicit.
While organization theory implicitly assumes that control is costly, agency theory makes this cost explicit through information economics (Demski, 1980). Both theories regard information as necessary for control, but agency theory attaches an explicit cost/benefit framework to the production of information. Information will be produced only to the extent that its marginal benefit exceeds its marginal cost. In order for information to have value, it must result in the reduction of uncertainty about some economic outcome or the inputs that give rise to the outcome. Further, risk is related to outcome uncertainty, and those who bear risk must be compensated. Therefore, organization strategies that affect organizational uncertainty, such as diversification into higher-risk projects, are likely to have an impact on the organization's control system by virtue of their effect on risk-sharing arrangements. Thus, agency theory provides an explicit framework, absent in the organization approach, that considers the costs and benefits of information-based control systems.

Agency theory regards the firm as a network of contracts between principals and agents (Jensen and Meckling, 1976). However, it is silent about the effects of organization structure on the design of control systems while organization theory makes explicit predictions about the relationship between structure and control. For example, structural characteristics such as complexity, formalization and decentralization have been theoretically associated with the use of information-based control systems (Galbraith, 1973; Ouchi, 1977). Thus, the structural aspects of internal organization, ignored by agency theory, are held to be important by organization theory in explaining internal control configurations.

One important facet of control that is given explicit attention by agency theory is the role of auditing in reducing moral hazard (i.e. the propensity
for deliberate suboptimization by agents when principals cannot observe their efforts). In this study, auditing refers to the observation of or investigation of evidence about subordinate behavior by persons who are not in the subordinate's chain of command. Auditors may be external or internal to the organization. From an agency perspective, auditing assures principals that agents' representations of organizational performance are reasonable and valid (Watts and Zimmerman, 1985). In this role, auditing is used to validate the inputs to outcome controls. However, auditing can also provide managers with a means of ascertaining the extent to which subordinates comply with organizational policies and procedures (Cook and Winkle, 1980). Thus, auditing controls play an important role that has been largely overlooked in organization studies of control.

Finally, while organization and agency theories both consider how certain aspects of tasks affect the type of control used by organizations, the two approaches provide different insights into the choice of outcome controls over behavior controls. Organization theory has predicted that behavior control will be preferred when task programmability is high while outcome control will be used when the opposite condition holds assuming outcomes can be measured (Ouchi, 1979). Agency theory predicts that behavior control represents the "first best" internal control and that outcome control will be used only when circumstances make task observability uneconomical. Further, agency theory holds that outcome control carries an explicit cost in the form of a risk premium demanded by agents who are evaluated under outcome controls. Therefore, outcome control will be used only when agents' actions cannot be observed at a cost lower than the risk premium and the measurement costs associated with outcome control (Demski, 1980). While these predictions differ in subtle but important ways, they are not incompatible. Rather, their combination offers new insights into the choice of controls.
For example, the critical issue in the decision to use outcome controls may not be whether it is possible to observe a task per se, but whether it is possible to observe the task economically (Jones, 1984). This suggests the choice of behavior versus outcome controls is not just a function of the nature of the task but also of other factors, such as organization structure, which may limit task observability. This proposition holds importance for the design of information-based controls to complement organization structure. It also suggests that there is a need for studies which examine the relationship between organization structure, information cost and controls.

Thus, the integration of organization and agency theories permits insights into control that are not possible if the theories are taken alone. The contributions of the theories to this integration are summarized in Figure 1.

(Figure 1.)

Strategy and Information-Based Controls

The decision by S&Ls to offer new and high-risk services increased the need for information-based controls to reduce the uncertainty associated with the entrance into new markets. Diversification created the need to track the status of these new services. Strategic decisions to engage in practices such as consumer lending had two main effects on S&Ls. First, by offering a full line of consumer services, S&Ls were able to compete with banks. Second, there was an increased degree of risk associated with providing these services. Although the expected payoffs from many of the new services were higher, S&Ls faced a corresponding increase in uncertainty which stemmed from a) their unfamiliarity with the services and b) the inherently riskier nature of some of the services. Unmitigated, this increased uncertainty represented a cost to S&Ls in the form of some loss of control over organizational outcomes.
Previous research on organizational systems of control suggests that outcome uncertainty motivates management to use systems that provide richer, finer and more timely information. These systems allow management to quickly and selectively receive information at the level of detail desired. To the extent that such information can facilitate corrective action, real-time information systems assist management in exercising cybernetic control over organizational outcomes (Galbraith, 1973) and allow management to influence future performance (Green, Welsh and Baker, 1987). Agency theory holds that the value of information lies in its ability to reduce uncertainty about organizational outcomes and the inputs to those outcomes (Watts and Zimmerman, 1985). Thus, we predict that:

H1: real-time information systems will be used by organizations employing a diversification strategy that increases outcome uncertainty.

Structure and Information-Based Controls

Prior studies (e.g. Ouchi and Maguire, 1975; Ouchi, 1977) suggest that internal control may be accomplished by behavior or outcome controls. Behavior control focuses on governing subordinates’ activities through observation of their behavior while outcome control focuses on relating measures of outcomes to their actions. Ouchi and Maguire (1975) suggest that behavior and outcome controls serve somewhat different purposes within the firm. Behavior control is used when means/end relationships are known while outcome control occurs in response to managers' needs to provide evidence of performance. In this section, we posit that behavior control is used to control employee actions where task programmability and observability are high, and outcome control is used in situations where: a) structure severely limits observation of subordinates' actions and/or b) subordinates are delegated the authority to participate in decisions that have a low degree of programmability.
Behavior Control. Uncertainty also arises because of the potential for idiosyncratic actions by employees that result in suboptimal organization outcomes. One means of reducing such idiosyncratic actions is to promulgate policies, procedures and rules, referred to as formalization, to guide employee actions in situations where tasks are highly programmable. Formalization is defined as the proportion of codified jobs and the range of variation that is tolerated within the rules defining the jobs. The higher the proportion of codified jobs and the less the range of variation allowed, the more formalized the organization (Hage, 1965).

Although formalization is intended to minimize idiosyncratic actions by employees and, in turn, reduce outcome uncertainty associated with employee actions (Van de Ven et al., 1976), a means of enforcing rule compliance must exist for formalization to be effective. Agency theory (Demski, 1980; Ross, 1973) suggests that, to enforce behavioral compliance, principals can either directly observe agents' activities or purchase information about agents' behaviors (Eisenhardt, 1985).

It is usually impossible for the primary manager of a firm to personally observe most employee actions. Therefore, to enforce rules, the firm hires subordinate managers to observe and direct employee actions. This, however, does not assure rule compliance because subordinate managers have incentives to misreport their failure to properly manage (Birnberg et al., 1983). Therefore, to provide such assurance, the firm can hire internal auditors or contract with external auditors to examine and report on evidence of rule compliance. In this role, internal auditors are generally preferrable to external auditors for two reasons. First, because internal auditors are employees, not independent contractors, the primary manager is better able to direct their activities.
Second, because internal auditors are permanent members of the organization, they are met with less suspicion and are better able to extract information from other organization members (Williamson, 1975).

Thus, formalization of policies and procedures provides one means of aligning employee actions with organization objectives in situations where tasks are highly programmable and lend themselves to codification. Formalization requires a means of rule enforcement to be effective, and internal auditing supplies this means. We predict that:

H2: internal auditing systems will be found in organizations using formalization to exercise behavior control over employee actions.

Outcome Control. In situations where tasks are not highly programmable or subordinates' actions cannot easily be observed, outcome control is more likely to be used. While behavior control involves observing and correcting subordinates' behavior, outcome control is effected through the use of measures of performance outcomes. In organization studies, outcome control has been found to be associated with the absence of task programmability (Ouchi and Maguire, 1975) and task observability (Jones, 1984). Likewise, agency theory holds that if agents' efforts cannot be observed a moral hazard is present indicating the use of outcome controls (Jensen and Meckling, 1976; Holmstrom, 1986). Thus, low task observability and programmability decrease the effectiveness of behavior control and increase the likelihood that outcome controls will be used.

Task observability is lessened by the physical distance separating primary managers from subordinates. In spatially complex (i.e., more dispersed) organizations, subordinates interact less with the primary manager resulting in less task observability. For example, it is more difficult for an S&L's chief executive to visit twenty branches than to visit five branches. Thus, as task
observability decreases, uncertainty about subordinates' actions increases. Unmitigated, this increase in uncertainty represents a loss of control.

The delegation of tasks that are not highly programmable also results in increased uncertainty. Decentralization, defined in this study as participation in important and relatively unprogrammable decisions by subordinate managers (Hage and Aiken, 1967), creates opportunities for suboptimal decisions. Although evidence about decisions may be observed, the decision processes are unobservable. Agency theory posits that agents make decisions based upon self-interest. Further, these agents possess information not held by the primary manager, and, given the opportunity to participate in decisions, may use their favorable position in this information asymmetry to effect suboptimal results. Decentralization, then, adds to outcome uncertainty and results in a loss of control.

In situations where spatial complexity and decentralization reduce the effectiveness of behavior control, outcome control may be used to obtain goal congruence by linking subordinates' behaviors to desirable outcomes. The decision to use outcome control, however, is also a question of efficiency. Agency theory (Demski, 1980; Ross, 1973) suggests that the choice of outcome control is a function of the relative efficiency of behavior control in achieving a sufficient level of control over subordinate actions. Organization theory (Ouchi and Maguire, 1975; Ouchi, 1977) also suggests that the choice between outcome and behavior control involves a trade-off between economic efficiency and risk. Although outcome control is more efficient and conserving of organizational resources in certain situations (Eisenhardt, 1985; Ouchi and Maguire, 1975), control systems based on objective measures require subordinates to bear some of the risk previously borne by the firm, particularly if compensation is directly contingent on performance outcomes.
Subordinates demand higher compensation for bearing this risk. Thus, outcome control carries a cost and will be used only when this cost is less than the cost of behavior control.

Thus, outcome control is more likely to be used in firms where a number of organization subunits are geographically separated and where subordinates are given authority to participate in important and relatively unprogrammable decisions. In S&Ls, a common outcome control is responsibility accounting which provides measures of subunit performance. These subunits can be branches or functional departments (e.g. loan department) within the S&L. The term "responsibility accounting" derives from the responsibility borne by subunit managers for the subunit outcomes (Miller, 1982). Responsibility accounting is, in effect, an outcome measure that permits S&L management to control subordinate managers' actions by relating these actions to subunit outcomes. Given that outcome control will likely be used in situations where organization structure increases uncertainty about subordinates' actions (Jones, 1984) and renders behavior control uneconomical (Ouchi and Maguire, 1975), we predict that:

H3: information-based outcome controls, such as responsibility accounting, will be used by organizations where structural characteristics greatly limit the effectiveness and efficiency of behavior controls.

Control Conjunctivity. Prior research and the integration of organizational and agency theories suggest that dependencies exist between information-based controls stemming from their complementary nature. This implies that these controls will be used conjunctively.

The ability of management to direct internal auditors toward problems needing investigation is a significant advantage of the organization's internal monitoring control system (Williamson, 1975). A real-time information system complements the internal monitoring system by alerting senior management to
potential problem areas upon which monitoring can be focused. By selectively obtaining information as required, reaction time is shortened. Thus, internal auditing provides an incentive for the use of real-time systems, and we predict that:

H4: real-time systems will be used by organizations that use internal auditing.

Likewise, the use of internal auditing complements information-based outcome control systems. When outcome controls are used, subordinates have incentives to manipulate the inputs to the outcome measurement system in order to make the outcomes appear more favorable to themselves. Such manipulations may take a variety of forms, including actions designed to bias the measures (Birnberg et al., 1983). In order to reduce this form of moral hazard associated with outcome control, organizations can implement monitoring systems that validate the performance indicators.

As previously discussed, internal auditing provides evidence of rule compliance and should be used in more formalized S&Ls. Internal auditors can also validate outcome measures by examining evidence of the behaviors that lead to outcomes. Inconsistencies between the evidence of inputs and outcomes provides a signal that subordinates are manipulating the outcome measures. If subordinates know that such a signal may be produced, they will be constrained from engaging in these manipulative behaviors.

Internal auditing may also be linked to outcome controls because it mitigates the risk imposed upon subordinate managers when they are evaluated under outcome controls (Williamson, 1975). Organizations desire to mitigate this risk for two reasons. First, mitigating the risk results in a reduction in the risk premium demanded by the subunit managers. Second, unmitigated, the imposition of risk creates incentives for subunit managers to undertake less risky projects than the organization would prefer (Marcus, 1982). Consider the
loan officer who declines to make a high-return loan for fear that it will go
bad for unforeseeable reasons. By providing evidence that unfavorable outcomes
were due to uncontrollable circumstances, internal auditing encourages
subordinate risk-taking propensities consistent with organizational goals.

Thus, internal auditing, linked to responsibility accounting, serves the
purposes of validating outcome measures and reducing the risk borne by
subordinate managers evaluated using the outcome measures. We predict that:

H5: Internal monitoring will be used by organizations that use
information-based outcome controls.

To summarize, firms that use internal auditing systems are expected to also
use real-time systems, and firms that use responsibility accounting systems are
expected to also use internal auditing systems (see Figure 2.). Taken to its
logical conclusion, this suggests that, of the possible configurations of
information-based controls, three are most likely to be used. The result is
that an ordered pattern of controls will be observed. We predict that:

H6: Real-time systems, internal auditing and responsibility accounting
will be used in three configurations: (1) real-time systems alone, (2)
internal auditing and real-time systems, and (3) responsibility
accounting, internal monitoring, and real-time systems.

(Figure 2.)

The remainder of this study deals with empirics. The sample and method are
discussed, followed by a description of the measures. Next, the results of the
empirical tests are presented and discussed. Finally, implications of the
study for future controls research are presented.

Sampling Method

The sample consists of 109 randomly selected, geographically diverse
savings and loan (S&L) associations from all Federal Home Loan Bank districts.
Use of a one industry sample controls for the effects of differing
transformation processes on controls. Firms within the same industry are more likely to have similar transformation processes than firms from different industries, and, consequently, interactions between structure and transformation process are minimized. Designing a study that considers both the effects of structure and transformation process simultaneously is ambitious because the interactions between the two are not well understood. To the extent, however, that such interactions affect control configuration, the external validity of this study may be limited.

Two instruments were used in this study: a senior officer questionnaire and an accounting questionnaire. The questionnaires were pretested using 16 pilot firms which are not used in the final sample. Three senior officer questionnaires and one accounting questionnaire were mailed to each of 173 S&Ls, and 141 (81.5%) responded. The chief executive officer (CEO) was asked to complete one of the senior officer questionnaires and instruct the S&L's chief financial officer (CFO) and chief lending officer (CLO) to complete the others. The respondents were given written directions for completing the questionnaires which included instructions prohibiting discussion of the responses. After completing the questionnaire, the respondents returned the instruments directly to the first author using a preaddressed envelope. The CFO also completed the accounting questionnaire. The questionnaires resulted in usable data on 109 firms. The remainder were eliminated because of missing, incomplete or ambiguous responses.

Measures

Each of the three types of controls was dichotomously coded, 1 if the control is used, 0 otherwise. Real-time systems (RTS) was given a value of 1 if the S&L uses either or both of two real-time accounting information systems
available to S&Ls: on-line general ledger and automated loan tracking. Each improves an S&L's ability to acquire more timely and specific information.

Internal auditing (IA) was measured as the existence of an internal auditing function in the firm. Outcome control was measured as the existence of a responsibility accounting (RA) system in the firm.

Diversification (DIVER) was measured on a scale of 0 to 9, depending upon the number of services, from a group of nine, that the S&L offers. Each of the services represents a departure from the traditional mortgage lending function performed by all S&Ls. The group includes: credit cards, automobile loans, education loans, signature loans, mobile home loans, secondary loan market sales, trust services, and building management services.

Spatial complexity (SCPX), one of the three structural variables, was measured as the number of different locations from which the S&L operates. The two remaining structural characteristics, decentralization (DECENT) and formalization (FORM) were measured by multi-item scales adapted from Hage and Aiken's (1967) subscales, "Participation in Decision Making" and "Job Specificity," which have previously demonstrated reliability and validity (Appendix A). Slight modifications were made to the scales based on recommendations of Mulford et al. (1984). A test for unidimensionality using a common factors model with oblique rotation and an eigenvalue > 1 cutoff was performed on each scale. The formalization and decentralization scales produced satisfactory interitem reliability coefficients (Cronbach's Alpha) of .85 and .92, respectively.

The individual formalization items were anchored by 1 and 5, with 5 indicating greater formalization. The total scores of all three respondents were added together to form organizational scores. Using the perceptions of three respondents enhances construct validity by reducing the potential for
perceptual bias that exists when only one respondent's perceptions are used. However, it also raises the possibility of unreliable data resulting from aggregation of widely disparate individual responses (Robinson, 1950; Price and Mueller, 1986). The use of aggregated data is warranted where homogeneous respondents are used (Joyce and Slocum, 1984) and interperceiver reliability can be established (Jones and James, 1979). Our respondents were all managers employed in the same industry. This should have minimized perceptual differences due to employee versus manager and interindustry perspectives. A test for interperceiver reliability, comparing the average within firm variance to the between subjects variance, produced a satisfactory reliability score of .76. Based on these considerations, aggregation appears justified.4

The individual decentralization items were anchored by 1 and 5, with 5 indicating the highest level of participation in decision-making. The CFO's and CLO's total scores were added to form an organizational score. In this study, we are concerned about the uncertainty created when subordinates are delegated the authority to participate in important and largely unprogrammable decisions. Delegation to upper level subordinates (e.g. heads of major functional areas) is likely to be a prerequisite for any lower level subordinates (e.g. branch managers) to be delegated such authority, and, consequently, we focus on the former. The CFO and CLO were selected to represent upper level subordinates because these functions exist in virtually all S&Ls and provide a common basis of comparison. Further, unlike the formalization measure in which respondents reported on a purely organizational phenomenon, decentralization may be individual specific. Consequently, the decentralization measure does not present the potential for aggregation bias that the formalization measure presents (See Price and Mueller, 1986, for a discussion of this point.)
External auditing cost (EXAC) and total assets (SIZE) were used as control variables in multivariate tests. External auditing cost was included in multivariate tests for internal auditing to control for the possibility that S&Ls may use internal auditing to reduce external auditing cost (Simunic, 1984). Since higher levels of external auditing may sometimes mitigate the need to use internal auditing to monitor rule compliance, it is included as a control variable in the multivariate tests for internal auditing. Total assets was included as a control variable because it is expected that size will be correlated with both the diversification and structural variables. Diversification may lead to increases in size, and it is likely that larger organizations will be, on average, more formalized, decentralized and spatially complex. Consequently, including a size measure in the multivariate tests avoids false inferences which might result from size being a correlated omitted variable.

Size was measured as total assets for three reasons. First, it is the most common measure of S&L size. For example, total assets is the only size measure reported in the U. S. League of Savings Institutions' annual directory of its members. Second, it is the only measure which captures the total financial resources of the institution. Third, it is highly associated with the number of employees in S&Ls. Based on the U. S. League's Annual Salary Surveys, the number of employees in S&Ls varies in a narrow range between .35 and .45 employees per million in assets. Consequently, total assets simultaneously provides a measure of an S&L's personnel size and its financial size.

Results

Figure 3. presents descriptive statistics. Spearman correlations, reported here because the controls are measured categorically, show size and external
auditing cost to be significantly correlated with the dependent variables. This substantiates their use as control variables in the multivariate tests. 

(Figure 3.)

Figure 4. shows the results of parametric and nonparametric univariate tests supporting the first five hypotheses. The 90 S&Ls using real-time systems (RTS) were significantly (p = .0001) more diversified than the 19 S&Ls that did not use RTS. Likewise, the 53 S&Ls using internal auditing (IA) were significantly (p = .0001) more formalized than the 56 S&Ls not using IA. Further, the 27 S&Ls using responsibility accounting (RA) were significantly (p < .0002) more decentralized and spatially complex than the 82 S&Ls not using RA. Finally, the predicted relationships appeared to exist between the controls. IA was significant (p ≤ .0003) in predicting the use of RTS, and RA was significant (p = .0001) in predicting the use of IA. 

(Figure 4.)

While useful in showing the unconditional relationships between variables, the univariate results represent partial tests because they do not consider conditional relationships among independent variables. Figure 5. presents the results of multivariate logistic regressions of each dependent variable on its theoretical and control variables. Logistic regression, a maximum likelihood technique, is a more appropriate test than discriminate techniques when testing dichotomous variables because it makes no assumptions of normality. 5

(Figure 5.)

In all three models, SIZE was entered first as a control variable. In Model 1, DIVER was significant at the p = .0002 level supporting Hypothesis 1 which predicted that more diversified firms would use RTS. IA was also significant (p = .0518) supporting Hypothesis 4 which predicted that firms using internal monitoring will also use real-time systems. In Model 2, external auditing cost (EXAC) was entered as an additional control variable.
FORM was significant \((p = .0005)\) supporting Hypothesis 2 which predicted that firms with formalized structures would use internal auditing. Further, RA was significant \((p = .0311)\) supporting Hypothesis 5 which predicted that firms using responsibility accounting will also use internal auditing. In Model 3, DECEN \((p = .0012)\) and SPCX \((p = .0399)\) were both significant supporting Hypothesis 3 which predicted that structural factors that limit the effectiveness and efficiency of behavior control are associated with the use of outcome control.6

The relationships between the dependent and theoretical variables do not appear to be the result of spurious size correlations. SIZE was not significant in any of the multivariate tests suggesting that its significant correlation (see Figure 3.) with the dependent variables results from its relationship with the theoretical variables.

Since discriminant analysis is sensitive to violations of normality, a modified, two-step, logistic, jackknife procedure was used to estimate classification accuracy. Regressions were performed in which: (1) each basic model was estimated ten times (after randomly eliminating approximately one half of the sample each time) to develop ten sets of coefficients; and (2) the ten sets of coefficients were used to classify firms as users or non-users of each control in ten iterations (again, after randomly eliminating approximately one half of the sample each iteration). This resulted in 100 classifications for each of the three basic models. The average classification accuracies were computed for each model and compared with the proportional chance criterion for each model (see Morrison, 1969). F-tests indicate that the classification accuracy of all three models is significantly \((p \leq .0001)\) higher than those observed with the naive criterion (see Figure 5.). We conclude that the three models are capable of reasonably accurate classification of the dependent variables.
Stepwise tests were conducted to determine the effects of multicollinearity on the coefficients of the theoretical variables. The results in Figure 6. show that these coefficients are affected very little by the presence of the other theoretical and control variables in the model. It does not appear that multicollinearity materially affected the significance of the theoretical variables in the multivariate tests.

(Figure 6.)

We did not hypothesize a relationship between responsibility accounting and real-time information systems. Had we done so, path analysis would be the appropriate test because multiple paths would exist from RA to and RTS. However, to determine if the relationship of IA with RTS is spurious due to IA proxying for a relationship between RA and RTS, Model 1 was re-estimated after inserting RA. RA was not significant in predicting the use of RTS, even in stepwise tests. This provides evidence that the relationship between IA and RTS does not result from a relationship between RA and RTS.

To investigate the possibility of interactions between the theoretical variables, the interaction terms, DIVERxIA, FORMxRA and DECENxSCPX, were inserted in Models 1, 2, and 3, respectively. None was significant in stepwise tests while the main effects remained significant. We conclude that the effects of the theoretical variables on the controls are additive, not interactive.

An alternative explanation for the correlations between the controls is that firms change strategy and structure sequentially so that growth from diversification increases size which, in turn, leads first to formalization and then to decentralization and spatial complexity. In this scenario, the relationships between the controls are artifactual. The multivariate tests, however, do not support this explanation of the relationships among the
controls. IA and RA are significant in predicting the use of RTS and IA, respectively, after controlling for the effects of size, strategy and structure. This would not be the case if the controls were a function of strategy and structure alone, and it suggests conjunctivity between the controls.

Hypothesis 6 predicted that, because of conjunctivity, real-time systems, internal auditing and responsibility accounting controls will be used in three possible configurations. Figure 7. presents the observed control configuration frequencies. Approximately 95% of the firms using information-based controls used the controls in one of the three predicted configurations. Only two firms used IA without using RTS. Likewise, only three firms used RA without also using IA. The observed frequencies of RTS given IA and IA given RA were compared with the frequencies of RTS and IA expected under the assumption of independence. In both cases, the adjusted chi-squares (see Siegel and Castellan, 1988) show that configurations indicating dependency occur significantly \((p = .001)\) more often than would be expected given independence. Thus, it appears that an ordered pattern of controls generally holds as a result of control conjunctivity.

(Figure 7.)

To learn more about the five firms using the controls independently, we investigated their individual strategies and structures. The two firms using IA without RTS had highly formalized structures with only moderate diversification. It appears that high formalization caused these firms to use internal auditing, but that they are not diversified enough to economically justify real-time information systems. Two of the firms that used RA and RTS but not IA have low levels of formalization. These firms may not be able to cost justify internal auditing to enforce rule compliance, and the use of
responsibility accounting may not be sufficient by itself to induce the firm to use IA. The third firm that used RA and RTS but not IA was highly formalized implying a strong need for internal auditing. Further, this firm had a low external auditing cost for its size which suggests that external auditing is not being substituted for internal auditing. We are unable to suggest a rationale based on strategy or structure for its lack of control conjunctivity. It is possible that its controls are affected by factors not considered in this study.

Discussion

The empirical results support our predictions regarding the use and conjunctivity of the information-based controls investigated. A strategy of diversification into new and/or riskier services is associated with the use of real-time systems which are capable of reducing uncertainty by providing richer, finer and more timely information about organizational outcomes. A formalized organizational structure is linked to the use of internal auditing which can provide feedback on rule compliance. An organizational structure that limits the effectiveness and efficiency of behavior control is associated with the use of outcome control. Further, the use of internal auditing is generally accompanied by the use of the real-time systems that are capable of signalling problems needing investigation. Likewise, the use of responsibility accounting is generally accompanied by internal auditing which provides a mechanism for validating the outcomes and reducing the risk borne by those evaluated under outcome control. Finally, the combinations of controls used by the sample firms fell into an ordered pattern that is predictable given their conjunctivity.
These results provide evidence of a relationship between strategy, structure and information-based controls using a single industry sample to control for differences in transformation processes. It appears that the sample firms design their control systems to reduce uncertainty about organizational outcomes and human behavior. The use of these controls appears to be predicated on a cost/benefit decision. The controls are used when uncertainty creates a loss of control which must be mitigated.

Evidence that controls are linked to strategy and structure has cost implications for firms' decisions about alternative investment strategies and organizational structures. In weighing the costs and benefits of such alternatives, the costs associated with changes in controls should be included in the decision model. Failure to do so will result in an underestimation of the costs and the likelihood that net returns will be less than anticipated.

Previous research (Ouchi, 1979) has suggested that outcome and behavior controls are substitutes. Our findings, however, indicate that internal auditing links behavior and outcome controls. In this study we observe internal auditing, useful in enforcing behavior control, being used concurrently with outcome control. Further, the fact that formalization, on average, is higher in sample firms using both responsibility accounting and internal monitoring (mean = 50.08) than in firms using only internal monitoring (mean = 46.83) provides evidence that workplace rules do not diminish with the advent of outcome controls. These results suggest that behavior and outcome controls may sometimes be complementary as opposed to being substitutes.

The apparent inconsistency between our results and Ouchi's predictions, however, represents a levels problem that can be reconciled by agency theory. If we view a decentralized, spatially complex firm as a tiered network of agency relationships in which outcome control is used when structure makes
behavior control uneconomical, then, based on cost considerations, we expect only a subset of the firm's members, usually managers, to be evaluated using outcome control. As long as employees' tasks are programmable and observable economically, behavior control will be used within subunits even when outcome control is used to control subunit managers' actions.

Conclusion - The Future of Controls Research

Besides having implications for the use of information-based control systems to complement strategy, structure and other controls, this study provides additional evidence that theoretical integration can be useful in furthering our knowledge of control systems. The integration of organizational and agency theories led to predictions regarding controls, supported by empirical evidence, that could not have been developed based on one of these theories alone. New approaches to the investigation of controls open numerous possibilities of further theoretical integration. Jones' (1984) observations on task visibility and Green and Welsh's (1988) consideration of cybernetics are recent examples.

Theory and logic lead us to believe that the choice of controls is influenced by a variety of factors which include: structure, strategy, transformation process, transaction nature and volume, and environment among others. It seems doubtful that any single perspective alone will result in a complete understanding of controls. This argues for more studies that attempt to integrate theories and develop testable predictions about control systems.
FOOTNOTES

1 "Information-based controls" refers to controls that have the primary function of information production. "Richness" refers to the number of signals about various states information contains. "Fineness" refers to the way in which a given signal "maps" to a given state or states. A signal that maps to only one state is finer than a signal that maps to two possible states. "Cybernetic" controls are controls that are designed to measure performance levels and compare those levels to some predetermined standard of performance through a feedback loop that identifies performance variances (Green and Welsh, 1988).

2 Factors besides strategy and structure may influence the use of information controls. For example, environmental uncertainty (e.g. competition) and scale economies (e.g. transaction volume) may impact the decision to use real-time information systems. In this study, we limit our focus to certain relationships between information-based controls and factors predicted by our integration of organizational and agency theories.

3 We purposefully avoid developing hypotheses about the relationship between controls and compensation. Eisenhardt (1985) notes the difficulties in linking control to compensation where variable compensation is not explicitly contractual (e.g. promotions). In this study, we focus on information-based controls that aid in subordinate evaluation and assume that evaluation is ultimately linked to compensation.

4 The interperceiver reliability test used in this study is described by the following equation:

\[ R = \frac{N-1}{N} \frac{\text{Var}_w}{\text{Var}_b} \]

where: \( R \) = reliability score, \( N \) = sample size, \( \text{Var}_w \) = average within firms variance, \( \text{Var}_b \) = between subjects variance. This is analogous to Cronbach's Alpha.

5 The logistic procedure used in this study is described in the SAS Institute (1983). Logistic regression employs maximum likelihood estimation to determine the probability that an observation is equal to the hypothesized value. In contrast to multiple discriminant analysis, logistic regression does not assume multivariate normality and, in fact, makes no distributional assumptions about the independent variables. The appropriateness of logistic regression for testing nonnormally distributed data is discussed in Halperin et al (1971). The advantage to logistic regression is that it is relatively robust to violations of normality. With normally distributed data, however, its estimates are less efficient than OLS estimates. Accordingly, under conditions of normality, tests of coefficient significance using logistic regressions are conservative in the sense the test statistics are biased toward not finding significance. See Aldrich and Nelson (1984) and Halperin et al. (1971) for a discussion of the properties of logistic versus OLS regression.

6 Examination of the sample revealed one large S&L with an inordinately high (108) number of operating locations. The results of the multivariate tests were not materially affected by its deletion from the sample.
APPENDIX A

Decentralization Questions

What is the frequency of your participation in the following decisions?

<table>
<thead>
<tr>
<th>Decision Situations</th>
<th>Never</th>
<th>Rarely</th>
<th>Occasionally</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>How frequently do you participate in decisions on the adoption of new policies?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How frequently do you participate in decisions to hire new officer and supervisory personnel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How frequently do you participate in decisions to promote officer and supervisory personnel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Formalization Questions

Please indicate the extent to which you agree or disagree with the following statements relating to jobs in your association.

<table>
<thead>
<tr>
<th>Statements About Jobs</th>
<th>Strongly Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job descriptions * are periodically reviewed and revised.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most jobs in this association have written job descriptions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New staff are provided a formal orientation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This association keeps written records on everyone’s job performance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* These words or phrases were defined for the respondents.

Note: The entire questionnaires are not presented for the sake of brevity. The questionnaires contained numerous questions requesting data utilized in other studies and were several pages long.
BIBLIOGRAPHY


Birnberg, Jacob G., Lawrence Turpolec and S. Mark Young, "The Organizational Context of Accounting," Accounting, Organizations, and Society, 8(1983),111-129.


Demske, J. Information Analysis, Addison-Wesley, Reading, MA (1980).


<table>
<thead>
<tr>
<th>Organization Theory</th>
<th>Agency Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Nature</td>
<td>man is rational</td>
</tr>
<tr>
<td>Nature of Information</td>
<td>information is an alternative means of controlling behavior</td>
</tr>
<tr>
<td>Basis of Control</td>
<td>internal organization</td>
</tr>
<tr>
<td>Role of Uncertainty</td>
<td>increases need for information</td>
</tr>
<tr>
<td>Role of Org Structure</td>
<td>affects need for control</td>
</tr>
<tr>
<td>Task Observability</td>
<td>required for behavior control</td>
</tr>
<tr>
<td>Task Programmability</td>
<td>required for behavior control</td>
</tr>
<tr>
<td>Role of Auditing</td>
<td>silent</td>
</tr>
</tbody>
</table>

Figure 1. Comparison of Organization and Agency Perspectives on Control
CONTROL CONJUNCTIVITY

Internal auditing provides incentives to use real-time systems to signal problems for investigation by monitors. Outcome control provides incentives to use internal monitoring to validate outcomes and reduce subordinates' risk.

CONTROLS

Real-Time Information Controls
Internal Auditing Controls
Responsibility Accounting Controls

STRATEGY/ STRUCTURE

Diversification into New/Risky Services
Formalization of Policies/Procedures
Decentralization Spatial Complexity

Figure 2. Relationships Among Strategy, Structure and Information-Based Controls
### Variable Mean Std Dev Median Min Max
---
DIVER 4.523 2.007 5.000 0.000 8.000
FORM 41.560 12.000 43.000 12.000 60.000
EXAC (X10³) 15.118 19.164 9.540 0.000 12.709
DECEN 20.679 5.752 21.000 6.000 30.000
SCMP 8.872 14.098 4.000 1.000 108.000
SIZE (X10⁶) 288.267 515.543 107.186 7.499 3336.371

### Spearman Correlation Coefficients

<table>
<thead>
<tr>
<th>Variable</th>
<th>FORM</th>
<th>EXAC</th>
<th>DECEN</th>
<th>SCPX</th>
<th>SIZE</th>
<th>RTS</th>
<th>IA</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORM</td>
<td>.389</td>
<td>.263</td>
<td>.333</td>
<td>.376</td>
<td>.291</td>
<td>.549</td>
<td>.366</td>
<td></td>
</tr>
<tr>
<td>EXAC</td>
<td>.213</td>
<td>.717</td>
<td>.712</td>
<td>.232</td>
<td>.311</td>
<td>.348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECEN</td>
<td>.189</td>
<td>.170</td>
<td>.938</td>
<td>.185</td>
<td>.352</td>
<td>.454</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCPX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>.186</td>
<td>.386</td>
<td>.430</td>
<td>.350</td>
<td>.264</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Absolute Value Of Coefficient

- >.15
- >.18
- >.25

#### Significance Level

- .10
- .05
- .01

DIVER = Diversification  
FORM = Formalization  
EXAC = External Auditing Cost  
DECEN = Decentralization  
SCPX = Spatial Complexity  
SIZE = Total Assets  
RTS = Real-Time Information Systems  
IA = Internal Auditing  
RA = Responsibility Accounting  
n = 109

---

Figure 3. Descriptive Statistics
<table>
<thead>
<tr>
<th>Theoretical Variable</th>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Chi-Square</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIVER</td>
<td>RTS</td>
<td>90</td>
<td>5.00</td>
<td>1.709</td>
<td>26.74</td>
<td>.0001</td>
</tr>
<tr>
<td></td>
<td>NO RTS</td>
<td>19</td>
<td>2.26</td>
<td>1.790</td>
<td>39.58</td>
<td>.0001</td>
</tr>
<tr>
<td>IA</td>
<td>RTS</td>
<td>90</td>
<td>0.57</td>
<td>0.498</td>
<td>13.25</td>
<td>.0003</td>
</tr>
<tr>
<td></td>
<td>NO RTS</td>
<td>19</td>
<td>0.11</td>
<td>0.315</td>
<td>14.96</td>
<td>.0002</td>
</tr>
<tr>
<td>FORM</td>
<td>IA</td>
<td>53</td>
<td>48.30</td>
<td>7.812</td>
<td>19.55</td>
<td>.0001</td>
</tr>
<tr>
<td></td>
<td>NO IA</td>
<td>56</td>
<td>35.18</td>
<td>11.825</td>
<td>46.19</td>
<td>.0001</td>
</tr>
<tr>
<td>RA</td>
<td>IA</td>
<td>53</td>
<td>0.07</td>
<td>0.503</td>
<td>23.08</td>
<td>.0001</td>
</tr>
<tr>
<td></td>
<td>NO IA</td>
<td>56</td>
<td>0.50</td>
<td>0.227</td>
<td>29.08</td>
<td>.0001</td>
</tr>
<tr>
<td>DECEN</td>
<td>RA</td>
<td>27</td>
<td>24.15</td>
<td>3.243</td>
<td>11.43</td>
<td>.0007</td>
</tr>
<tr>
<td></td>
<td>NO RA</td>
<td>82</td>
<td>19.54</td>
<td>5.951</td>
<td>14.71</td>
<td>.0002</td>
</tr>
<tr>
<td>SCPX</td>
<td>RA</td>
<td>27</td>
<td>19.96</td>
<td>23.477</td>
<td>30.44</td>
<td>.0001</td>
</tr>
<tr>
<td></td>
<td>NO RA</td>
<td>82</td>
<td>5.22</td>
<td>5.795</td>
<td>27.71</td>
<td>.0001</td>
</tr>
</tbody>
</table>

DIVER = Diversification  
RTS = Real-Time Information Systems  
FORM = Formalization  
IA = Internal Auditing  
DECEN = Decentralization  
RA = Responsibility Accounting  
SCPX = Spatial Complexity  
n = 109

Figure 4. Univariate Tests
<table>
<thead>
<tr>
<th>Model</th>
<th>Dep Var</th>
<th>Indep Var</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>Chi-Square</th>
<th>Sig Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RTS</td>
<td>Intercept</td>
<td>-1.6608</td>
<td>0.6747</td>
<td>6.06</td>
<td>.0138</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SIZE</td>
<td>0.0015</td>
<td>0.0026</td>
<td>0.31</td>
<td>.5799</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DIVER</td>
<td>0.6789</td>
<td>0.1793</td>
<td>14.33</td>
<td>.0002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IA</td>
<td>1.6601</td>
<td>0.8536</td>
<td>3.78</td>
<td>.0518</td>
</tr>
<tr>
<td>2</td>
<td>IA</td>
<td>Intercept</td>
<td>-5.0489</td>
<td>1.1989</td>
<td>17.74</td>
<td>.0000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SIZE</td>
<td>0.0030</td>
<td>0.0030</td>
<td>1.02</td>
<td>.3127</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXAC</td>
<td>1.347x10^-5</td>
<td>4.712x10^-5</td>
<td>0.08</td>
<td>.7750</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FORM</td>
<td>0.0945</td>
<td>0.0271</td>
<td>12.17</td>
<td>.0005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RA</td>
<td>1.6563</td>
<td>0.7684</td>
<td>4.65</td>
<td>.0311</td>
</tr>
<tr>
<td>3</td>
<td>RA</td>
<td>Intercept</td>
<td>-8.2319</td>
<td>2.0485</td>
<td>16.15</td>
<td>.0001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SIZE</td>
<td>-0.0008</td>
<td>0.0014</td>
<td>0.30</td>
<td>.5825</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DECEN</td>
<td>0.2616</td>
<td>0.0805</td>
<td>10.56</td>
<td>.0012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SCPX</td>
<td>0.1606</td>
<td>0.0781</td>
<td>4.22</td>
<td>.0399</td>
</tr>
</tbody>
</table>

**Model Statistics**

<table>
<thead>
<tr>
<th>Model</th>
<th>Chi-Square</th>
<th>Sig Level</th>
<th>$R^2$</th>
<th>Class Accuracy</th>
<th>Naive Y Class Accuracy</th>
<th>Sig Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37.16</td>
<td>.0000</td>
<td>.489</td>
<td>.8700</td>
<td>.4965</td>
<td>.0001</td>
</tr>
<tr>
<td>2</td>
<td>56.38</td>
<td>.0000</td>
<td>.511</td>
<td>.7526</td>
<td>.4954</td>
<td>.0001</td>
</tr>
<tr>
<td>3</td>
<td>40.20</td>
<td>.0000</td>
<td>.418</td>
<td>.7981</td>
<td>.4952</td>
<td>.0001</td>
</tr>
</tbody>
</table>

DIVER = Diversification  
SIZE = Total Assets  
FORM = Formalization  
RTS = Real-Time Information Systems  
EXAC = External Auditing Cost  
IA = Internal Auditing  
DECEN = Decentralization  
RA = Responsibility Accounting  
SCPX = Spatial Complexity  
n = 109

Figure 5. Multivariate Logistic Regressions
<table>
<thead>
<tr>
<th>Dep Var</th>
<th>Var Added</th>
<th>Chi-Square</th>
<th>Model Sig</th>
<th>Coefficients (Sig Levels)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Step 1</td>
</tr>
<tr>
<td>RTS</td>
<td>DIVER</td>
<td>30.09</td>
<td>.0000</td>
<td>0.7831 (.01)</td>
</tr>
<tr>
<td></td>
<td>IA</td>
<td>36.68</td>
<td>.0000</td>
<td>1.8670 (.03)</td>
</tr>
<tr>
<td>IA</td>
<td>FORM</td>
<td>37.89</td>
<td>.0000</td>
<td>0.1242 (.01)</td>
</tr>
<tr>
<td></td>
<td>RA</td>
<td>50.22</td>
<td>.0000</td>
<td>2.2253 (.01)</td>
</tr>
<tr>
<td>RA</td>
<td>SCPX</td>
<td>25.18</td>
<td>.0000</td>
<td>0.1190 (.01)</td>
</tr>
<tr>
<td></td>
<td>DECEN</td>
<td>39.90</td>
<td>.0000</td>
<td>0.2601 (.01)</td>
</tr>
</tbody>
</table>

DIVER = Diversification  
FORM = Formalization  
SCPX = Spatial Complexity  
DECEN = Decentralization  
SIZE = Total Assets  
RTS = Real-Time Information Systems  
IA = Internal Auditing  
RA = Responsibility Accounting  
Significance level required for entry and retention = .10; n = 109

---

Figure 6. Stepwise Logistic Regressions
<table>
<thead>
<tr>
<th>Configuration Frequency</th>
<th>No Info Controls</th>
<th>RTS</th>
<th>RTS+IA</th>
<th>RTS+IA+RA</th>
<th><em>Dependent</em></th>
<th><em>Independent</em></th>
<th>Partially Dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>36</td>
<td>27</td>
<td>24</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Firms Using IA

<table>
<thead>
<tr>
<th>RTS</th>
<th>No RTS</th>
<th>IA</th>
<th>No IA</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.77</td>
<td>9.23</td>
<td>13.12</td>
<td>13.88</td>
</tr>
<tr>
<td>51.00</td>
<td>2.00</td>
<td>24.00</td>
<td>3.00</td>
</tr>
<tr>
<td>15.08 (.001)</td>
<td></td>
<td>25.64 (.001)</td>
<td></td>
</tr>
</tbody>
</table>

Chi-square (sig level)

RTS = Real-Time Information Systems
IA = Internal Auditing
RA = Responsibility Accounting
n = 109

Figure 7. Frequencies of Control Configurations