A Cross-Country Comparison of the Relationships Between Strategy, Environment and Control System Attributes: Singapore and Australia.

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Abstract

Following the trend towards increased cross-cultural research, this paper reports the results of a study that examines the relationships of strategy, environment, controls and performance in different national contexts viz., Singapore and Australia. A multiple discriminant model was constructed for each country to determine whether the same combination of environmental and control system variables best discriminated between the strategic types in both countries. The results yielded highly significant discriminant functions, indicating that empirical relationships among these variable exits. However, there were differences in the types of discriminating variables between the two countries. In the Singaporean model the control changeability factor loads most heavily in the discriminant function. For the Australian model, dynamism is the most significant discriminator. In terms of environment variables, all three environmental variables (dynamism, hostility and heterogeneity) are significant discriminators for Australia, while only dynamism emerges as significant in the Singapore model. These results suggest that national contexts have an influence on the discriminant functions. Areas for further research are also suggested.

Though there is considerable literature on the conceptual link between strategy, environment and controls, the empirical evidence has been limited. Still fewer studies examined the impact on controls by looking at specific control attributes in the accounting system. Moreover, empirical studies were mostly confined to a single country or national setting, especially in the North American context. This study reports the results of a comparative analysis of the relationships between business strategy, environment, control system attributes and performance in two different national contexts: Singapore and Australia.

Literature Review

Miles and Snow's Strategic Types

Much has been written about the relationship between strategy and environment [for example, Porter 1980; Mintzberg & McHugh 1985; Miller 1987]. The strategy typology by Miles and Snow [1978] has great appeal and has been empirically tested in both management and accounting research. Miles and Snow identified four distinct strategies: Prospectors, Defenders, Analyzers, and Reactors. The Prospector strategy is concerned with seeking new market opportunities, and Prospector companies compete largely through new product-market innovations. The Defender strategy is concerned with seeking a market niche in relatively stable domains, and Defender companies are able to defend their niches by emphasizing cost efficiently, quality and service. The Analyzer strategy is partly defensive as when an Analyzer company seeks to protect its market niche from competition, like a Defender company, but the strategy also calls for seizing market opportunities, if appropriate, like a Prospector company. The Reactor strategy, strictly, is a non-viable strategy since a Reactor company merely reacts to situations.

Miles and Snow postulated that Prospector strategy companies operate in a more dynamic environment and Defender strategy companies in a more stable environment. They also postulated that these different strategies could be present in the same environment and are equally effective with proper implementation. Various studies have found Prospectors outperform Defenders in innovative and dynamic industries [Hambrick 1983; Simons 1987]. Miller [1987, 1988] also reported significant relationships between strategies of innovation and dynamic environments, market differentiation strategies and hostile environments, cost control strategies and stable environments, and breadth strate-

gies and heterogeneous environments. Simons [1987] found positive correlation between performance and industry dynamism for Prospectors and negative correlation for Defenders. However Simons studied only one dimension of environment in his research. Other dimension such as hostility and heterogeneity were not investigated. This study will include these environmental variables, and also explore the impact of different national contexts.

Strategy and Control System Attributes

The literature on the effects of strategy on management control systems is more limited. Miles and Snow postulated that a Defender strategy operating in a product-market domain and focusing on cost efficiency would require a sophisticated control system with greater reliance on formal accounting procedures, cost control and trend monitoring. A Prospectors strategy, on the other hand, would have less emphasis on accounting controls because, in the research for and exploitation of, new market opportunities, the system should provide for greater flexibility. The Analyzer strategy operating in both stable and changing domains would combine attributes of both Defenders and Prospectors.

There is some empirical evidence that systematic differences exist between control attributes and strategic types [Miller & Friesen 1982; Govindarajan & Gupta 1985; Simons 1987]. The results however were inconclusive. For example, Miller and Friesen [1982] found control and innovation were positively correlated for conservative firms ("Defenders" in Miles and Snow) and conversely for entrepreneurial firms ("Prospectors"), which was inconsistent with the Miles and Snow postulate. Simons [187] also found that Defenders (particularly large companies) use their control systems less intensively than Prospectors. One explanation for this apparent inconsistency, as suggested by Dent [1990], would be that Prospectors use their control systems in order to constrain innovative excesses and risk taking within acceptable levels. As well, the greater uncertainty faced by these companies might call for more frequent performance monitoring to facilitate organizational learning. In the case of Defenders, which usually exhibit greater stability, the argument was that stringent cost controls might be inefficient. A better alternative would be monitoring of quality and inventory levels [Kaplan 1983]. The different conceptualisation of control used by Simons and Miles and Snow could also have contributed to the inconsistency. Whereas Simons emphasized financial/accounting controls, Miles and Snow as organizational theory researchers looked at management and organizational control from broader perspective.

The lack of conclusive evidence from these studies has prompted this research. Moreover, the empirical studies were all reported from a North American context. Various studies have highlighted the importance of the national context for strategic behavior and business management [see, for example, Huo & Mckinley, 1992; Ali, et al, 1992; Douglas & Rhee, 1989; Porter, 1990]. Schneider & Meyer [1991] reported that different national cultures were also likely to interpret and respond to the same strategic issue in different ways. Birnberg & Snodgrass [1988] found evidence that culture affected the nature of formal control systems. Japanese firms were found to be spending less control and control related activities than their counterparts in the United States. Ueno and Sekaran [1992] examined the influence of culture on budget control practices in terms of two cultural dimensions, individual-collectivism and uncertainty avoidance. They found that the United States, which is high on individualism, predispose the U.S. Companies to use more communication and coordination, build more slack in the budget and resort to short term performance evaluation, more than Japanese companies. The study by Chow et al, [1991] included performance as a variable and found that cultural individualism and management control system have significant independent, but not interactive, effects on performance.

While increasing interest is focused on cross-cultural research, empirical studies reporting the relationships of strategy, environment, controls and performance in different cultural and/or national context are somewhat limited. Our comparative study between Singapore and Australia should contribute to this literature.

Research Method

Participants

Participants are manufacturing companies in Singapore and Australia. A random sample from each country was chosen from a cross-section of industries by applying a four digit Standard Industry Classification Code.

Description of Variables

The first variable, strategy types, for the purpose of this study, is classified into Defenders, Prospectors and Analyzers, following Miles and Snow. This typology was chosen, rather than Porter's business strategies, mainly because it

has been used in prior accounting research [Simons, 1987], and also because the perceptual measures of Miles and Snow's strategic types have been validated by various studies [Hambrick, 1983; Shortell & Zajac, 1990]. The instrument consists of brief description of two firms, one using a Defender strategy described only as Type 1 and another using a Prospector strategy described as Type 2. These two strategies are employed because they represent the two extreme strategic types. The Miles & Snow typology is used as the grouping variable to categories manufacturing companies into one of these strategic types. A self-typing procedure is adopted whereby respondents would indicate which of these descriptions most closely match each company's strategic policies.

The second variable, environment, was drawn from the works of Khandwalla [1977], Miller & Friesen [1984] and Miller [1987]. In these studies environment was distinguished into dynamism, heterogeneity, and hostility. Dynamism measures the amount of change and unpredictability in the technical, economic and political economic and political dimensions of the industry environment. The dynamism construct is captured using a four-item statement. Hostility measures the extent and unpredictability of competitive pressures from key competitors faced by a company. This construct is operationalised using three-item statement. All responses were recorded on 7-point Likert-type scales with descriptive anchors at the two extreme points. Cronbach alpha tests of reliability for dynamism and hostility showed that the alpha values were above 0.60.

The third variable, control system attributes, was based on a study by Simons [1987] who first factor analyzed 33 control system items. Ten factors were identified which represent different dimensions of a normal accounting control system. Table 1 presents a summary of the 10 control factors and a brief explanation of each.

Table 1
Summary of Control Factors and Brief Explanation

F1	Tight budget goals	Extent to which meeting tight budget targets is emphasized.
F2	External scanning	Extent to which data on external events are included in control information.
F3	Results monitoring	Extent to which managers monitor interperiod budget and performance results.
F4	Cost control	Extent to which cost analysis techniques and controls are used.
F5	Forecast data	Extent to which forecast data included in control reports.
F6	Goals related to output effetiveness	Knowledge and importance of factors related to product output.
F7	Reporting frequency	Frequency of issuing control reports.
F8	Formula-based bonus renumeration	Extent to which bonus renumeration is established by formula based on achieving budget targets rather than discretionary.
F9	Tailored control system	Extent to which control system are tailored to departmental circumstances and needs.
F10	Control system changea bility	Frequency of change in control systems and importance of employing informal communications to transit control information.

The last variable, performance, was measured using two criteria: return on investment and annual sales growth. To minimize the possibility of annual

fluctuations, a three year average was computed in each case. As a reliability check, an overall performance measure was also included which is rated a 7-point scale.

Procedure

A mail questionnaire survey design was used to collect the data which was supplemented by interviews. The questionnaire was pilot-tested in each country on a small sample drawn from the same population of this study. No major changes were required and the final questionnaire was mailed to the Chief Executive Officer in each company. Follow up interviews were also conducted with selected companies to ensure that the procedures were complied with and that no problems in completing the questionnaire had been encountered. The total usable replies were for Singapore 69 and Australia 77, representing response rates of 26.5 percent and 28.8 percent respectively, which were considered within the modal range for mail questionnaires [Nachmias & Nachmias, 1976]. The responses by strategy types ranged from 28.6 percent to 37.7 percent.

The collected data were submitted to a step-wise multiple discriminant analysis (MDA). MDA is a linear multivariate statistical techniques which attempts to develop a discriminant function model that would allocate the sampled companies to one of the three strategic types viz., Defenders, Prospectors, or Analyzers, based on a set of discriminating variables comprising environmental, control system factors, and performance measures. MDA has been chosen, instead of the alternative legit or probate analysis, because the purpose is merely to develop a discriminatory model [Ingrain & Freezer, 1982]. It is thus appropriate for descriptive or inferential research questions, as in this study, where the question of causality is not a primary concern. In applying MDA, two parametric assumptions about the data should be borne in mind, viz., multivariate normality in the distribution of the discriminating variables and homogeneous variance-covariance across the groups. Inspection of the data indicated that normality could be assumed. In any case, discriminant analysis is not particularly sensitive to minor violations of the normality assumption [Click, 1980]. Equality of the variance-covariance matrices across groups was tested using the Box's M test which yielded Box's $M=32.831$, $p<0.669$ for Singapore and Box's $M=39.045$, $p<0.364$ for Australia.

Results and Discussion

A Series of discriminant analyses was performed on the response of the survey population from each country in order to isolate the set of environmental and control system variable that cloud best segregate companies into the strategic types. The discriminant analyses proceeded stepwise by minimizing Wild's lambda. The overall ability of the discriminant model to discriminate among the strategic groups can be evaluated by testing for the equality of the group centroids using Wilk's lambda. Based on these lambda values, the discriminant function was highly significant ($p<0.0000$) for each country, indicating that the strategic groupings did differ significantly on the discriminating variables identified. Table 2 presents the results.

Table 2
Result of Step-Wise Discriminant Analysis

A. Canonical Discriminant Function	Singapore	Australia
Eigenvalue	3.0519	4.5462
% of variance	75.33	81.87
Canonical correlation	0.8679	0.9048
Wilk's lambda	0.2066	0.1813
Chi-square	55.190	53.790
Degrees of freedom	10	7
Significance	0.0000	0.0000
B. Group Centroids		
Defenders	-2.5326	-2.5031
Prospectors	1.7200	1.7067

The canonical correlation for Singapore and Australia were also high. These indicate the strength of relationship of discriminating variables in the function and the grouping variable (strategy types). The percentage of variance, which is the square of the correlation coefficient, showed that 75.33 percent of the variance for Australia associated with group membership was explained by the identified discriminating variables.

The discriminating variables which were found to be significant in the discriminant analysis function are presented in Table 3, along with their standardized and structure coefficient.

The size of the standardized discriminant function coefficient shown in Table 3 normally would be used to interpret the relative importance of individual variables. An examination of the correlation matrix for the set of independent variables, however, revealed some evidence of statistical multicollinearity in the data. For this reason it has been suggested by Klecka [1980] that structure coefficient should used instead. The structure coefficients i.e. loadings, are the correlations between the discriminant function and each discriminating variable.

Table 3
Standardized Canonical Coefficients & Structure Coefficients

	Standardized Coefficient	Structure
A. Singapore sample		
Dynamism	0.3822	0.3314
F3 (Result monitoring)	-1.2705	0.0992
F5 (Forecast data)	0.9739	0.3251
F7 (Reporting frequency)	0.8371	0.3391
F10 (Control system changeability)	0.7929	0.5033
B. Australian sample		
Dynamism	1.0998	0.5134
Hostility	0.7757	0.3669
Heterogeneity	0.4458	0.2255
F3 (Result monitoring)	-0.4191	0.0700
F7 (Reporting frequency)	-0.6312	0.0525
F9 (Tailored control system)	-0.9923	-0.0054
F10 (Control system changeability)	0.7132	0.1506

In the Singapore discriminant model, the control changeability factor loads most heavily in the discriminant function. For the Australian model, dynamism is the most significant discriminator. This different can be attributed to

the impact of the recession and market changes in the Australian market. In terms of environmental variables, all three environmental variables (dynamism, hostility, heterogeneity) are significant discriminator for Australia, while only dynamisms emerge as significant in the Singapore model. The absence of hostility and heterogeneity in Singapore's discriminant function could be due to the smaller market of Singapore which is more homogenous and stable. On the other hand, the Australian economy has been experiencing severe recessionary conditions, as well as restructuring, making environmental factors the more critical variables in their strategy formulation. Hence, in the Australian discriminant function, control factors did not load as heavily as environmental factors.

In terms of control system variables, only control system changeability is the most significant discriminating factor for both countries. The other control factors vary in importance between countries. For the Singaporean sample, these are F7 (reporting frequency), F5 (forecast data) and F3 (results monitoring), and for the Australian sample, F3, F7 and F9 (tailored control system). These control variables generally do not have high structure coefficients. Overall, this analysis indicates that Prospectors, when faced with a more dynamic, hostile and heterogeneous environment, would require greater control changeability.

From Table 2 performance measures do not appear to be significant discriminators. The impact of performance in the discriminant model was tested by applying the stepwise discriminant procedures for environmental and control variables with each performance measure one at a time. The lack of robustness of performance in our discriminant analysis suggests that more research need be done in this area.

Conclusion

The comparative analysis between Singapore and Australia showed that a multiple discriminant model can be constructed which will discriminate companies by using the Miles and Snow strategic types based on selected environmental and control system characteristics. The discriminators common to both countries are dynamism and control system changeability. Other discriminators vary between the two countries. This suggests that differences in national contexts do have some impact on the discriminant functions.

The results reported should be considered tentative however because of the sample size and limitations of methodology. Perceptual self-typing was

employed to group the companies by strategic types, whereas Shortell & Zajac (1990) suggested a combination of self-typing and archival data. The study could have benefited more if Simon's original set of questions were to be used to obtain the control system attributes which might be more indicative of the national context. Moreover, future research might structure in specific national contextual variables in the analysis.

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