

Organization

Working Paper Series

SALIENT DIMENSIONS OF ORGANIZATIONAL STRUCTURES

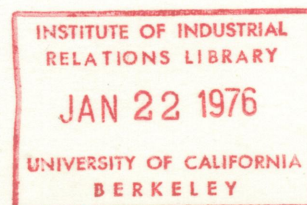
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(Working Paper no. 74-03)

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Purpose

This research seeks to explore and uncover a set of organizational characteristics which could serve to describe, analyze and compare organizations. Firms have traditionally been classified by the type of product or output supplied. Instead, this research takes the approach that the firm possesses certain characteristics analogous to the psychologist's notion of personality traits. It is when these components are identified, that one can properly analyze organizational units. Therefore, we present a set of empirically derived characteristics, and then relate those to certain measures of effectiveness of the firm.

Brief Literature Review

The concept of "individual differences" (i.e. certain dimensions or traits of an individual related to behavior), has played a central role in psychological studies examining individual behavior for over five decades. The study of organizational behavior has only quite recently attempted to empirically examine organizational characteristics and dimensions. The small amount of attention devoted to this research topic in organizational behavior is well summarized by Hall (1972). Although the majority of the work has been of a deductive nature, to our knowledge, Hass, Hall and Johnson (1966) would seem to have been the only ones to empirically derive a typology for organizations. Using a wide cross-section of firms and organizations they derived their typology by grouping those organizations which had most in common. After describing their typology, Hall (1972) suggests a classificatory scheme from which a typology may be constructed. It is not the purpose of our study to develop a new typology or verify Hass et al.'s, but instead to assess the adequacy of those components given by Hall, as well as relating to other non-empirically derived sociological components or organizational dimensions.

Those author's findings which stand out in this area of research are summarized in exhibit 1. Hall (1972) suggests adding to these dimensions; that is, he proposes that a complete scheme should also include: 1) decision making, 2) communication, 3) conflict, and 4) interaction; one, two and four were empirically verified in this study, while the conflict characteristic was not attested to. We anticipate that our results will integrate these approaches and in addition, we will attempt to relate

these empirically derived dimensions to certain measures of organizational effectiveness.

EXHIBIT 1 about here

Procedure and Methodology

The data were gathered through a national mailed survey of Canadian based manufacturing firms directed toward chief executives. The manufacturing firms chosen were those listed in Scott's Directory of Manufacturing Firms in Canada. Our response rate was better than the average mail response rate of about 10% (Wentz, 1972; Ferber, 1949). Approximately 2,000 questionnaires were mailed to the various firms and a total of 331 were returned, thus accounting for about a 17% response rate. Although this may seem low, it must be pointed out that this is by far the largest sample ever gathered for this type of research in organizational behavior (Woodward, 1965 N = 100, Hage and Aiken, 1969 N = 16, Harvey, 1968 N = 43, Pugh, Hickson, Hinings and Turner, 1969 N = 46, and Child, 1972 N = 82).

Preliminary analysis of the data suggested that those respondents whom had not answered the majority of the questions should be deleted from the analysis since these were not thought to be representative of the sample. Those questions which were directed specifically to the individual and not to the firm, and also those which were not answered frequently, were also removed from the analysis in order to minimize the subjectivity of the results. Therefore, we were left with a sample of chief executives which had answered the great majority of the questions while the replies contained a minimum of subjectivity and a maximum of representativeness of the firms. This final sample had an N = 200 with 52 variables or questions measuring different organizational attributes. The manufacturing firms in this final sample ranged in size from 4 to 6,000 with a mean of 300 employees. Of the 200 Canadian based firms, 125 or 62.5% were Canadian owned, and 75 or 37.5% were American owned.

The data (excluding four variables measuring the firm's effectiveness) were submitted to a common factor analysis with the use of the COMPAN program developed by Dr. R.P. McDonald (1970) and modified by Bourgeois (1974). The factor analysis produced 8 factors. These eight factors were presented to and interpreted by a panel of five academic professionals in the area of organizational behavior. The consensus was that 7 of these factors were clearly interpretable, while the panel also reached independently a consensus on the labelling of these seven factors. In order to proceed in the analysis, variables were created to represent each factor. These variables were

formed by taking the simple sum of the standardized form of the variables in each respective factor.

Further tests were carried out to attest to the reliability of the factors. Different terminologies have been given in order to represent different classes of reliability coefficients. Guion (1965) pointed out that a joint committee of the American Psychological Association, the American Educational Research Association, and the National Council on Measurements used in Education, standardized the headings into three kinds: 1) the coefficient of stability, which is the correlation of measures with a second set of measures obtained at a later time, 2) the coefficient of equivalence, which is the correlation between measures obtained from equivalent instruments, and 3) the coefficient of internal consistency, which is obtained from internal analysis of data gathered in a single administration of the measuring device. It is this latter approach which is adopted.

The internal consistency of each factor was verified in two ways. First, by correlating each item within a factor with the overall sum score of the respective factor. Second, the sample was split and the consistency between both split halves and the total sample was a measure of internal consistency. The face or consensus validity of the results was attested by the unanimity of the interpretation of the factors by the professional panel, while convergent validity was supported by the similarity of this organizational scheme with others, as evidenced in exhibit 1.

Following these tests on the factors which attested to the reliability and validity of the factors we proceeded to investigate, by regression analysis, the effects of each of these organizational components on a few measures of effectiveness (MOE). These MOE's were: 1) Sales, 2) Pretax profit, 3) Net worth, and 4) Rate of return. These measures are quite familiar and no further explanation is given, except that, we divided the first three MOE's by the number of employees and the level of capital investment such as to account for the size of firms and to distinguish between capital intensive firms and labour intensive firms. The independent variables for each regression were those organizational components derived through factor analysis.

As mentioned earlier, although our sample is entirely made up of Canadian based firms, there was a significant percentage of them which were American owned. Accounting for possible differences between these two groups is an important step, and is the subject of the next stage of analysis. Thus, the next and final stage in the analysis was to carry out a discriminant analysis in order to find those organizational components and effectiveness measures

which contribute most to the discrimination between these two groups.

Results & Discussion

The Factors

Due to editorial restrictions the entire original correlation matrix is not presented, but is available upon request. Since the correlation matrix is the basis on which factor analysis operates, it was tested for statistical significance and a $\chi^2 = 3242.4$ with 1128 d.f. was obtained. Since the normal χ^2 tables do not present such values a Wilson Hilferty transformation to a standard normal deviate was used and yielded $z = 30.07$, which is statistically significant at $\alpha \ll 0.001$. The cut off point for the number of factors was not arbitrarily chosen. Several criteria have been described by Mulaik (1972) in order to determine the appropriate number of factors. Those most popular criteria are probably best summarized by Tatsuoka (1971). These criteria and others can be summarized as follows: 1) statistical significance test for the number of factors required for adequately accounting for the observed correlation matrix, 2) consideration of the proportion of total common variance accounted for, 3) consider only those components corresponding to eigenvalues of the complete correlation matrix that are greater than unity, 4) use the scree test consisting of examining the plot of the entire set of eigenvalues against their ordinal numbers. One usually retains all the components down to and including the one associated with the largest eigenvalue whose plot lies on the "scree line" at the nearly straight line part of the plot, 5) a fifth criterion of pragmatic significance, most factors should also be interpretable. In practice, one does not usually adhere to any one in particular, but rather to a combination of these criteria.

The first criterion is satisfied since we obtained a $\chi^2 = 1202.1$ with 772 d.f. or a Wilson-Hilferty standard normal deviate $z = 9.39$ which is significant at $\alpha \ll 0.001$. The second criterion is of less concern to us, since our goal is not to obtain predictive ability but rather the purpose is one of an explanatory nature, and one does not necessarily also imply the other, although the solution obtained did account for 35% of the total variance. The third and fourth criteria are not relevant in this analysis since an oblique factor structure was used. The fifth criterion is obviously satisfied since the panel members unanimously agreed on the interpretation of all factors.

Since we had not made the prior assumption of independence between factors and indeed since we believe that some organizational characteristics may be interrelated, we sought an oblique solution (Hendrickson,

White, 1964). The entire oblique factor structure exhibited a clear "independent cluster solution", that is, a solution where each variable is related at most to one common factor. No variables were "factorially complex", that is, involved in more than one factor. Further, 16 of the 48 variables had low correlations with all other variables, and did not appreciably load on any factor. Exhibit 2 lists those 8 factors extracted; while the correlations between each of these eight derived organizational components are also presented. A complete summary of the factor analysis, reliability analysis and internal consistency analysis is presented in Exhibit 3.

EXHIBIT 2 & 3 about here

Description of factors

Before proceeding to the description and interpretation of each factor, we would like to again draw your attention to exhibit 1 where a brief summary of the previous findings is presented. Comparing our results with the previous research, we notice a slightly different terminology, but surprisingly, there is general consensus.

Factor 1 would seem to be quite clearly defined by those variables loading on it. All of these characteristics clearly demonstrate the degree of formalization and standardization in the employees' work. Hall (1972) with a more general label, encompasses this characteristic, as well as others, when he uses the term "environment". Pugh et al. and Aiken et al. refer to this characteristic while adopting the same terminology; that is, formalization.

Factor 2 depicts the firm's internal operating and decision making environment. It would seem that all of the qualitative statements within this factor are best summarized by the adjective "novelty". Aiken et al.'s complexity component would seem to be covered here, but the factor actually encompasses more than just the complexity of the operating environment by also describing the firm's varying internal climate.

Factor 3 is also quite obvious. The descriptors of this factor certainly describe the size and configuration aspects of the firm. Size is described by the number of personnel. The firm's configuration is described by the number of levels of management and the span of control, which is defined since the number of employees and the number of managers are present simultaneously and their ratio defines span of control.

Factor 4 describes the firm's flexibility and its ability to specialize. This is similar to Pugh et al.'s two classifications, specialization and flexibility, except that they emerge here as one dimension. These two characteristics would seem to be defined in a competitive market. Therefore, as well as describing the two components of specialization and flexibility, it also depicts the firm's external operating environment, a competitive one.

Factor 5 represents the personnel dimension of a firm. By qualifying different staff areas, we have identified a personnel component. Although this is similar to Hall's component, it is not identical since we are not describing the main type of personnel a firm possesses, but rather we are qualifying the effectiveness of different areas in the personnel of the organization.

Factor 6 describes sources and ways by which the firm keeps in touch with its external environment. That is, it describes the organization's medium of interface, feedback, and communication, with its competitive environment, by making use of trade publications, business periodicals, and professional associations.

Factor 8 clearly identifies technology. This is quite similar to Hall's technology component. Therefore, technology is defined here as the technical sophistication of the production equipment, the degree of automation and the degree of sequencing work flow. These have similarly been defined previously (Aldrich 1972; Harvey 1968; Hickson 1969; Klatzky 1970; Pugh 1969) as representing technology.

It is interesting to note that the firm's internal environment is described in factor 2 and the firm's interface with its external environment is described by factor 6. Thus, while both the internal environment and an interfacing mechanism are described, the firm's external environment is not revealed in any of the factors. Perhaps as a solution to this, one might have simply used "sales" as measuring the firm's external environment. This same approach was used by Child (1973). Child measured the firm's external environment by monitoring the "market variability". This variable is calculated in the following fashion: first, the raw sales data are regressed against time, and the standard error of the estimate for each regression is then divided by the mean score to obtain an estimate of market variability.

Factor Correlates Of Effectiveness

The dummy variable ownership, and the seven factors previously described were regressed successively against each of the MOE's presented earlier. Exhibit 4 summarizes those results obtain through our stepwise regression analysis. It is found that regression of the dependent

variable "sales" produced three statistically significant independent variables: size, personnel effectiveness, and the interface with the external operating environment. We also found, upon examining the beta coefficients, that all three have approximately the same relative importance. Thus, sales when allowing for the physical and financial size of the firm, would still seem to be related to size, but negatively related. The firm's degree of interface with its environment is also related to sales, as one might expect. Personnel effectiveness in the areas of marketing, sales, sales planning, and other domains would also be positively related to the level of sales. Recalling that we controlled for physical and financial size, we conclude that higher sales level are positively related to smaller firms, to the degree of interaction and interface with the firm's external environment through trade publications and professional associations, and to the organization's personnel effectiveness in certain areas.

EXHIBIT 4 about here

The second regression produced two significant variables: size and the interfacing mechanism. The firm's net worth, as for sales, is negatively related to size and positively related to the degree of interface which the firm exhibits. The degree of interface was weighted only slightly more than size. Thus, net worth is seen here as being negatively related to size and positively related to the degree of interface.

Regression 3 and 4 have similar results. That is, both the level of pretax profits and the firm's rate of return are also negatively related to size and size alone. No other factor entered significantly. Thus, smaller firms would seem to have higher levels of pretax profits and a greater rate of return.

In summary, the physical size and configuration of a firm tend to have a negative effect on those measures of effectiveness used. Although some people (e.g. Comanor and Wilson 1969) have given support to the hypothesis that there are advantages to size, it was found in our research, that when one accounts for the firm's physical and financial magnitude, that larger firms are generally less efficient. This may be due to the more bureaucratic nature of larger firms leading to a duplication of efforts, and excessive red tape. The difference between our results and those of Comanor and Wilson may be due to the measure of size employed. While they use the average value of assets, we use a more general size trait, that derived from factor analysis. By using only the financial aspect of size and by

not reflecting the number of employees, they may be unduly restricting themselves. In our case, both financial and physical size are accounted for since all measures of effectiveness were standardized for these. Thus, with those usual limitations of having measured those pertinent variables, we may conclude that size is a predominant variable negatively affecting the effectiveness of a firm.

It should also be noticed that although we have a small percentage of variance explained, (2.2% to 3.5%) this is not an indication that the relationships are not meaningful (Morrison, 1973; Bass, 1971), but rather, that there is a large random error term (i.e. much of organizational behavior is stochastic), or that other independent variables were not considered which should have been considered, or that our sample is too heterogeneous (Snedecor, 1972). Thus, what matters here is the significance of those variables included in the regression and not the level of R^2 . Further research is intended to clarify this issue. We will concentrate on producing more homogeneous industry types, such as the work done by Cattin and Wittink (1974). Then, possessing more homogeneous groups we would theoretically have much greater predictive power and more meaningful results, as suggested by Child (1973).

Discriminating Factors

The discriminant analysis was carried out using the BMD07M Stepwise Discriminant Analysis Program (Dixon 1967). The variables entered into the analysis were the seven factors and the four measures of effectiveness. The purpose here was to reveal those underlying dimensions and variables under which Canadian and American owned firms differed most. As illustrated in Exhibit 5, only those statistically significant variables were retained. Thus the discriminating variables (by order of discriminating power) were: 1) Interface with External Operating Environment, 2) Formalization, and 3) Flexibility and Specialization Ability.

EXHIBIT 5 about here

The relative importance of these variables in terms of discriminating power is indicated by the size of their canonical coefficient. Thus, the firm's degree of interface with its external environment would seem to discriminate between American and Canadian owned firms, as well as its degree of formalization, and both of these are slightly better discriminators than the organization's ability to be flexible and specialize. Given that only these three variables are significant, we may now compare their group mean scores. Thus, Canadian owned firms are found to be

less formalized, they have a greater ability to be flexible and specialize, and they also interface, to a greater extent, with their external operating environment.

The F statistic, presented in exhibit 5, tests the equality of the two group means, with measurement taken on all three variables. This statistic is found to be significant at $\alpha < 0.001$. The χ^2 statistic which tests the statistical significance of the discriminant function is also significant at the 0.005 level. Although the difference in group means is significant (as shown by the significance of the F statistic), this does not necessarily imply a large difference. Tatsuo (1970) provided a measure (ω^2) which measures the magnitude of this difference. The ω^2 is a measure similar to R^2 in multiple regression analysis, and is a measure of discriminatory power. Therefore, to measure the extent of differentiation or total discriminatory power, we used ω^2 and found that approximately 8.1% of the variance in the discriminant space was relevant to group differentiation. Thus, it was discovered that although we have a significant difference, this difference was not at all large. The hit ratio or percent of firms correctly classified (63.5%) was approximately 10% better than what would be expected by the proportional chance criterion (Morrison, 1969). However, it should be noticed here that a hit ratio calculated in this fashion may have a slight upward bias (Morrison, 1969), this ten percent difference between actual and expected is significant at the $\alpha < 0.008$.

Conclusion

Although we may have filled a need in organizational sociology by empirically studying organizational dimensions, we may have fallen in a trap of oversimplification, as pointed out by Hall (1972), "The great danger in most classificatory schemes is oversimplification". Any classificatory study is limited by certain difficulties. First, any taxonomy is a function of those firms sampled. Those not in the sample could certainly have had important effects. Another factor is that those variables selected for inclusion might not be those that are most crucial to the organizations; that is, the variable list is certainly not exhaustive. Measurement error is also another weakness. The Hass et al. (1966) study used tape recordings, this makes the actual responses open to subjective interpretation.

The mail survey used in our study alleviates much of this subjectivity, but the method could also have the pitfall of measuring only those that answered, and thus, the non-responses could actually correspond to a different population. A weakness in our study may have been the request, imposed on key personnel within each firm

investigated, to formulate answers. This may have the worrying effect that the data gathered represents the perceptions of those persons sampled only, and as Child (1973) put it, in discussing this type of approach: "the data are derived from persons whose perceptions of the environment may be heavily conditioned by the capability of their company's own systems for obtaining and processing information about the world outside." A similar critique was made by Tosi et al. (1973) when they reported on the Lawrence and Lorsch (1967) study. To overcome some of the weaknesses and to certify as to the validity of this and other classificatory schemes, future research should be conducted on a longitudinal basis, such as Child's (1973) study on organizational factors which relate to company performance. This would permit the monitoring of the continually changing organizations and provide researchers with the necessary data to analyze this change, its sources, causes and effects.

Hall suggested that the factors and variables used to derive Hall et al.'s typology turn out not to be crucial in differentiating organizations. It was the purpose of this paper to uncover a relevant set of factors and variables with which organizations could be compared or grouped to form a typology. Thus, given these organizational components or characteristics, the researcher could now derive an organizational typology, if so desired. From a theoretical basis, Hall proposes that environmental and technological factors, together with the nature of the personnel, traditions, decision making and other internal conditions form an organization at any particular point in time. The classification scheme derived in this paper lends empirical evidence to most of these components while also presenting additions to the scheme. In relating these components to certain corporate measures of effectiveness, we have given pragmatic significance to these findings. It was not the intention to concentrate on any one point or key element as Woodward (1965), Harvey (1968), Child (1972), Hage and Aiken (1969) and many others have done when they stressed technology or size as the key variables. We feel that there is no key variable and that, analysis should look at the organization as an entity which has several interrelated component parts.

The following briefly summarizes the findings of this study:

1. A valid and reasonable organizational scheme was empirically derived.
2. These organizational dimensions were related to certain financial measures of effectiveness and the following resulted:
 - a) The size of the firm is negatively related to all measures of effectiveness used.

b) The firm's degree of interface with its external environment and the organization's degree of personnel effectiveness are positively related to certain MOE's.

3. Although there are significant differences between American and Canadian owned firms, these differences are not large. These two groups differ on three major dimensions:

a) Canadian owned firms are less formalized.

b) Canadian owned firms have a greater ability to be flexible and to specialize.

c) Canadian owned firms interface to a greater extent with their external operating environment.

These findings will hopefully have made a significant contribution in the area of organizational behavior. We believe that by deriving this classification scheme, we will have provided a wider scope with which to analyze and compare organizations. As opposed to examining any one particular component in isolation, this approach presented a more general framework with which to operate, and hopefully it provides certain guidelines with which to pursue further research.

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EXHIBIT 1

COMPARATIVE ANALYSIS OF ORGANIZATIONAL COMPONENTS

(By Major Authors)

COMPONENT	Child (1973)	Hall (1972)	Pugh et.al. (1963)	Aiken et.al. (1966)	Bourgeois/Siegel (Factor Reference)
Environment	X	X			1, 2, 4, 5, 6.
formalization			X	X	1
standardization			X		1, 2
complexity				X	2
Personnel		X			5
Output		X			
Size-Configuration	X		X		3
Centralization			X	X	
Specialization			X		4
Flexibility			X		4
Technology	X	X			8

EXHIBIT 2

LIST OF FACTORS AND THEIR INTER-CORRELATIONS

	1	2	3	4	5	6	7
1. Formalization-Standardization	1.000						
2. Novelty of internal operating & decision making environment	0.043	1.000					
3. Size-Configuration	-0.211	-0.137	1.000				
4. Flexibility & Specialization ability in a competitive market	-0.080	-0.120	-0.138	1.000			
5. Personnel Effectiveness	-0.194	0.132	-0.339	-0.115	1.000		
6. Interface with External Operating Environment	-0.296	-0.180	-0.197	-0.121	0.034	1.000	
7. Uninterpretable	0.090	0.109	0.562	0.181	0.286	0.355	1.000
8. Technology	0.264	-0.026	0.351	0.116	0.358	0.126	0.292

EXHIBIT 3
SUMMARY OF FACTOR LOADINGS, RELIABILITY, AND INTERNAL CONSISTENCY ANALYSIS

	FACTOR LOADINGS		INTERNAL CONSISTENCY COEFFICIENT	FACTOR LOADINGS		INTERNAL CONSISTENCY COEFFICIENT
	Total	Second		Total	Second	
	Sample Split-Half Split-Half			Sample Split-Half Split-Half		
FACTOR I: FORMALIZATION - STANDARDIZATION						
40. Written documents (such as budgets, schedules, project specifications, procedures or program plans, job description, etc.) are used as an integral part of job.	0.714	0.836	0.742	0.570	0.742	0.742
43. Company's reliance on policies and procedure is formal.	0.701	0.781	0.645	0.477	0.645	0.645
42. Performance appraisals are based on written performance standards or criteria.	0.683	0.746	0.767	0.582	0.767	0.767
41. Standards of performance and control systems have been established in writing.	0.623	0.720	0.790	0.460	0.790	0.790
39. Duties, authority and accountability are documented in policies, procedures or job descriptions.	0.517	0.545	0.770	0.316	0.770	0.770
FACTOR II: NOVELTY OF INTERNAL OPERATING AND DECISION MAKING ENVIRONMENT						
34. Our operating and decision making environment has novel problems.	0.675	0.747	0.711	0.411	0.711	0.711
29. Our operating and decision making environment is not routine.	0.667	0.648	0.746	0.394	0.746	0.746
35. Our operating and decision making environment is unpredictable.	0.626	0.615	0.734	0.266	0.734	0.734
33. Our operating and decision making environment is not standardized.	0.599	0.557	0.703	0.386	0.703	0.703
31. Our operating and decision making environment is changing.	0.546	0.579	0.654	0.190	0.654	0.654
FACTOR III: SIZE - CONFIGURATION						
1. Number of full time employees.	0.794	0.758	0.873	0.469	0.873	0.873
3. Number of levels of management.	0.737	0.542	0.836	0.513	0.836	0.836
2. Number of managers.	0.686	0.636	0.892	0.471	0.892	0.892
FACTOR IV: FLEXIBILITY AND SPECIALIZATION ABILITY IN A COMPETITIVE MARKET						
27. We are able to meet market needs that larger firms cannot meet.	0.549	0.428	0.624	0.501	0.624	0.624
28. Management is enterprising.	0.532	0.386	0.579	0.499	0.579	0.579
FACTOR V: PERSONNEL EFFECTIVENESS						
21. We lack planning.	-0.635	-0.668	0.767	-0.034	0.767	0.767
23. We have poor marketing and sales.	-0.541	-0.588	0.595	0.037	0.595	0.595
20. We have managerial incompetence.	-0.510	-0.483	0.710	-0.159	0.710	0.710
22. We have a lack of budgeting and control.	-0.482	-0.528	0.653	0.124	0.653	0.653
24. We have a lack of imbalance of skills and experience.	-0.456	-0.380	0.605	-0.285	0.605	0.605
FACTOR VI: INTERFACE WITH EXTERNAL OPERATING ENVIRONMENT						
17. Business periodicals are used often.	0.755	0.750	0.852	0.498	0.852	0.852
16. Trade publications are used often to keep us informed about business conditions.	0.729	0.810	0.823	0.551	0.823	0.823
15. Professional associations are used often to keep us informed about business conditions.	0.346	0.310	0.647	0.155	0.647	0.647
FACTOR VII: UNINTERPRETABLE						
FACTOR VIII: TECHNOLOGY						
17. Manufacturing equipment is technically sophisticated.	0.659	0.289	0.394	0.394	0.754	0.754
48. Our production is fully automated.	0.542	0.608	0.335	0.335	0.732	0.732
46. There is sequencing of activities in the company's work flow.	0.408	0.123	0.203	0.203	0.696	0.696
FACTOR IV: (continued)						
26. We are able to specialize to a greater extent than larger firms.	0.524	0.408	0.521	0.521	0.635	0.635
8. There is intense competition in our industry when it comes to delivery.	0.480	0.626	0.241	0.241	0.556	0.556
25. We are able to be flexible.	0.445	0.441	0.462	0.462	0.532	0.532
10. There is intense competition in our industry when it comes to service.	0.419	0.651	0.165	0.165	0.528	0.528
9. There is intense competition in our industry when it comes to meet consumer specification.	0.388	0.647	0.022	0.022	0.487	0.487
11. Innovation Index.**	0.369	0.138	0.467	0.467	0.474	0.474

** Index formed of the sum score of five nominally scaled variables.

** All coefficients are significant at $\alpha < 0.001$.

EXHIBIT 4
SUMMARY OF REGRESSION RESULTS

REGRESSION NO. & DEPENDENT VARIABLE	REGR. CONS- TANT	INDEPENDENT VARIABLES							R ² (%)	F	
		FACTOR									OWNER- SHIP
		1	2	3	4	5	6	8			
1. Sales	85.96			-10.625 ^a -0.104 ^b (0.144) ^c		7.372 0.093 (0.194)	12.796 0.112 (0.113)		3.5	2.35 (0.074) ^f	
2. Net Worth	43.99			-7.70 -0.088 (0.211)			12.96 0.133 (0.061)		2.5	2.57 (0.08)	
3. Pre-Tax Profit	7.979			-1.119 -0.148 (0.037)					2.2	4.43 (0.037)	
4. Rate of Return	1.225			-0.206 -0.172 (0.015)					3.0	6.05 (0.015)	

NOTE: a: regression coefficient, b: beta coefficient, c: probability significance level

EXHIBIT 5
SUMMARY OF DISCRIMINANT ANALYSIS RESULTS

VAR./FACTOR NUMBER	F		CANONICAL COEFFICIENT	DISCR. FUNCTION	
	LEVEL	SIG.		CDN.	AMER.
1	9.183	0.001	-0.2002	-0.0473	0.0789
4	7.888	0.005	0.1545	0.0365	-0.0609
6	3.613	0.060	0.2005	0.0474	-0.0790
			(Constant:-)	-0.7211	-0.7708

CLASSIFICATION MATRIX:

	Cdn.	Amer.
Canadian	78	47
American	26	49

F_{α<0.001} = 6.146

χ_{α<0.005}² = 17.576

ω² = 0.081

HIT RATIO: Actual 63.5%, Expected 53.125% (α < 0.008)

CANADIAN MEAN SCORE: 0.2364

AMERICAN MEAN SCORE: -0.3940