OPERATIONS STRATEGY AND GLOBALIZATION IN BRAZIL: A SELF ASSESSMENT AND TAXONOMY OF MID-SIZE AND LARGE BRAZILIAN FIRMS

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ABSTRACT

This study consists of three distinct stages. First, it employs statistical interdependence methodologies to develop empirical operations strategy classification taxonomies for medium to large Brazilian firms. The taxonomies are the consequence of a classification scheme based on self-assessment measures on a wide variety of variables, which constitute fundamental components of operations strategy. Second, it examines the assessments with regard to specific variable sub-groups over time. Finally, it examines the consistency of the membership of the resultant clusters, over time, in the context of a shift toward Globalization in Brazil. **Keywords:** operations strategy, Brazil, Globalization, cluster analysis**.**

INTRODUCTION

The goal of this study is to develop operations strategy classification taxonomy for medium and large Brazilian firms (annual sales in excess of $40 million), which reflects the evolution of their attitudes toward key elements of operations strategies in terms of selected variables. The study consists of three distinct stages. First, it employs nonparametric analysis of variance to examine the respondents' attitudes towards specific elements of operations strategy over three distinct time periods.   Second, employs Q-type cluster analysis to identify groups of variables associated with neutral, optimistic and pessimistic views of operations strategies over these the aforementioned periods. Finally it examines the consistency of the membership of the resultant clusters over time as Brazil moved toward greater participation in the global economy.

OPERATIONS STRATEGY ASSESSED

In a recent presentation to companies at Colorado's World Trade Center, the United States Representative of the Federation of Industries (FIEMG) from Minas Gerais, Brazil's second largest industrial state after São Paulo, observed that while Brazil's GDP is among

the world's largest, as a trader Brazil is a relative novice.[i] The state of Minas Gerais alone has a population and an economy the size of Chile's, yet Brazil's total foreign trade in 1997($25.3 Billion) was less than a third of Chile's($87.1 billion)[ii]. The U.S. Commercial Consul to Minas Gerais also in attendance agreed that despite the changes, which have take place over the past decade, Brazilians entry into the global market has not been proportional to the size of its economy.

The questions under investigation in this study are: Are managers' attitudes toward operations issues linked to changes in Brazil's economy? Are managers' attitudes toward operations issues linked to Brazil's increasing involvement in the global economy? Can dimensions of strategy be identified, and do their components change over time?

The Elements

While it is often difficult to isolate operations strategy from overall business strategy, 27 variables relating to operations were employed in this study. Most of the variables are directly related to elements of operations while have a more general association. Managers ranked their attitudes regarding these variables on a six point Likert scale over three different time frames.   In a few cases a four-point scale was employed when more appropriate.

The variables in the study consisted of several groups. Specific operations variables include questions relating to vendor issues, purchasing, production methods, product quality, product delivery, internal logistics, external logistics, plant operations, raw materials acquisition, parts and components acquisition, managerial technology, and production technology.

A series of questions relating to relative performance with respect to the competition addressed precision of delivery, product quality, production flexibility, new product development, new product production, customer satisfaction, production methods, and worker team implementation.

More general associated areas included the state of the economy, availability of working capital, worker productivity, technology transfer, international issues, and involvement in strategic alliances.

The 27 variables were analyzed individually across the three time periods and 26 of them collectively within each time period.

The Backdrop: The Brazilian Economy (1988-1998)

The survey upon which the data for this analysis is based collected data relating to the variables of interest for three time periods, each covering a three year period. Each of the three time periods, 1989-1991, 1992-1994, and 1995-1997, addressed in this study encompasses a distinct stage in Brazil's political and economic transition from relative economic isolation and uncertainty to economic stability and participation in the global economy during the last decade of the 20th century.

During the initial period (1989-1991), Brazil moved from the transition government implemented in 1996, to it's first fully democratically elected president in 1990. It also marked the end of Brazil's economic isolation associated with the import substitution approach to economic development, and its commitment to the creation of MERCOSUL with the treaty of Punta del Este in 1991. Inflation still ravaged the economy, with annual rates in excess of 1000%. Internal economic shocks and general uncertainty characterized this period. Foreign direct investment was still relatively small given the size of the Brazilian economy.

The second period (1992-1994) saw Brazil's democracy survive its first severe test with the impeachment and conviction of President Collor followed by a legal transition of

power to the vie president, Itamar Franco. While inflation still persisted throughout this period until the implementation of the Plano Real in June, 1994, as did extreme economic uncertainty, the economy continued the opening to the outside world which had begun in 1990. During this period, the groundwork for both Mercosul and the Plano Real were put in to place.

January, 1995 not only marked the beginning of the third period addressed in the study, but also the launching of MERCOSUL and beginning of Plano Real architect Fernando Henrique Cardoso's first term as president. During this period, Brazilian's experienced an end to inflation as well as easy access to foreign goods and markets or the first time in half a century. This was also accompanied by privatizations, a wide range of economic reforms and restructuring, and the first balance of payments deficits in over a decade. The period ended with the Asian economic crisis in October, 1997 that would foreshadow a series of trials to come for the Brazilian economy.

It was against this changing backdrop that Managers were polled with regards to their attitudes towards the state of affairs relating to a series of key elements of operations strategy.

METHOD

Participants

The analysis is based upon responses from a sample of 149 Brazilian companies with annual revenues in excess of $40 million. The survey, developed by the authors, was conducted during 1997-98 and completed, June 1998. Approximately one fifth of the respondents were the CEO's of the companies, with the remainder consisting of CFO's and a variety of managers down through middle management levels. The survey consisted of measures collected on a total of over 110 variables.

Procedure

The data employed in this study have been collected empirically. The cost of the survey, developed by the authors, was covered by CNPq (Brazil's national agency responsible for the funding of research). The sample employed represents a subset of respondents to questionnaires sent to 1500 firms in Brazil. The data set consists of a wide range of measures relating to strategy, operations and strategic alliances. This research effort will focus on the subset of the data set relevant to operations policy and strategy over time.

Analysis

The data have been collected with regard to each data item for three distinct periods: 1989-1991, 1992-1994, and 1995-1997. The operations related data items, a sub-portion of the data collection instrument, were dedicated to the detailed questions regarding company policy and managers attitudes towards operations policy and strategy.

The principal methodologies employed in the analyses are cluster analysis and nonparametric ANOVA. Cluster analysis by its very nature it nearly a perfect fit for addressing the research questions addressed in this study. Not only is it a useful data reduction tool for organization of the large amounts of data collected by the questionnaires into manageable groups, but also is it is also useful for the examination of hypotheses addressed by the research questions. Three fundamental objectives of cluster analysis are:
1. Taxonomy description
2. Data simplification

3. Relationship identification

A non-inferential technique, cluster analysis enables the empirical examination of the data while at the same time providing the flexibility to select clustering variables that allow for indirect tests of selected hypotheses. It also offers sufficient flexibility to effectively provide meaningful analysis of ordinal data sets.

Nonparametric Friedman's ANOVA is applied to analyze changes in key variables relating to operations strategy over three time periods which encompass the significant political and economic changes, which have occurred in Brazil between 1988 and 1998.

RESULTS

The results of the survey and analysis are presented in two segments. The first provides a summary of the nonparametric analyses of variance performed on the three responses, one for each time period, provided for each of the 27 variables.

The Brazilian Economy from the Companies' Point of View

The variable depicting the Brazilians view of their economy deserves special attention since it provides a macro overview of the respondents' view of the environment in which they are functioning. It also provides one of the criteria against which overall cluster characteristics will be evaluated in a later section. Figure 1 and Table 1 provide a summary of their opinions regarding the Brazilian economy.

¡Error! No hay tema especificado. Figure 1: Brazilian Firms' View of Their Economy – Nonparametric *Friedman's ANOVA*

Years	Average Rank	Sum of Ranks	Mean	Standard Deviation
Friedman's ANOVA Chi Square (N = 144, df = 2) = 85.98357 **p < .00000** *Kendall's Coefficient. of Concordance* = .29855 Aver. rank r = .29365				
1989-1991	1.555556	224.0000	2.326388	1.499789
1992-1994	1.899306	273.5000	2.791666	1.278521
1995-1997	2.545139	366.5000	3.944445	1.310409

Table 1: Brazilian Firms' View of Their Economy -Nonparametric ANOVA

The results indicate a general improvement of opinion over time, with the movement of the median ranking from moderately unfavorable during the 1989-1991 period to slightly favorable in the 1995-1997 period.

Operations variables

Twelve variables directly relating to operations were assessed using six point Likert scales. The choices depended upon the variable being assessed. One set of variables offered the choices: unfavorable, moderately unfavorable, slightly unfavorable, slightly favorable, moderately favorable, and favorable while the rest provided a similar scale ranging from disadvantageous to advantageous. Figure 2 provides a graphic summary of the Friedman nonparametic ANOVA's for the 12 operations variables.
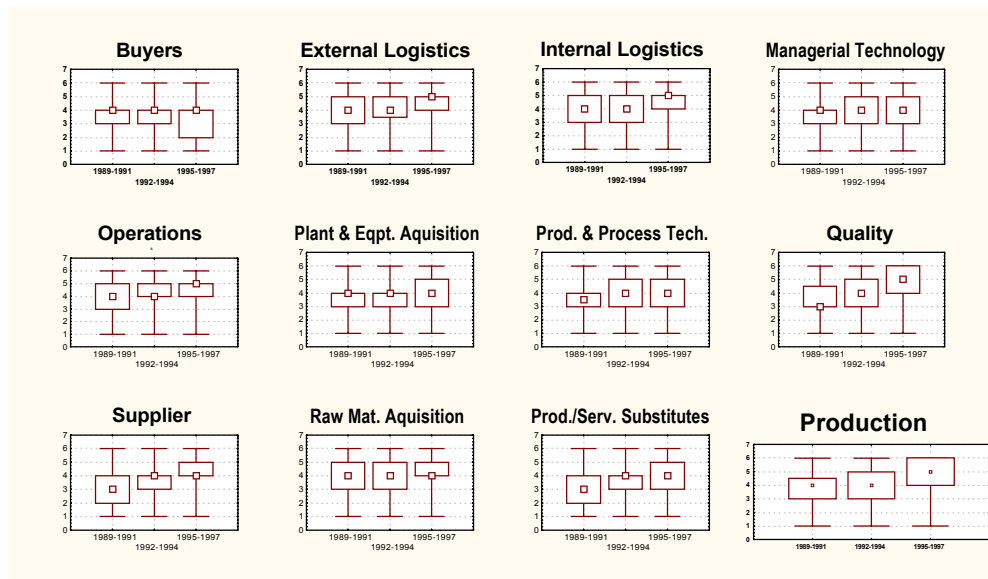
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Figure 2: *Operations* variables Box & Whisker Plots – Nonparametric *Friedman's ANOVA* over three time periods for each variable. (Use legend from Figure 1)

All analyses but one were statistically significant at $\alpha = .05$, indicating a change in viewpoint across the three time frames. Most of these statistically significant analyses indicated p values <.0000, with the exception of the variable *Product./Serv. Substitutes* which was significant, but with p <.0208. Examination of Figure 2 also implies that all of the variables except *Buyers,* tended toward the positive end of the assessment scale over time, not unlike the assessment of the overall economy in Figure 1.

The Friedman ANOVA analysis of Buyers indicated no statistically significant change in the assessment of this variable over time as indicated by Table 2.

Friedman's ANOVA Chi Square (N = 142, df = 2) = .3333333 **p < .84648**				
Kendall's Coefficient. of Concordance = .00117 Aver. rank r = -.0059				
Years	Average Rank	Sum of Ranks	Mean	Standard Deviation
1989-1991	2.007042	285	3.457746	1.275093
1992-1994	2.024648	287.5	3.521126	0.950687
1995-1997	1.96831	279.5	3.485916	1.412889

Table 2: Brazilian Firms' View Buyers -Nonparametric ANOVA

The variable, *Buyers*, captures respondents views as to pressure over pricing, quality demanded, services demanded, level of concentration, and bargaining power in the area of purchasing.

The Competition Variables

Nine variables assessed a firm's performance relative to its competitors on a number of operations issues using six point Likert scales. The choices included: inferior, moderately inferior, slightly inferior, slightly superior, moderately superior, and superior. Figure 3 provide a graphic summary of the Friedman nonparametric ANOVA's for the nine competition variables.
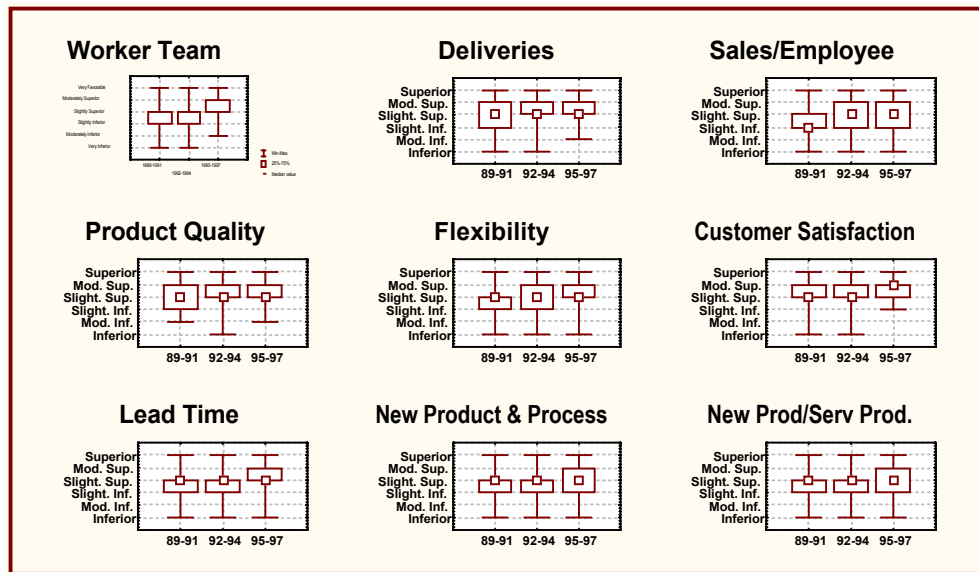
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Figure 3: *Competition* variables Box & Whisker Plots – Nonparametric *Friedman's ANOVA* over three time periods for each variable. (Use legend from Figure 1)

All analyses but one were statistically significant at α= .05, all with p values <.0000, indicating a change in viewpoint across the three time frames. All of the variables, tended toward the positive end of the assessment scale over time. This result generally conformed to those reported in the previous sections.

Other Related Variables

Four variables assessed general conditions that help define the operations environment as well and attitudes toward international issues and the extent of involvement in strategic alliances. Figure 4 provides a graphic summary of these variables. All analyses but one were statistically significant at α= .05, all with p values <.0000, indicating a change in viewpoint across the three time frames.
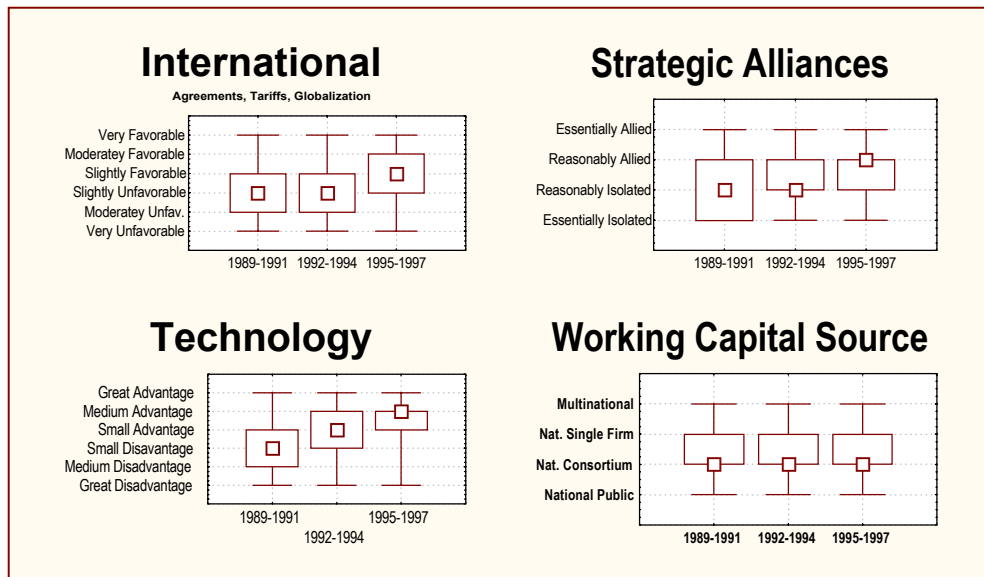
Figure 4: Remaining variables Box & Whisker Plots – Nonparametric *Friedman's ANOVA* over three time periods for each variable. (Use legend from Figure 1)

The results indicated that sources of working capital remained unchanged over the three periods when tested at α= .05 using Friedman's nonparametic ANOVA as indicated in Table 3.

Friedman's ANOVA Chi Square (N = 149, df = 2) = 5.220779 **p < .07352** Kendall's Coefficient. of Concordance = .01752 Aver. rank r = .01088				
Years	**Average Rank**	**Sum of Ranks**	**Mean**	**Standard Deviation**
1989-1991	1.963087	292.5	2.436241	1.429998
1992-1994	1.983222	295.5	2.382551	1.165943
1995-1997	2.053691	306	2.422819	1.05383

Table 3: Brazilian Firms' View Working Capital Source-Nonparametric ANOVA

Cluster Analyses

In addition to the *within variable* longitudinal time testing, non-hierarchical *k means Q type* (across variables rather than cases) cluster analyses were performed across 26 of the variables within each of the three time periods. The Q-type cluster analysis approach was chosen over factor analysis due to the ordinal nature of the data.

Within each time group, 5 separate analyses were performed, one for each of the 2 through 6 clustering possibilities. Employing both analysis of distances and similarity plots, it was determined that the three-cluster solution provided the best within-cluster homogeneity combined with between-cluster distinctions. The results of the cluster analyses were three natural groupings not unlike the divisions used for the nonparametric ANOVAS. The three groupings have been named *"Environment", "Competition"* and *"Operations".* While there was migration of variables from group to group across the time periods, the core characteristics defined by 3 or 4 stable variables in each cluster remained. It was from these core characteristics that the names were derived. The number of variables in each group/time period combination varied as indicated in Table 4.

	Environment	**Competition**	**Operations**

7

1989-1991	7	13	6
1992-1994	3	16	4
1994-1996	5	5	16

Table 4: Number of variables per cluster by time period

Core variables identified in the "Environment" group *include working capital, the economy* and *strategic alliance involvement.* The "Competition" group core *included lead time reduction, customer satisfaction new product & process development, new product/service production* and *worker team implementation.* The Operations group changed significantly from the 89-91 period to the latter periods. From 1992 on, the core was composed of *production, operations, product quality*, and *Raw Materials Acquisition*.

DISCUSSION

The individual analyses of the variables over time in all but a few cases indicated a change in managers' attitudes the positive direction over time. The starting point (1989-91) however was generally on the lower end of the scale and it is only in the latter period (95-97) that there is a general movement of the median ranks, and adjacent distributions of responses into the positive range.

The cluster analysis tended to confirm the intuitive groupings of variables, and provides valuable data reduction input for future analyses. It helps identify key variables in the data that can be used for further analysis of this data set or in conjunction with external data sets.

Caveats and Future Research

While the employment of cluster analysis has provided some insight into the evolution of operations policies and strategies in the context the economic changes, which have taken place in Brazil over the past decade, the results must be interpreted with caution. Hair, Anderson Tatham and Black characterize cluster analysis as being descriptive, theoretical, and non-inferential. They also point out that the solutions are not unique and the method will always create clusters whether or not any real structure exists. Also, it is likely that an unknown non-respondent bias exists given that only 149 of the 1500 questionnaires were returned.

The data set employed in this analysis contains considerable additional information, particularly with respect to more detailed information pertaining to the firms' participation in strategic alliances. Identification of key variables within the clusters presented here provides valuable information for further analysis of specific research questions involving operations issues and participation in strategic alliances.

CONCLUSIONS

The improvement in self-assessment with regard to operations issues has tracked the changes and improvements, which have occurred in Brazil over the past decade. The values assessed however seem to lag the improvements in the economic conditions of the country, perhaps as a result of conservatism associated with previous decades of economic turmoil. This lag, perhaps depicting conservatism, may well explain why Brazil's performance as a trading nation is far less than its GDP would indicate, however, if it is just a lag, this should change dramatically in the near future.

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[i] Glenn Cheney, US FIEMG Representative, Denver World Trade Center, May23, 2000

[ii] Economist Screen Saver, February 1998