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ABSTRACT

Much of the research in manufacturing strategy has focused on specific relationships between a few constructs, with relatively little emphasis on typologies and taxonomies (Bozarth and McDermott, 1998). Using data from 196 respondents in 98 manufacturing units, this study develops a taxonomy of small manufacturers based on their emphasis on several competitive priorities. The annual sales for sixty-four percent of the participating units in this study are below US $50 million, which is on the lower side as compared to other studies in this area (cf., Miller & Roth, 1994). The study findings indicate that different groups of manufacturers – Do All, Speedy Conformers, Efficient Conformers, and Starters – emphasize different sets of competitive priorities, even within the same industry. Further, the Do All types, who emphasize all four competitive priorities, seem to perform better on customer satisfaction than their counterparts in the Starters group. The above findings lend support to the sandcone model but contradict the traditional trade-off model.

Key words: Manufacturing Strategy; Taxonomy; Competitive Priorities; Sandcone model.

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1.0 Introduction

Manufacturing strategy is an area of growing interest to academics, and a top ranked strategic issue for manufacturing managers (Malhotra, Steele, and Grover, 1994). Bozarth and McDermott (1998) observed that much of the research in this area had focused on specific relationships between a few constructs, with relatively little emphasis on typologies and taxonomies. With some notable exceptions, there are few empirically derived taxonomies that characterize manufacturers by manufacturing task or competitive priorities, such as quality, delivery, flexibility, or cost. Using data from the 1987 Manufacturing Futures Project Survey, Miller and Roth (1994) identified three strategic groups of manufacturers with similar manufacturing tasks, which they labeled caretakers, marketers, and innovators. They also observed differences among groups with regard to the improvement programs emphasized (zero defects, new product introductions, etc.), and the importance placed on several performance measures (outgoing quality, headcount, number of grievances, etc.).

Youndt, Snell, Dean, and Lepak (1996) cluster analyzed 97 manufacturers across four manufacturing strategies orientations (quality, delivery flexibility, scope flexibility, and cost), while examining the moderating effect of different manufacturing strategies on the human resource systems-performance relationship. Though their main objective was not to develop or test any taxonomy of manufacturing strategy, their findings have a bearing on this research stream. Their analysis yielded five groups of manufacturers,

which they labeled by the emphasis on corresponding manufacturing strategies, as follows: (1) quality emphasis, (2) cost and quality emphasis, (3) cost, quality, delivery flexibility, and scope flexibility emphasis, (4) quality and delivery flexibility emphasis, and (5) no strategic emphasis (p. 855). They, however, did not find these strategy clusters to have any direct impact on manufacturing performance as captured by self-reported measures of product quality, employee productivity, on-time delivery, equipment utilization, etc.

The lack of performance differences among clusters in Youndt et al.'s (1996) study could be explained using the equifinality argument that different organizations could pursue different strategies and be equally effective (van de Van and Drazin, 1985; Bozarth and McDermott, 1998). Further, the findings of Youndt et al. (1996) and Miller and Roth (1994) are not directly comparable since, among other things, the former examined the relationship between cluster membership and a unit's performance, whereas, the latter examined the relationship between cluster membership and the perceived *importance* of various competitive dimensions. The findings of the two studies, however, are conflicting enough to warrant further investigation. This study is a step in that direction.

2.0 Research Propositions

Anticipating the development of new competitive dimensions, and the formation of new manufacturing strategic groups, Miller and Roth (1994) encouraged researchers to test the taxonomy over time and in different settings. The dynamic nature of competitive priorities (Corbett and Wassenhove, 1993), and an ever-increasing consensus on

manufacturers' ability to simultaneously emphasize multiple competitive priorities (Ferdows and De Meyer, 1990; Noble, 1995; Hayes and Pisano, 1996; Clark, 1996; Kathuria, 1997), are added incentives for reexamining the issue. About a decade after the data in Miller and Roth's (1994) study was collected, the time seems ripe to reexamine the clustering of manufacturers across several competitive priorities. Further, it would be interesting to see if the patterns observed among large manufacturers in Miller and Roth's study would be prevalent in relatively small manufacturers in a cross-section of industries.

Accordingly, the purpose of this study is to examine if units differ across the competitive priorities emphasized. If so, are these differences, in any way, explained by any contextual factors, such as industry membership, or reflected in their manufacturing performance? Figure 1 presents a model of contextual factors and performance criteria associated with competitive priorities emphasized.

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Insert Figure 1 about here
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The conceptual model in Figure 1 includes four widely accepted competitive priorities in the manufacturing strategy literature – cost, delivery, quality and flexibility (cf., Ward, Duray, Leong & Sum, 1995). The model suggests that the relative emphasis of various manufacturing units on these competitive priorities is likely to be associated with contextual variables, such as industry membership. Further, it is expected that manufacturing units placing a relatively high emphasis on *a group* of priorities will perform better on the corresponding performance criteria – efficiency, timeliness,

customer satisfaction, etc. The above conceptualizations are stated below in the form of three propositions.

Proposition 1. *Manufacturing units can be classified into different groups based on their emphasis on competitive priorities: Cost, Flexibility, Quality, and Delivery.*

Proposition 2. *The group orientation – competitive priorities emphasized – is associated with industry membership.*

Proposition 3. *Depending upon the orientation of the groups identified above, the groups will perform better on different sets of performance criteria.*

This study tests the above propositions as follows. First, it identifies groups of manufacturers who perceive a similar emphasis on multiple competitive priorities in different industries. Second, it examines differences in the relative emphasis on competitive priorities between and within groups. Third, it explores the relationship between the groups' orientation (i.e., competitive priorities emphasized by the group) and the industry membership. Finally, perceived managerial performance of the respective groups on several measures is examined for differences between and within groups.

3.0 Methodology

3.1 Data and procedures

The data used in this study was collected as a part of the bigger project that involved five employees - a manufacturing manager, three subordinate employees, and a general manager - from each participating unit. For details regarding the bigger project, please refer to Kathuria & Partovi (1999) and Kathuria, Porth, and Joshi (1999). Given the nature of the project and the extent of data collection, a low response rate was

anticipated. Thus, a large potential pool of over 1300 manufacturers was identified from Pennsylvania Directory of Manufacturers (1995), New Jersey Directory of Manufacturers (1995), and Delaware Directory of Manufacturers (1995). The sample included different industries to facilitate generalizability of the results. Given the low response rate of mail surveys and limited resources, first a letter accompanied by a postage-paid reply card was mailed to solicit participation in the study. About 100 letters came back undelivered due to change of address or incorrect address. Of the remaining, over 300 responded of which 158 agreed to participate. The rest, though expressed interest in the study, were unable to participate due to other commitments at that time or reduced manufacturing activity.

The focus of this study was a manufacturing unit where the manufacturing manager would have implemented or pursued the competitive priorities of the unit, based on his/her perception. These units included manufacturing units or divisions of some large firms, and for smaller manufacturers, the entire organization. The data used in the study came from two questionnaires (one for the manufacturing manager and one for the general manager) from each participating unit. Of the 316(=158x2) questionnaires distributed at the two levels, 197 responses from 99 units were received. One general manager's response was discarded since the matching manufacturing manager's response was not received. A comparison of the units in this study with nonparticipating units showed no statistically significant differences for size (number of employees and annual sales). The average manufacturer in the sample had annual sales of US $43 million with about 75% of the sample being below US $100 million. The average number of employees in a sample plant was 275, which is on the higher side considering the

national average (Compton, 1997). A comparison of the sample with the national statistics is provided in Table 1.

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Insert Table 1 about here
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The Manufacturing Manager's survey, shown in the top panel of Appendix I, was filled out by managers whose titles included Operations Manager, Director of Operations, and Manufacturing Manager. The average job tenure for the participating manufacturing managers was 5.11 years with a standard deviation of 4.53 years. Second, the General Manager's Survey, shown in the bottom panel of Appendix I, was completed by a superior of the manufacturing manager who responded to the manufacturing manager's survey. Thus, the term General Manager refers to a superior to whom the manufacturing manager reports directly. The average years of association for the two managers in the sample were over 5 years, with a standard deviation of 4.45 years.

3.2 Industry Mix

This research focused on six industries in the manufacturing sector, as done in some recent studies by Boyer, Ward, and Leong (1996), Swamidass (1994), and Ritzman, Safizadeh, Wood, and Sharma (1993). Specifically, manufacturing units in the following industries were studied: fabricated metal, machinery except electrical and computers, electrical machinery including computers, transportation and aerospace, consumer nondurables, and a miscellaneous industry that was called "other". Table 1 contains the composition of the sample, based on the manufacturing managers' response to the industry-related questions. In terms of the type of industry, 15% of the units are in

fabricated metal, 9% in machinery except electrical and computers, 11% in electrical machinery and electrical goods, 7% in transportation and aerospace, 20% in consumer nondurable, and 38% are in the miscellaneous category with no more than five percent in any single industry.

3.3 Measures

3.3.1 Competitive Priorities

Consistent with the literature, the term "competitive priorities" is used to describe manufacturers' choice of manufacturing tasks or key competitive capabilities, which are broadly expressed in terms of low cost, flexibility, quality, and delivery (Ward et al., 1995; Skinner, 1969; Berry, Bozarth, Hill, and Klompmaker, 1991; Hayes and Wheelwright, 1984). Given the multi-dimensional nature of these priorities, multiple items were used to capture a manufacturer's emphasis on each competitive priority. These items, listed in Appendix I, were taken from several published sources, including Morrison and Roth (1993); Ritzman et al. (1993); Nemetz (1990); Wood, Ritzman, and Sharma (1990); and Roth and Miller (1990). Manufacturing managers rated all items on a five-point Likert scale with values ranging from 1 to 5, with 5 being extremely important. The items in the questionnaire were arranged in a random order to elicit accurate information from respondents.

To determine the underlying dimensions of competitive priorities, a principal component factor analysis with oblimin rotation in SPSS 8.0 was used. The oblimin rotation was used since the competitive priorities are not assumed to be orthogonal, but may actually be mutually supportive of each other. To ensure that a given item represented the construct underlying each factor, a two-stage rule was used (cf., Nunnally, 1978). First, a factor weight of 0.45 was used as the minimum cutoff. Second, if an item loaded on more than one factor, with difference between weights less than 0.10 across factors, the item was deleted from the final scale. The Cost and Quality-of-

Conformance scales retained all the items as expected, and the Flexibility scale retained four of the five items. One item that did not load on Flexibility was 'customizing product to customer specification.' For the Delivery scale, one item (making fast deliveries) was dropped due to a low factor loading.

Next, the internal consistency of the competitive priority scales was assessed using Cronbach's alpha coefficients. In the present study, since the alphas for the revised scales were not significantly different from those of the original scales, the original scales were retained for subsequent analyses. The original alphas for the Cost, Quality-of-Conformance, Flexibility, and Delivery scales, reported in Appendix I, are above the lower limits of acceptability, generally considered to be around 0.60 (Nunnally, 1978). The Quality-of-Design scale, which had an alpha of 0.46, was dropped from further analysis.

Finally, the scores for each scale were determined by adding up the individual scores for the corresponding measures and then dividing by the number of measures. For example, a manufacturing unit's emphasis on cost was calculated by averaging its score on three measures – M1 (Controlling production costs), M3 (Improving labor productivity), and M9 (Running equipment at peak efficiency). As shown in Appendix I, the individual scores on six of the seventeen measures ranged between 1 (not at all important) and 5 (extremely important), while nine of the seventeen measures ranged between 2 and 5, and only two of the seventeen between 3 and 5.

3.3.2 Managerial Performance

Regarding studies of manufacturing strategy, Swamidass and Newell (1987), among others, noted the difficulty of obtaining objective financial measures of performance, such as profit growth, profit margin, sales increase, market share, return on investment, etc. Although it is preferable to use objective measures of performance, such measures are hard to compare across units with different technologies, product lines, and

competitive priorities (Bozarth & Edwards, 1997). Hence, perceptual measures of managerial performance were adopted from the organizational sciences literature, which included quality of work, accuracy of work, productivity of the group, customer satisfaction, operating efficiency, quantity of work, and timeliness in meeting delivery schedules. The above measures are generic enough to be applicable to different industries, and different units pursuing dissimilar strategies.

The perceived measures have been used and recommended as a substitute when objective measures are either not available or not relevant (Dess and Robinson, 1984; Venkatraman and Ramanujam, 1987; Youndt et al., 1996). The use of perceptual measures, however, could lead to the common methods variance (CMV) problem, which was tested using the Harman (1967) one-factor test. The same test has been used in similar studies in the Operations Management literature (cf., Bozarth & Edwards, 1997). If the measures were to be affected by CMV, then they would tend to load on a single factor. The factor analysis for the managerial performance measures resulted in two factors, with the highest factor loadings spread across the two factors.

To further moderate the problem of common method variance due to the mono-respondent bias, superiors of manufacturing managers (not the manufacturing managers themselves) were asked to rate the manufacturing managers' performance on a scale of 1 to 7, with 1 being 'Unsatisfactory' and 7 being 'Excellent.' As seen in Appendix I, four of the seven measures ranged between 2 and 7, and three ranged between 3 and 7, while the average scores on the seven measures range between 4.98 and 5.49. Further, the high ranking respondents (manufacturing and general managers) in this study also helped to overcome the common method variance problem, since they tend to be more reliable sources of information (Philips, 1981).

4.0 Results and Discussion

4.1 Clusters Emphasizing Multiple Priorities

The data were cluster analyzed using Ward's method with the squared Euclidean distance measure in SPSS 8.0, also deployed by Noble (1995). A problem with the cluster analysis is the selection of the most appropriate number of clusters (Miller and Roth, 1994). The objective, generally, is to strike a balance between parsimony (few clusters) and accuracy that is attained by keeping the data as individual observations (Boyer et al., 1996). This study used several rules of thumb as guides for determining the appropriate number of clusters, as employed in similar studies by Miller and Roth (1994) and Boyer et al. (1996).

First, Lehmann (1979) suggests that the number of clusters should be limited to between n/30 and n/60, where n is the sample size. This implies that the number of clusters in the final analysis should be between two and four. Second, a hierarchical clustering model was used to generate a dendogram, which graphically illustrated how the manufacturers quickly grouped into four main clusters. Third, to check the stability of membership in the four clusters, three iterations of the Ward's method were performed with the number of clusters set at three, four, and five. A comparison of the three solutions indicated that the cluster membership was stable across solutions and new clusters were formed only by splitting apart larger clusters. Fourth, as suggested by one of the reviewers, Ward's clustering method was run several times after rearranging the observations, based on several keys. Since the shuffling of observations did not affect the cluster membership in any way, it was concluded that the four-cluster solution identified by the Ward's method was, indeed, a robust solution.

Finally, the managerial interpretability of the solutions was sought. First, ANOVA was used to test for differences in the defining variables (the emphasis on the four competitive priorities), among clusters. Second, Scheffe pairwise comparisons of

means were performed to determine which pairs were significantly different. The four-cluster model best met the above criteria. The null hypothesis that the four clusters are equal across all defining variables was rejected at the 0.0001 level of significance.

Table 2 presents the cluster means, the standard errors, the group numbers from which this group was significantly different at the 0.05 level of significance or less, and the relative ranking of the emphasis on the four competitive priorities within each group. The F-statistics indicate strong evidence that one or more of the cluster means differed from another on all four defining variables, at the 0.0001 level of significance. Further, the Scheffe pairwise comparison of the mean difference, at the 0.05 level of significance or less, indicated that 38% of the group means were different from all of the other three group means, 56% were different from two of the three groups, and (6%) were different from only one of the three groups.

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Insert Table 2 about here

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The four clusters are named: Starters(Cluster1), Efficient Conformers(Cluster 2); Speedy Conformers(Cluster3), and Do All(Cluster4). The interpretation of the groups is based on whether (a) the relative emphasis on competitive priorities is significantly different among clusters, and (b) the relative emphasis on a competitive priority is significantly different from other competitive priorities within a cluster. The latter is tested using the two-tailed paired-sample t-tests in Table 3. Each column in Table 3 corresponds to a group, and presents the competitive priority(ies) from which a given priority was emphasized significantly differently at the 0.05 level of significance or less.

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Insert Table 3 about here

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Cluster 1: Starters. This cluster of thirty-two manufacturing units ascribes significantly *lower* emphasis to cost and quality compared to the other three clusters. Delivery and flexibility are both rated significantly *below* the importance given by the cluster 3 and 4 members. This cluster is named "Starters" for their low relative emphasis on all four priorities, which is below 3.80, on a scale of 1-5, with the highest (3.78) on quality. Based on the within cluster analysis (Table 3), the emphasis on quality ranks #1, and is significantly higher than flexibility, though not different from cost or delivery. The manufacturers in this group appear to be emphasizing quality so as to 'qualify' in the market place. It is also possible that other non-manufacturing priorities, such as design or innovation, are more important for this group. The starters are the second largest group, representing thirty-three percent of the cases in four clusters.

Cluster 2: Efficient Conformers. This cluster of eleven units distinguishes itself from the Starters (cluster 1), based on a significantly higher emphasis on quality and cost. The top two priorities within this cluster are cost and quality, with about an equal emphasis (4.51 and 4.48 respectively). Further, within this cluster, the emphasis on cost and quality is significantly higher than that of delivery and flexibility, that is why the name – Efficient Conformers. The Efficient Conformers are the smallest group, representing about eleven percent of the cases.

Cluster 3: Speedy Conformers. This cluster's emphasis on delivery (4.35) is significantly higher than that of the Starters (cluster 1) and the Efficient Conformers (cluster 2), but <u>not</u> significantly lower than the members of cluster 4. Within this cluster, the emphasis on quality (4.43) is <u>not</u> significantly different from delivery, which means quality and delivery are equally emphasized, hence, the name – Speedy Conformers. This cluster of forty units places significantly higher emphasis on both quality and

delivery as compared to cost and flexibility. The speedy conformers are the largest group accounting for forty-one percent of the cases.

Cluster 4: Do All. This cluster of fifteen units, representing about fifteen percent of the cases in all four groups, places a simultaneously high emphasis on all four competitive priorities. This group's emphasis on all four priorities exceeds 4.5, which earns this group the name – "Do All." The emphasis on quality and flexibility is significantly higher than that in the other three groups, which clearly distinguishes this group from the lot. Further, based on the within group analysis (Table 3), the emphasis on quality is not significantly different from flexibility, which means the group equally emphasizes these two priorities. The emphasis on flexibility is not significantly different from the emphasis on cost, and delivery. Given a very high emphasis on all four competitive priorities (4.51 – 4.93), and, about the same emphasis on flexibility, delivery, and cost, the group was named Do All.

The above results support Proposition 1 and suggest that in general, manufacturers emphasize various sets of competitive priorities that reflect their strategies to meet the needs of the markets they serve. The study also found a group of manufacturers, though small, who simultaneously emphasize all four competitive priorities. This finding reinforces the views of Ferdows & DeMeyer (1990) but goes against the traditional 'trade-offs' thinking.

4.2 Industry-Cluster Relationship

Proposition 2 was tested using a chi-square test, which indicates no relationship between group membership and the industry to which the manufacturing unit belongs (Chi-square = 14.39, p = 0.49, df = 15). Table 4 illustrates the distribution of the four groups by industries in the sample. In the four clusters, there are multiple competitors in each industry with the following exceptions. First, the two smallest groups, Efficient

Conformers and Do All, had no representation in the Machinery industry, and a single respondent each in Electrical machinery and electrical goods. Second, there were no Efficient Conformers in the fabricated metal industry. Finally, there was only one respondent from the Do All group in the transportation and aerospace industry. This could be due to small size of the two clusters, 11 and 15 respectively. In the bigger clusters, the Starters and the Speedy Conformers, there were multiple competitors in all industries. Proposition 2 was, therefore, not supported.

The lack of industry associations with competitive priority group membership suggests that manufacturers use different competitive priorities to compete in the same industry. This is consistent with Porter's (1980) views that a broad range of strategies is available to competitors within an industry. Prima facie, this finding seems different from Miller & Roth (1994) who observed that certain strategic groups were more likely to be found in certain industries. In a detailed examination of their sample at the SIC code level, however, Miller & Roth also found that at least one competitor used a significantly different basis to compete than its primary competitors.

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Insert Table 4 about here

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4.3 Performance Measures:

Table 5 presents the cluster mean scores, the standard errors, and the in-cluster rankings of the seven performance measures. One or more of the four competitive priority clusters are significantly different from another, at 0.05 level or less, on two performance measures – customer satisfaction ($F = 4.04$, $p = 0.0097$) and quality of work ($F = 3.19$, $p = 0.0269$).

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The manufacturing managers of the Do All group are perceived by their respective superiors to perform significantly better on customer satisfaction than their counterparts in the Starters group. Within the Do All group, the managerial performance on customer satisfaction is rated the highest (6.07 on a scale of 1-7), followed by the accuracy of work (6.00) and quality of work (5.80). The Speedy Conformers perform significantly better than their counterparts in the Starters group on the quality of work, which is also rated the highest within the Speedy Conformers group, with the accuracy of work and timeliness in meeting customer delivery schedule tied for the second place.

Within the group of Efficient Conformers, managerial performance on the quantity of work is rated the highest (5.66). Efficient Conformers are also rated the highest, among the four clusters, on quantity, productivity, and efficiency. The ratings are, however, not significantly distinguishable from the other three groups. The highest cluster means on the remaining four measures – accuracy, customer satisfaction, timeliness, and quality – are attained by the Do All group, though the between-cluster differences are significant on customer satisfaction only.

To further understand the managerial performance implications for the competitive priority clusters, within-cluster paired-sample T-tests were conducted (Table 6). All reported pairs in Table 6 are significantly different at 0.05 level or less, except six pairs marked ‘b’ that are different at 0.10 level or less. The results shed some extra light on the performance-priority cluster relationships. Members of the Do All group perform significantly better on accuracy, quality, quantity, customer satisfaction, and timeliness,

as compared to efficiency and productivity of that cluster. The Speedy Conformers, consistent with their orientation, perform significantly better on customer satisfaction, and timeliness, as compared to their perceived efficiency and productivity. Their perceived performance on accuracy and quality is also significantly better as compared to that on efficiency, productivity, and quantity. The Efficient Conformers, on the other hand, perform better on quantity than on timeliness, quality, productivity, and efficiency. The Starters perform better on accuracy, quality, timeliness, quantity, and productivity as compared to efficiency. Further, their performance on quantity is better than their performance on customer satisfaction.

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Insert Table 6 about here

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The performance differences between and within groups identified in this study support Proposition 3. As discussed above, various groups appear to perform better on those performance criteria that are consistent with their competitive priorities. Researchers including Richardson, Taylor and Gordon (1985), Giffi, Roth and Seal (1990), have suggested that performance measures should correspond to the content of a manufacturing strategy, which includes the competitive priorities emphasized. This study helps take the manufacturing strategy-performance research a step further by establishing that the manufacturers, indeed, perform better on those measures that correspond specifically to their strategic orientation.

5.0 Conclusion:

This study developed a taxonomy based on the content of manufacturing strategy, i.e., competitive priorities. Analysis reveals that different groups of manufacturers emphasize different sets of competitive priorities. Among relatively small manufacturers, the focus of this study, Speedy Conformers are the biggest group with forty-one percent constituents, who emphasize delivery and quality. The Efficient Conformers, eleven percent of the sample, place a higher emphasis on cost and quality than the other two priorities. The 'Do All' are not many, fifteen percent, and they place a very high emphasis on all four competitive priorities – quality, delivery, flexibility, and cost. There are several Starters, thirty-three percent, who seem to be focusing on quality more than any other priority. The Starters' emphasis on quality is, however, the lowest among all four groups, which also raises the possibility that this group might focus on some other non-manufacturing priorities not included in the study. Further, they don't surpass any group in terms of emphasis on any competitive priority.

It is also interesting to note that the four types of manufacturers exist in most all industries covered in the sample, which suggests that different manufacturers use different basis to compete within the same industry. More interesting is the fact that the Do All type, who emphasize all four competitive priorities, also satisfy their customers better than their counterparts in the Starters group. This finding is contrary to the belief of some researchers, including Skinner (1969), who would argue that the Do All companies could not perform well. The existence of the Do All types, on the other hand, is consistent with the observations of Nakane (1986) and Ferdows and De Meyer (1990),

who believed that the four competitive capabilities could be simultaneously emphasized and enhanced.

Further, based on within group performance analysis, different groups of manufacturers seem to perform better on certain performance measures that are consistent with their focus. For example, the Speedy Conformers are perceived better on timeliness in meeting customer delivery schedules, accuracy and quality of work than on their efficiency and productivity. Efficient Conformers, on the other hand, are doing better on quantity of work than timeliness in meeting customer schedules. The Starters, with their focus on quality, are doing better on accuracy and quality than on efficiency. This finding is consistent with the literature that suggests a correspondence between performance measures and the manufacturing priorities emphasized (Richardson et al., 1985; Roth, 1989; Nemetz, 1990).

It is also possible that the above within and between group differences could be related to both Nakane's (1986) notion of how manufacturing progresses through various competitive priorities and Ferdows & De Meyer's (1990) sandcone model. For example, the Starters seem to have a light emphasis on all priorities that might show how dividing attention between the priorities diminishes the impact on certain performance measures. This group is the lowest performer on customer satisfaction. The Do All cluster also emphasizes all priorities, but places a relatively high emphasis on all four. These manufacturing units may have progressed through the sandcone, and are able to simultaneously emphasize and enhance all four priorities. Speedy Conformers place a higher emphasis on quality and delivery as compared to cost. This group appears to be building up the sandcone. The Efficient Conformers, who place a higher emphasis on

quality and cost, might be taking a low cost strategy after having progressed on quality and, perhaps, may follow a different sandcone model than that of Ferdows & De Meyer (1990) and Nakane (1986).

The present study, in some respects, also builds on Miller and Roth's (1994) and Noble's (1995). Though Noble (1995) tested the cumulative model in a multiple country context using data collected between 1984 and 1987, the findings of the three studies bear some similarities. First, all three studies found multiple groups of manufacturers that have different competitive orientation, with Noble's North American sample being least supportive of all. Second, all three studies found a correspondence between performance measures and the manufacturing priorities emphasized.

Despite the similarities noted above, this study is different from Miller and Roth's (1994) and Noble's (1995). First, it focuses on relatively smaller American manufacturers, which have been mostly neglected in manufacturing strategy research. The annual sales for fifty-percent of Miller & Roth's sample was above US $200 million, whereas sixty-four percent of manufacturers in this study were below US $50 million. Noble's North American sample included Fortune 500 plants though average annual sales for the sample were not reported. Second, the present study uses only the manufacturing competitive priorities with multiple items used for operationalizing each. The other two studies used a combination of manufacturing and marketing capabilities, with Miller & Roth using single-item measures to operationalize them.

Third, the variables used in this study are obtained from two levels of respondents in each participating unit – the emphasis on competitive priorities from manufacturing managers, and the managerial performance from their superiors, general managers. The

other studies used one respondent for all of the data gathered from each firm or plant, and suggested that future research should attempt to use multiple sources. Finally, this study examined how different groups perform on various measures, as opposed to the importance attached to various measures in Miller & Roth's work. Noble (1995), who found clusters emphasizing multiple priorities, used fewer performance measures - labor productivity and relative productivity only. The present study used seven measures of managerial performance.

Despite the strengths of this study, it is not free from limitations that should be addressed in future studies. First, the cross-sectional data used in the study precludes any causal links between competitive priorities emphasized and perceived performance. In future, a longitudinal study might help in investigating the causal relationship between the variables. Second, two of the four scales used in the study had low alphas, which suggest the need for developing more reliable measures for the two scales - flexibility and delivery. Further research should examine if service organizations would endure a similar taxonomy, given the differences between manufacturing and services.

REFERENCES

Berry, W.L., Bozarth, C., Hill, T.J., Klompmaker, J.E., 1991. Factory focus: Segmenting markets from an operations perspective. Journal of Operations Management, 10 (3), 363-387.

Boyer, K.K., Ward, P.T., Leong, G.K., 1996. Approaches to the factory of the future an empirical taxonomy. Journal of Operations Management, 14, 297-313.

Bozarth, C., Edwards, S., 1997. The impact of market requirements focus and manufacturing characteristics focus on plant performance. Journal of Operations Management, 15 (3), 161-180.

Bozarth, C., McDermott, C., 1998. Configurations in manufacturing strategy: a review and directions for future research. Journal of Operations Management, 16 (4), 427-439.

Clark, K.B., 1996. Competing through manufacturing and the new manufacturing paradigm: Is manufacturing strategy passe? Production and Operations Management, 5 (1), 42-58.

Compton, W.D., 1997. Engineering Management: Creating and Managing World-Class Operations, Upper Saddle River, NJ: Prentice-Hall.

Corbett, C., Wassenhove, L.V., 1993. Trade-offs? What trade-offs? Competence and competitiveness in manufacturing strategy. California Management Review, Summer: 107-122.

Delaware Directory of Manufacturers, 1995. Commerce Register, Inc., Midland Park, N.J.

Dess, G.D., Robinson, R.B., Jr., 1984. Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit. Strategic Management Journal, 5, 265-273.

Ferdows, K., De Meyer, A., 1990. Lasting improvements in manufacturing performance: In search of a new theory. Journal of Operations Management, 9 (2), 168-184.

Harman, H.H., 1967. Modern factor analysis. University of Chicago Press, Chicago, IL.

Hayes, R.H., Pisano, G.P., 1996. Manufacturing strategy: At the intersection of two paradigm shifts. Production and Operations Management, 5 (1), 25-41.

Hayes, R.H., Wheelwright, S.C., 1984. Restoring our competitive edge. John Wiley and Sons, New York, NY.

Kathuria, R., 1997. Lasting improvements in manufacturing performance: Validation of the "New" theory. 57th Annual Meeting of the Academy of Management, Boston, MA.

Kathuria, R., Partovi, F.Y., 1999. Work force management practices for manufacturing flexibility. Journal of Operations Management, 18 (1), 21-39.

Kathuria, R., Porth, S.J., Joshi, M.P., (1999). Manufacturing priorities: Do general managers and manufacturing managers agree? International Journal of Production Research, 37 (9), 2077-2092.

Lehmann, D.R., 1979. Market research and analysis. Irwin, Homewood, IL.

Malhotra, M.K., Steele, D.C., Grover, V., 1994. Important strategic and tactical manufacturing issues in the 1990s. Decision Sciences, 25 (2), 189-214.

Miller, J.G., Roth, A.V., 1994. A taxonomy of manufacturing strategies. Management Science, 40 (3), 285-304.

Morrison, A., Roth, K., 1993. Relating Porter's configuration/coordination framework to competitive strategy and structural mechanisms: Analysis and implications. Journal of Management, 19 (4), 797-818.

Nakane, J., 1986. Manufacturing futures survey in Japan: A comparative survey 1983-1986. System Science Institute, Waseda University, Tokyo.

Nemetz, P., 1990. Bridging the strategic outcome measurement gap in manufacturing organizations. In Ettlie, J.E., Burstein, M.C., Fiegenbaum, A. (Eds.), Manufacturing strategy, Kluwer Academic Publishers, Boston, MA.

New Jersey Directory of Manufacturers, 1995. Commerce Register, Inc., Midland Park, NJ.

Noble, M.A., 1995. Manufacturing strategy: Testing the cumulative model in a multiple country context. Decision Sciences, 26 (5), 693-721.

Nunnally, J.D., 1978. Psychometric theory, (2nd Ed.), McGraw Hill, New York, NY.

Pennsylvania Directory of Manufacturers, 1995. Commerce Register, Inc., Midland Park, NJ.

Phillips, L.W., 1981. Assessing measurement error in key informant reports: A methodological note on organizational analysis in marketing. Journal of Marketing Research, 18 (4), 395-415.

Porter, M., 1980. Competitive Strategy: Techniques for analyzing industries and competitors. Free Press, New York.

Richardson, P.R., Taylor, A.J., and Gorden, R.M., 1985. A strategic approach to evaluating manufacturing performance. Interfaces, 15 (Nov-Dec), 15-27.

Ritzman, L., Safizadeh, H., Wood, C.H., Sharma, D., 1993. An empirical investigation of the relationship between product plans, business strategy and competitive priorities. 24th Annual meeting of the Decision Sciences Institute, Washington, DC.

Roth, A.V., 1989. Linking manufacturing strategy and performance: An empirical investigation. 49th Annual meeting of the Academy of Management, Washington, DC.

Roth, A., Miller, J.G., 1990. Manufacturing strategy, manufacturing strength, managerial success, and economic outcomes. In Ettlie, J.E., Burstein, M.C., Fiegenbaum, A. (Eds.), Manufacturing strategy, Kluwer Academic Publishers, Boston, MA, pp. 97-108.

Skinner, W., 1969. Manufacturing: The missing link in corporate strategy. Harvard Business Review, May-June, 136-145.

Swamidass, P.M., 1994. Technology on the factory floor II: Benchmarking manufacturing technology use in the United States. The Manufacturing Institute, Washington, DC.

Swamidass, P.M., Newell, W.T., 1987. Manufacturing strategy, environmental uncertainty and performance: A path analytic model. Management Science, 33 (4), 509-524.

van de Ven, A., Drazin, R., 1985. The concept of fit in contingency theory. In: Cummings, L., Straw, B. (Eds.). Research in Organizational Behavior, 7, 333-365.

Venkatraman, N., Ramanujam, V., 1987. Measurement of business economic performance: An examination of method convergence. Journal of Management, 13 (1), 109-122.

Ward, P., Duray, G.K., Leong, G.K., Sum, C., 1995. Business environment, operations strategy, and performance: An empirical study of Singapore Manufacturers. Journal of Operations Management, 13, 99-115.

Wood, C.H., Ritzman, L.P., Sharma, D., 1990. Intended and achieved competitive priorities: measures, frequencies, and financial impact. In Ettlie, J. E., Burstein, M.C., Fiegenbaum, A. (Eds.), Manufacturing strategy, Kluwer Academic Publishers, Boston, MA, pp. 225-232.

Youndt, M.A., Snell, S.A., Dean, J.W., Jr., Lepak, D.P., 1996. Human resource management, manufacturing strategy and firm performance. Academy of Management Journal, 39 (4), 836-866.

Appendix I

I. Manufacturing Manager's Survey (Items used in this study).

Section I. Competitive Priorities**:** Measured by the importance given to each item in *a manufacturing unit.* (1 - Not at all Important --to-- 5 - Extremely Important)

Item #	**Underlying construct/measures**	
	Cost **(Cronbach's alpha = 0.70; Mean =4.04)**	Range (Observed)
M1.	Controlling production costs	2.00-5.00
M3.	Improving labor productivity	2.00-5.00
M9.	Running equipment at peak efficiency	1.00-5.00
	Flexibility **(Cronbach's alpha = 0.66; Mean =3.75)**	
M4.	Introducing new designs or new products into production quickly	1.00-5.00
M6.	Adjusting capacity rapidly within a short period	1.00-5.00
M7.	Handling variations in customer delivery schedule	2.00-5.00
M2.	Handling changes in the product mix quickly	2.00-5.00
M16.	Customizing product to customer specifications	1.00-5.00
	Quality-of-conformance **(Cronbach's alpha = 0.74; Mean =4.30)**	
M8.	Ensuring conformance of final product to design specifications	3.00-5.00
M10.	Ensuring accuracy in manufacturing	3.00-5.00
M12.	Ensuring consistency in manufacturing	2.00-5.00
	Quality-of-design **(Cronbach's alpha = 0.46)** **Scale dropped due low alpha.**	
M5.	Manufacturing durable and reliable products	1.00-5.00
M13.	Making design changes in the product as desired by customer	1.00-5.00
M15.	Meeting and exceeding customer needs and preferences	2.00-5.00
	Delivery **(Cronbach's alpha = 0.61; Mean =3.98)**	
M14.	Reducing manufacturing lead time	2.00-5.00
M11.	Meeting delivery dates	2.00-5.00
M17.	Making fast deliveries	2.00-5.00

2. Name a major product line of this manufacturing unit _____.

3. The industry this product line belongs to is: (Please circle one)

1) Fabricated metal
2) Machinery except elect. and computers
3) Electrical machinery including computers
4) Transportation and aerospace
5) Consumer nondurables
6) other (Please specify)_____

Appendix I - continued

II. General Manager's Survey

Section I

Managerial Performance : Performance of the group managed by the manufacturing manager. (1-Unsatisfactory --to-- 7-Excellent)

	Mean	Range (Observed)
Accuracy of work	5.49	2.00-7.00
Quality of work	5.44	2.00-7.00
Productivity of the group	4.98	2.00-7.00
Customer Satisfaction	5.39	3.00-7.00
Operating Efficiency	5.02	3.00-7.00
Quantity of work	5.35	3.00-7.00
Timeliness in meeting delivery schedules	5.46	2.00-7.00

Section II

1. What is your current job title? _____
2. For how many years has this manufacturing manager been reporting to you? _____

Table 1. Sample Statistics

Industry Mix	**Percent**
1 - Fabricated Metal	15
2 - Machinery except Electrical and Computers	09
3 - Electrical Machinery and other Electric Goods	11
4 - Transportation and Aerospace	07
5 - Consumer Nondurable	20
6 - Other	38
Total	100%

Industry Type : Other (Break-up)

Chemicals	4.1
Plastic/Extrusion/Tape Mfg.	4.1
Construction related mfg.	4.1
Packaging products	4.1
Miscellaneous products	4.1
Components & Instruments	3.1
Food products	3.1
Printing	2.0
Bio-tech	2.0
Pharmaceutical packaging	2.0
Communication	2.0
Detergents	1.0
Tooling	1.0
Steel Mill, Plate	1.0
Total (Other)	38 %

 # Employees

Range	Sample %	National Distribution for Manufacturing*
1 to 49	10	83
50 to 99	30	08
100 to 249	37	06
250 to 499	12	02
500 to 999	07	< 01
1000 or more	04	< 01
	100%	100%

Annual Sales (US $million)

Range	Sample %
Below 50	64
50-99	11
100-199	06
200 and above	19
	100%

* Source: Compton (1997)

Table 2. Competitive priorities emphasized by clusters

	Starters n = 32 Cluster #1	**Efficient Conformers** n = 11 Cluster #2	**Speedy Conformers** n = 40 Cluster #3	**Do All** n = 15 Cluster #4	F = Value (p = probability)
Cost Cluster Mean Std. error Rank	3.51 (2, 3, 4) .10 3	4.51 (1) .10 1	4.10 (1, 4) .09 3	4.64 (1, 3) .07 2	F = 19.75 p < .0001
Delivery Cluster Mean Std. error Rank	3.63 (2, 3, 4) .09 2	2.93 (1, 3, 4) .10 4	4.35 (1, 2) .06 2	4.51 (1, 2) .10 4	F = 40.27 p < .0001
Flexibility Cluster Mean Std. error Rank	3.33 (3, 4) .09 4	3.05 (3, 4) .07 3	3.96 (1, 2) .06 4	4.58 (1, 2, 3) .08 3	F = 42.11 p < .0001
Quality Cluster Mean Std. error Rank	3.78 (2, 3, 4) .09 1	4.48 (1, 4) .12 2	4.43 (1, 4) .05 1	4.93 (1, 2, 3) .03 1	F = 31.93 p < .0001

Note: The numbers in parentheses show the group number(s) from which this group was significantly different at the 0.05 level of significance, based on the Scheffe pairwise tests.
The rank indicates the rank order of this competitive priority within the cluster.

Table 3. Pairwise T-tests for the difference in degree of emphasis on competitive priorities within a group.

	Cost (C)	Delivery (D)	Flexibility (F)	Quality (Q)
Starters				
Cluster Mean	3.51	3.63 (F)	3.33 (D, Q)	3.78 (F)
Std. error	.10	.09	.09	.09
Efficient Conformers				
Cluster Mean	4.51 (D, F)	2.93 (C, Q)	3.05 (C, Q)	4.48 (D, F)
Std. error	.10	.10	.07	.12
Speedy Conformers				
Cluster Mean	4.10 (D, Q)	4.35 (C, F)	3.96 (D, Q)	4.43 (C, F)
Std. error	.09	.06	.06	.05
Do All				
Cluster Mean	4.64 (Q)	4.51 (Q)	4.58	4.93 (C, D)
Std. error	.07	.01	.08	.03

Note: The letters in parentheses indicate the competitive priority(ies) this priority is significantly different from, at the 0.05 level of significance (2-tailed).

Table 4. Industry membership by competitive priority cluster.

Industry	**Starters** n = 32	**Efficient Conformers** n = 11	**Speedy Conformers** n = 40	**Do All** n = 15	Frequency / Percent
Fabricated Metal	8 (4.9)	0 (1.7)	3 (6.2)	4 (2.2)	15 15.5%
Machinery except electrical	3 (2.6)	0 (0.9)	5 (3.3)	0 (1.2)	8 8.2%
Electrical Machinery and Goods	4 (3.6)	1 (1.2)	5 (4.5)	1 (1.6)	11 11.3%
Transportation and Aerospace	2 (2.3)	2 (0.8)	2 (2.9)	1 (1.0)	7 7.2%
Consumer non-durable	6 (6.3)	2 (2.2)	9 (7.8)	2 (2.7)	19 19.6%
Other	9 (12.2)	6 (4.2)	16 (15.3)	6 (5.3)	37 38.1%
Frequency/ Percent	32 33.0%	11 11.3%	40 41.2%	14 14.4%	97 100.0%

$x^2 = 14.39$ d.f. = 15 p = 0.4955
The numbers in parentheses represent the expected count.

Table 5. Managerial performance by competitive priority clusters.

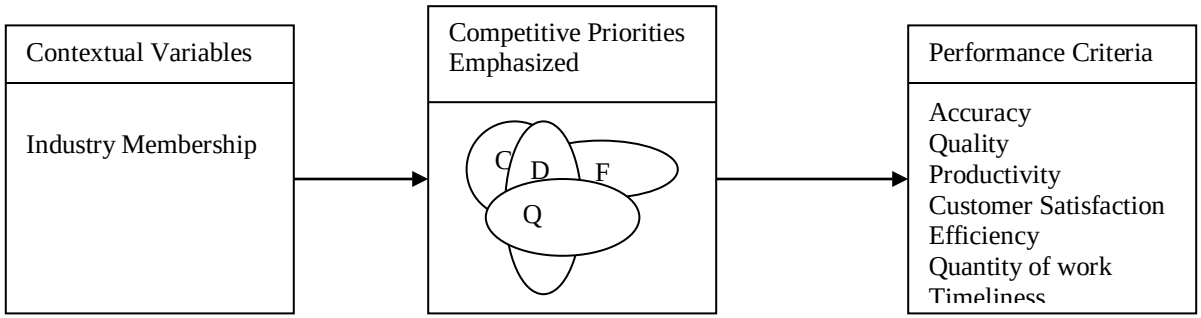
	Starters n = 32 Cluster #1	**Efficient Conformers** n = 11 Cluster #2	**Speedy Conformers** n = 40 Cluster #3	**Do All** n = 15 Cluster #4	F = Value (p = probability)
Accuracy Cluster Mean Std. error Rank	5.28 .18 2	5.30 .33 3	5.55 .14 2	6.00 .21 2	F = 1.88 p = .1381
Customer Satisfaction Cluster Mean Std. error Rank	5.03 (4) .16 6	5.18 .26 4	5.50 .15 3	6.07(1) .26 1	F = 4.04 p = .0097
Efficiency Cluster Mean Std. error Rank	4.86 .14 7	5.18 .18 4	5.05 .15 5	5.13 .33 6	F = .45 p = .71
Productivity Cluster Mean Std. error Rank	5.06 .14 5	5.09 .28 5	4.87 .19 6	5.06 .28 7	F = .27 p = .84
Timeliness Cluster Mean Std. error Rank	5.25 .21 3	5.33 .28 2	5.55 .19 2	5.73 .26 4	F = .71 p = .54
Quality Cluster Mean Std. error Rank	5.15 (3) .16 4	5.09 .25 5	5.65 (1) .13 1	5.80 .24 3	F = 3.1981 p = .0269
Quantity Cluster Mean Std. error Rank	5.30 .18 1	5.66 .33 1	5.23 .16 4	5.60 .32 5	F = .72 p = .53

Note: The numbers in parentheses show the group number(s) from which this group was significantly different at the 0.05 level of significance, based on the Scheffe's pairwise tests.
The rank indicates the rank order of this managerial performance measure within the cluster.

Table 6. Pairwise T-tests for managerial performance differences within a cluster.

	Accuracy	*Quality*	*Productivity*	*Efficiency*	*Quantity*	*Customer Satisfaction*	*Timeliness*
Starters n = 32	Efficiency $^{-}$	Efficiency $^{-}$	Efficiency $^{b-}$	Quantity $^{+}$ Timeliness $^{+}$ Productivity $^{b+}$ Accuracy $^{+}$ Quality $^{+}$	Customer $^{b-}$ Efficiency $^{-}$	Quantity $^{b+}$	Efficiency $^{-}$
Efficient Conformers n = 11		Quantity $^{+}$	Quantity $^{+}$	Quantity $^{+}$	Quality $^{-}$ Productivity $^{-}$ Efficiency $^{-}$ Timeliness $^{b-}$		Quantity^{b+}
Speedy Conformers n = 40	Productivity $^{-}$ Efficiency $^{-}$ Quantity $^{-}$	Productivity $^{-}$ Efficiency $^{-}$ Quantity $^{-}$	Quantity $^{+}$ Customer $^{+}$ Timeliness $^{+}$ Accuracy $^{+}$ Quality $^{+}$	Customer $^{+}$ Timeliness $^{+}$ Accuracy $^{+}$ Quality $^{+}$	Accuracy $^{+}$ Quality $^{+}$ Productivity $^{-}$	Productivity $^{-}$ Efficiency $^{-}$	Productivity $^{-}$ Efficiency $^{-}$
Do All n = 15	Productivity $^{-}$ Efficiency $^{-}$	Productivity $^{-}$ Efficiency $^{-}$	Quantity $^{+}$ Customer $^{+}$ Timeliness $^{+}$ Accuracy $^{+}$ Quality $^{+}$	Quantity $^{+}$ Customer $^{+}$ Timeliness $^{+}$ Accuracy $^{+}$ Quality $^{+}$	Productivity $^{-}$ Efficiency $^{-}$	Productivity $^{-}$ Efficiency $^{-}$	Productivity $^{-}$ Efficiency $^{-}$

Note: The + and - signs indicate whether the performance on that measure is significantly higher or lower than the one representing that column. For example, *Do All* perform low on both productivity and efficiency compared to the accuracy measure.
Only significant differences at $p < 0.05$ level or less are reported, except for those marked (b) which are significant at 0.10 or less.



Legend: C- Cost; D- Delivery; Q- Quality; F-Flexibility.

Figure 1. A model of contextual variables and performance criteria associated with competitive priorities emphasized.