2010

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Comments
This is a pre-copy-editing, author-produced PDF of an article accepted for publication in *International Journal of Operations & Production Management*, volume 30, issue 10, in 2010 following peer review. The definitive publisher-authenticated version is available online at DOI: 10.1108/01443571011082535.

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Submitted to IJOPM: August 31, 2008
First Revision: December 30, 2009
Second Revision: May 14, 2010

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ABSTRACT

This study examines the role of manufacturing leadership in enhancing manufacturing performance for different manufacturing configurations based on their competitive orientation. The study hypotheses are tested using data from three levels of respondents in excess of 480, from about 100 manufacturers. The results support our general contention that the use of effective leadership practices positively contributes to the overall manufacturing performance, beyond the fixed effects of manufacturing configurations and industry membership. The manufacturing leadership, however, does not seem to affect customer satisfaction. The implications of the study findings for research and practice are discussed.

Key Words: Operations Strategy; Manufacturing Configurations, Competitive Priorities; Leadership; Management Practices Survey.

INTRODUCTION

The topic of manufacturers' competitive priorities and leadership was first broached in operations management when Skinner (1969) examined the strategy of two furniture manufacturers: one manufacturing a low-price product line and the other making high-price, high-style furniture. Skinner stated that the two manufacturers would need to develop different policies, personnel, and operations to be able to carry out their strategies successfully. The leadership styles he suggested were: "much or little involvement in detail, authoritarian or nondirective style, and much or little contact with [the] organization" (1969, p.141). Later, Wheelwright (1984), building upon Skinner's (1969) framework, commented "...The root cause of many a 'manufacturing crisis' is that a business's manufacturing policies and people—workers, supervisors and managers—have become incompatible with its plant and equipment, or that both have become incompatible with its competitive needs" (1984, p.85).

Subsequent research in manufacturing strategy underscored the need for aligning strategic decisions in various areas—structural and infrastructural—with the competitive priorities emphasized by a company. For example, Hill (1989), Kleindorfer and Partovi (1990), and Safizadeh et al. (1996) attempted to align the structural decisions, such as technology and process choice, with competitive priorities. On the infrastructural side, Berry and Hill (1992) examined the choice of manufacturing, planning and control systems, and Kathuria et al. (1999) aligned IT applications with competitive priorities and the process structure.

Later, some studies related to human resource management and competitive priorities appeared in the operations management literature. For example, Jayaram et al. (1999) examined the linkage between human resource management practices and four dimensions of manufacturing performance—quality, cost, flexibility, and time. Santos (2000) identified human resource management policies appropriate for each of the four competitive priorities. Ahmad and Schroeder (2003) investigated the impact of seven human resource management practices on an aggregate operational performance measure, and examined whether the use of these practices differed by country or industry.

The aforementioned research in operations management is of much importance, but most studies have examined the main, mediating or interaction effects of variables rather than configurations of variables. A configuration denotes “a multidimensional constellation of conceptually distinct characteristics that commonly occur together” (Meyer et al., 1993). Configuration models are apt for studying complex, multivariate phenomena in operations management (Bozarth and McDermott, 1998; Boyer et al., 2000). Some relevant configuration studies in operations management have focused on a) competitive orientation and manufacturing performance (cf., Kathuria 2000); b) manufacturing strategies and performance (cf., Devaraj et al., 2001); c) entrepreneurial orientation (cf., Jambulingam et al., 2005), and d) lean production practices and job characteristics (cf., de Treville and Antonakis, 2006). To the best of our knowledge, no comprehensive research has been done where the effects of competitive orientation of manufacturers (configurations) and leadership practices have been simultaneously examined on manufacturing performance.

The competitive orientation is a type of configuration and is defined after Kathuria (2000) as the emphasis on a set of competitive priorities (quality, flexibility, delivery, cost). Consistent with Hill’s (1989) notion of order-winners and order-qualifiers, each company places a varying degree of emphasis on these priorities as it uses some priorities as order winners and others as order-qualifiers. The leadership is defined after Yukl (1989) who posits that leaders/managers display all of the fourteen behaviors or practices, such as planning, inspiring, networking, etc., but to varying degrees. The present study addresses the following research question: Does leadership explain incremental variance in predicting manufacturing performance beyond the fixed effects of competitive orientation?

THE CONCEPTUAL MODEL

The issue of leadership and strategy has been discussed in the strategic management literature at the corporate and strategic business unit (SBU) level (cf., Gupta & Govindrajan, 1984; Govindrajan, 1989; Thomas et al., 1991). Since the unit of analysis of these studies was a corporation or an SBU, the researchers focused on the characteristics and practices of top executives, and used strategic options, such as low cost and differentiation, as "trade-offs." None of these studies has considered competitive orientation of manufacturers and leadership practices of their manufacturing managers who are instrumental in getting the work done at the plant level.

In the organizational sciences literature, Liden and Antonakis (2009) underscore the need to partial out the effects of firm-level factors as well as industry while testing the impact of leadership behavior on organizational outcomes. They further note "[T]here are still not enough studies that consider (or at least control for) macroeconomic or microeconomic fixed effects…that might be correlated with the variables under study (Bluedorn and Jaussi 2008)" (p. 1595). Given the importance and dearth of leadership studies involving organizational variables as fixed effects, we propose to examine the effect of manufacturing leadership on manufacturing performance beyond the fixed effects of competitive orientation of the focal organization and the industry to which the organization belongs.

Competitive Orientation, Leadership Practices, and Performance: A Conceptual Linkage

***Competitive Orientation*.** The competitive orientation of manufacturers is defined as their relative emphases on various competitive priorities, which have been referred to as the content or the dimensions of manufacturing strategy (Swamidass and Newell, 1987). For a detailed description of these priorities, please refer to Miller and Roth (1994), Safizadeh et al. (1996), Ward et al. (1998), and Kathuria (2000), among others. Looking at the common set of competitive priorities in various theoretical and empirical papers (cf., Ward et al., 1998; Boyer et al., 1996), we consider the four basic ones—quality, delivery, flexibility, and cost—for this study.

Recently, Swink et al. (2005) noted a growing literature on manufacturing capabilities or competitive priorities being mutually reinforcing or cumulative. Their observation is consistent with a group of researchers in the operations strategy field who have suggested that manufacturers pursue competitive priorities and build related capabilities in a particular order (Nakane, 1986; Ferdows & De Meyer, 1990; Noble, 1995). Similarly, Flynn and Flynn (2004) and Rosenzweig and Roth (2004) have noted that manufacturers are able to simultaneously emphasize multiple competitive priorities. Miller and Roth (1994), Kathuria (2000), and Frohlich and Dixon (2001), among others, have surmised that manufacturers can be grouped based on their relative emphases on competitive priorities.

Early researchers in manufacturing strategy (cf., Wheelwright, 1984; Skinner, 1985) considered these priorities to be mutually exclusive. They maintained that a manufacturer has to choose between conflicting competitive priorities, such as delivery and flexibility. Skinner (1996) clarified his original stance on the issue and said that the trade-offs are dynamic in nature. He maintained that the trade-offs do still exist, but in many variations. Boyer and Lewis (2002) found no trade-off between quality and cost, but asserted that some other trade-offs between competitive priorities still remain. Safizadeh et al. (2000) observed that different patterns of trade-offs exist in plants with different production processes. Pagell et al. (2000) found the existence of trade-offs at higher levels, as well as evidence of simultaneous improvements along multiple competitive dimensions.

Some researchers have attempted to reconcile the two apparently opposing views by taking an integrative perspective (Schmenner and Swink, 1998; Lapre and Scudder, 2004).

Swink et al. (2005) noted "a growing literature suggests that capabilities are mutually reinforcing, or cumulative" (pp. 428-429). Recognizing this trend, we believe that manufacturers may simultaneously pursue multiple competitive priorities and that their emphasis on these priorities is manifest through their competitive orientation.

Leadership Practices. Most of the manager-task congruence studies in the organizational behavior literature considered dichotomies of leadership styles, such as authoritative vs. participative leadership. Researchers now favor the use of more specific leadership practices rather than the dichotomies used in the past. For this study, we use Yukl's (1989) taxonomy of fourteen leadership practices that he subsequently developed into a widely used measure of leadership known as the Managerial Practices Survey (MPS). These practices are generic behaviors applicable to all types of managers and organizations, and include: networking, team building, supporting, mentoring, inspiring, recognizing, rewarding, consulting, delegating, planning, clarifying, problem solving, monitoring and informing.

Yukl's measure of leadership (MPS) captures a broad category of leader behaviors that are common to other well-known measures of leadership, such as the notion of transformational leadership generally credited to Bass and Avolio (1994). Tracey and Hinkin (1998) note several striking similarities between the four dimensions of transformational leadership proposed by Bass and Avolio (1990) and the fourteen managerial practices put forth by Yukl. For example, Tracey and Hinkin (1998) contend that the inspirational motivation dimension of transformational leadership, which is described as 'behaviors that communicate expectations (clarify) and create a team spirit (team building) through enthusiasm (inspiring), is simply a blend of the clarifying, team building, and inspiring behaviors' in Yukl's taxonomy. They also showed significant correlations ranging from 0.64 to 0.82 ($p < 0.01$) between the scales of Multifactor Leadership Questionnaire (MLQ) of Bass and Avolio (1990) and MPS of Yukl (1989).

Performance. Recognizing the difficulty of obtaining objective financial measures of performance in similar studies (cf., Swamidass and Newell 1987; Rosenzweig et al., 2004), we used a set of seven perceptual measures for manufacturing group performance. Researchers (cf., Bozarth and Edwards 1997) have also noted the difficulty with the use of objective measures to compare performance across units with different technologies and product lines. In such situations, Ketokivi and Schroeder (2004) consider perceptual measures to be a viable alternative. Hence, we used perceptual measures, such as quality of work, productivity of the group, and customer satisfaction, which are easily comparable across different industries represented in our sample. Evidence for the validity of perceptual measures of performance can be inferred from statistically significant correlations between perceptual and corresponding objective measures of performance (Dess and Robinson 1984, Vickery 1997, Ward et al. 1994, 1998). Since this study focuses on the manufacturing managers' leadership practices and not the top management, we use manufacturing group performance as the outcome variable rather than organizational performance. The latter would most likely depend upon factors beyond the direct control of a manufacturing manager, such as market conditions, economic conditions, technological changes, and governmental policies (Yukl and Van Fleet, 1992).

The Conceptual Linkage. The conceptual model linking the above three components is presented in Figure 1. Leaders can influence the performance of an organization by: a) the use of specific leadership behaviors when interacting with peers, subordinates and outside parties, b) making appropriate decisions about management systems and organization structure, and c) determining the competitive strategy for the organization (Yukl 2008). A middle-level manager, such as a manufacturing manager, can exert most influence on the manufacturing performance by displaying appropriate leadership behaviors as s/he might play a limited role in the other two—manufacturing systems and competitive strategy. The competitive strategy or competitive orientation is nevertheless linked to manufacturing performance (cf., Kathuria 2000), and the manufacturing systems might be specific to a particular industry type.

Liden and Antonakis (2009) noted that leader behaviors in organizations cannot be completely understood if studied in isolation of the context, which in our case represents the competitive orientation of the organization and its membership in a particular type of industry. Antonakis et al. (2003) also found the leadership styles to be intricately related to the contexts in which they occurred. We statistically control for the fixed effects of the context and surmise that beyond the fixed effects of industry type and competitive orientation (configuration type), the more effective the leadership of the manufacturing manager the higher the performance.

Insert Figure 1 About Here

HYPOTHESIS

A leader continuously evokes motivational responses from followers and modifies their behavior (Burns 1978). A charismatic or transformational leader, based on his/her behavioral tendencies and personal characteristics, espouses admiration and respect from his/her followers (Waldman and Yammarino 1999). A transactional leader is able to recognize the needs and desires of his/her followers and attempts to satisfy those by focusing on contingent reward behavior (Burns 1978; Bass 1990). Contrary to some early views, it is possible for a leader to be both transformational and transactional (Shamir 1995; Waldman, Bass and Yammarino 1990).

The fourteen leadership behaviors in Yukl’s taxonomy are grouped under three categories, namely Relationship-oriented, Participative leadership and delegation, and Work-oriented practices. Work-oriented behaviors help eliminate or reduce wasted resources, errors, redundant operations, etc., and thereby enhance group performance (Yukl 2006). Relationship-oriented behaviors help build mutual trust, reduce stress, etc., and thus facilitate group performance (Bass 1990). Participative behaviors encourage development and application of new ideas, facilitate learning, and thus help enhance team performance (Yukl 2006). Next, we discuss how each of the fourteen practices, generally grouped under the three categories mentioned above, enhances manufacturing performance.

The effective leadership of a manufacturing manager helps improve manufacturing performance on many fronts. For example, Delegating, i.e., empowering employees to take action and implement decisions helps a company reduce its manufacturing lead time, since the time otherwise spent on seeking approvals is now saved. Sorting out problems quickly at the source (by the employees) should help reduce the cycle time, and thus enable a company to compete on the basis of time (Northey and Southway, 1993; Slater, 1993). This might help improve timeliness of deliveries, quantity produced, productivity, and efficiency. Timely deliveries may, in turn, improve customer satisfaction. Empowered employees also do the 'action planning' for day to day activities. Further, the employees may also be authorized to identify and resolve work-related problems, thus improving accuracy and quality of work.

Similarly, when a manager encourages employees to give suggestions for improvement, invites them to participate in decision making, and incorporates their ideas in decisions (i.e., Consulting behavior), the employees understand the decision process and its implications better (Lawrence & Smith, 1955; Bass and Shackleton, 1979). The opportunity to participate and shape the decision process helps increase employees' 'ownership' of the outcome (Howell and Costley, 2001). As a result, the ensuing acceptance and commitment to carry out the decision on part of the employees is likely to enhance group performance (Vroom and Jago, 1988; Bass, 1990).

An effective manufacturing manager is likely to judiciously determine the utilization of production personnel, allocate resources according to priorities, and improve coordination to avoid waste--the elements of the Planning behavior (Yukl, 1989). To avoid or minimize delays due to work interruptions, a manufacturing manager is likely to identify, analyze, and resolve problems in a timely fashion, i.e., demonstrate Problem Solving behavior (Yukl, 1989). Also, strict enforcement of rules is considered necessary when the objective is to control product costs

(Porter, 1980, 1985). A manufacturing manager can enforce rules and thus control costs, by constant monitoring, i.e., checking the way work progresses (Yukl, 1989).

When tasks require a specific set of procedures for successful completion, effective leadership usually results in better group performance (Wofford, 1971; Griffin, 1980; Kahai et al., 1997). This is probably because a clearly defined task structure gives the leader a set of steps to guide the employees more effectively (Howell and Costley, 2001). It is, therefore, logical to infer that the leadership practices, such as Planning, Problem Solving, Informing, Clarifying and Monitoring would help a manufacturing manager carry out the manufacturing tasks more effectively.

An effective manager handles possible variations in delivery schedule, product mix, and product design by gathering information from potential sources, including vendors and customers (Networking). Brennesholtz (1996) suggests that manufacturing managers should spend time to understand how salespeople and customers bring uncertainty in the system through varying demand for different products. To cope with changing demands of the customers, managers should encourage cooperation and teamwork among employees (Team Building). This reasoning for team building behavior is supported by Wofford (1971), who found conflict management to be an important managerial characteristic when a manager faced unstructured and complex tasks. Conflict management is classified as team building behavior under Yukl's (1989) taxonomy. Further, networking plays an important role in manufacturing settings where the ability to handle changes in the product mix and customer delivery schedule, to adjust capacity rapidly, and to introduce new products or new designs quickly is important. It seems plausible that managers, who are good at managing relationships, are likely to be more effective in managing a group that faces variability in output, input, processing requirements, product mix, etc.

Dealing with uncertainty on an ongoing basis could lead to frustration among employees, which could be addressed or avoided by generating enthusiasm for work (Inspiring), and by being considerate of employee needs (Supportive). It appears that a supportive leader helps employees overcome the anxiety often associated with a new complex task (Howell and Costley, 2001). The encouraging and confidence building behavior of such a manager allows employees to more efficiently apply their collective energies toward effective performance (Burke, 1965).

Generally, tasks that are complex in nature and require creativity are better performed under relationship-oriented leadership (DuBrin, 1998). Non-routine tasks are best carried out when the manger maintains collegial relationship with employees (Hall, 1962). Developing and mentoring helps foster cooperative relationships that are especially useful when dealing with non-routine and unstructured tasks (Upton, 1994). Expressing appreciation for special effort (Recognizing) needed to deal with uncertainty and recommending employees for appropriate rewards (Rewarding) are also likely to help improve manufacturing performance when dealing with uncertainty. When employees perform a large variety of tasks, a leader's contingent reward-punishment behavior is likely to enhance performance (Podsakoff et al., 1984).

The use of the above mentioned leadership practices by a manufacturing manager might be influenced by the competitive orientation of the manufacturing unit. For example, it is plausible that a manufacturing firm would hire a manufacturing manager with a particular leadership style, manifested through various leadership practices, in order to pursue a specific competitive strategy evidenced through a varying degree of emphasis placed on different competitive priorities. In other words, managers with a certain leadership style might be considered more suitable for a given competitive orientation. Similarly, it is also reasonable that the emphasis placed on certain competitive priorities, and the resultant competitive orientation, might be germane to the type of industry that a manufacturing firm belongs. Hence, in order to cull out the true effects of leadership on manufacturing performance, we need to statistically control for the potential confounding effects of the competitive orientation and industry type. Thus, we propose:

H1. Effective leadership will contribute to manufacturing performance beyond the fixed effects of competitive orientation and industry type.

METHODOLOGY

Sample

The unit of analysis for this study was a manufacturing unit. These units included manufacturing plants or divisions of some large firms, and for smaller organizations, the entire organization—a majority in our sample. Data were collected from manufacturing managers, three of their subordinates, and their superiors (i.e., the general managers). The data from manufacturing managers was used for assessing manufacturing units' competitive orientation. Three subordinates per manufacturing manager were used for determining the leadership practices of manufacturing managers, and the general managers were used to obtain data on the performance of manufacturing managers. Responses from three different sources of each unit were matched for the analyses. Anticipating a low response due multiple respondents, five from each participating organization, we identified a large potential pool of over 1,300 manufacturers from directories of manufacturers in the Mid-Atlantic region of the United States.

First, a letter accompanied by a postage-paid reply card was mailed to solicit participation in the study. Over 100 letters came back undelivered due incorrect address or change of address. One hundred and fifty-eight manufacturers agreed to participate in the study and another 150 expressed interest but were unable to participate due either other commitments at the time or reduced in-house manufacturing activity. A set of five questionnaires was sent to each of the 158 manufacturing companies that agreed to participate. Of the 790 questionnaires distributed, a total of 483 questionnaires (98 manufacturing managers, 99 general managers, and 286 Employees) were returned, yielding a response rate of over 60 percent.

This research focused on six industries in the manufacturing sector, as done in other manufacturing strategy related studies by Boyer et al. (1996) and Swamidass (1994). Table 1 contains the composition of the sample that is consistent with the type of industries in the original sample. In terms of the mix, 20% of the companies are in consumer nondurable, 15% in fabricated metal, 11% in electrical machinery and electrical goods, 9% in machinery except electrical and computers, 7% in transportation and aerospace, and 38% are in the chemical, pharmaceutical, or packaging industry. The average manufacturer in the sample had annual sales of U.S. $43 million and 275 employees.

Insert Table 1 About Here

Development of Measures

Competitive Priorities. The emphasis on the four competitive priorities was measured using a total of seventeen items, listed as the 'management priorities in manufacturing' in the Appendix. These items were taken from several seminal conceptual works (Hayes and Wheelwright, 1979; Wheelwright, 1984; Giffi et al., 1990), and empirical studies (Nemetz, 1990; Roth and Miller, 1990; Wood et al., 1990; Morrison and Roth, 1993; Ritzman et al., 1993). The fact that measures were drawn from well-established empirical and conceptual works helps to assure their validity (Bohrnstedt, 1983). Manufacturing managers rated all items on a five-point scale with values ranging from 1 - 'Not at all Important' to 5- 'Extremely Important.' The items in the questionnaire were arranged in a random order.

First, a factor analysis with oblimin rotation was conducted to ensure that the items in the manufacturing manager survey loaded on the factors as expected. The oblimin rotation was used because the competitive priorities are not considered orthogonal to one other. In fact, a company may simultaneously place high emphasis on more than one priority. A two-stage rule was used to ensure that a given item represented the construct underlying each factor (Nunnally, 1978). First, a unique factor loading of at least 0.45 was the criterion set for including an item in a factor. Second, if an item loaded on more than one factor, with difference between weights less that 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. The flexibility scale retained four of the five items, and for the delivery scale, one of the three items (making fast deliveries) was dropped due to a low factor loading.

Next, Cronbach alpha coefficients for the competitive priority scales were computed to assess internal consistency of the scales. These reliability estimates for the scales based on factor analysis ranged from 0.61 to 0.73, with one exception. The quality-of-design scale had an alpha of 0.46 and was therefore dropped from further consideration. The alphas for the original scales ranged from 0.60 to 0.73. Since the alphas for the revised scales were no different from those of the original scales, we retained the original scales for subsequent analyses. Finally, we determined the scores for each scale by adding up the individual scores for the corresponding items and then dividing by the number of items.

Leadership Practices. The specific measures for the leadership practices were obtained from Professor Gary Yukl who has the copyright for this instrument. For research purposes, the instrument is available for free [Phone: 518-442-4932; Fax: 518-442-4765; E-mail: G.Yukl@albany.edu]. The use of the instrument in many studies (Yukl, Wall and Lepsinger, 1990) lends support to its validity. To ascertain scale reliabilities for this dataset, we computed Cronbach's Alpha coefficients for all of the leadership practices. The internal consistency is very high for all of the fourteen scales (alphas range from 0.82 to 0.93).

A common criticism in the leadership literature is the use of single-informant for assessing leadership style. Researchers in the operations management literature have also voiced such concern (Ketokivi and Schroder, 2004; Boyer et al, 2005). We targeted three employees per manager to assess his/her leadership style. Before averaging the responses of multiple subordinates for a manager on each leadership practice, the level of agreement among subordinates was assessed, using a one-way analysis of variance on each scale score for the 99 companies. The *F*-tests were significant ($p < 0.05$) for each of the fourteen scales, which imply that the variation among managers is much greater than the variation among individual respondents reporting to these managers. In other words, differences among managers, on each of the fourteen practices, are significantly greater than the differences in managers' behaviors perceived by their respective subordinates. Eta squared for each *F*-test was computed to determine the proportion of variance in behavior means accounted for by managers. The eta square values were then converted to eta, and were found to be much higher than those reported in earlier research using Yukl's questionnaire (Yukl et al., 1990).

Intraclass Correlation (ICC) is another measure for inter-rater reliability for two or more raters and is a representation of the fraction of between group variation that does not contain within group variation (Boyer and Verma (2000). Given that we had 69 items on the leadership survey, we calculated the ICCs based on the aggregate scale scores (Boyer and Verma 2000). The formula used to calculate ICC is: $(MS_{between} -- MS_{within}) / (MS_{between} + (k-1)*MS_{within})$, where *MS* stands for mean squared variance, *between* stands for between groups, *within* stands for within groups, and *k* is the number of raters. The ICCs for the fourteen scales ranged between 0.12-0.43.

The leadership practice scores of manufacturing managers were first computed by averaging across items, and then across respondents to produce fourteen scores for each manufacturing manager. As per theory, the fourteen scores were then collapsed into three categories, namely Relationship-oriented, Participative leadership and delegation, and Work-oriented practices. The correlations between the three leadership categories were found to be very high (0.72-0.83), which could cause multicollinearity issues in data analyses. Hence, we combined them into one scale for leadership. The Cronbach's alpha for the combined scale was 0.94, which suggests that the scales are largely unidimensional and hence could be combined into one scale.

Performance. The measure of manufacturing group performance was based on the information provided by general managers on a total of seven items, if relevant (Question 1 in Section I of the General Manager Survey in the Appendix). The superiors were first asked to judge the relevance of each item for evaluating the performance of the group managed by their manufacturing manager, and then rate the performance on a seven point scale ranging from "Unsatisfactory" to "Excellent." The items are: 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. Further, the objective financial measures of performance such as profit growth, profit margin, sales increase, market share, return on investment, etc., were considered to be inappropriate for this study because they reflect the contribution of the organization as a whole, and not of the manufacturing group in particular.

The Threat of Common Method Variance

The common method bias is likely to be encountered in the data analysis when responses from a single respondent are used to measure criterion and predictor variables (Miller and Roth, 1994; Podsakoff et al., 2003). Similarly, when self-reported data on two or more variables are collected from the same source at one time, correlations among them may be systematically contaminated by any defect in that source. The present study does not seem to suffer from these limitations as we obtained the measures of the criterion variable, manufacturing performance, from the superiors of manufacturing managers and the measures of the two predictor variables—competitive orientation and leadership—from manufacturing managers and their subordinates respectively. Further, we used up to three subordinates per manager to collect data on the leadership practices. Thus, a total of up to five employees per company were used to collect data on the three primary study variables. The industry type, though self-reported by the manufacturing manager, is an objective, categorical variable that is not subject to the limitations of a Likert type scale.

Next, we adopted some procedural and statistical measures recommended by Podsakoff et al. (2003) to reduce the incidence of mono-method bias. For instance, we promised and kept anonymity of the respondents. Further, respondents were told that there were no “right or wrong” answers, thus reducing the respondents' desire to provide socially desirable or lenient responses, as well as consistent answers to questions based on some implicit theories (Podsakoff and Organ, 1986). We also followed the recommendation of Podsakoff et al. (2003) to physically separate the items representing different variables on each of the three surveys. Next, we tested for non-response bias by comparing the respondents and non-respondents on the number of employees and sales. Student t-tests indicated no significant differences between the two groups. Thus, non-response bias does not seem to pose a serious threat to the findings of this study.

RESULTS AND DISCUSSION

Competitive Orientation

To identify the configurations of manufacturers with different competitive orientations, the competitive priorities data was cluster analyzed using Ward's method with the Squared Euclidean distance measure. To strike a balance between parsimony (few clusters) and accuracy—a challenge with cluster analysis—we used several rules of thumb as guides for determining an appropriate number of clusters, as employed in similar studies by Miller and Roth (1994) and Boyer et al. (1996).

First, a dendogram was generated using a hierarchical clustering model, which graphically illustrated how the manufacturers quickly grouped into four main clusters. Second, the stability of membership in the four clusters was checked using three iterations of the Ward's method with the number of clusters set at three, four, and five. A comparison of the three solutions indicated that larger clusters split into smaller new clusters, yet the group membership remained stable across solutions. Third, the robustness of the four-cluster solution was checked by running Ward's clustering method several times after shuffling the observations, which did not affect the cluster membership in any way. Finally, ANOVA was used, followed by Scheffe's pairwise comparisons of means, to test for differences in the competitive orientation of clusters. At the 0.0001 level of significance, we concluded that the four clusters didn't have the same competitive orientation. 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.

Insert Table 2 About Here

The competitive orientation of the four clusters is identified as follows. It may be noted that all clusters place a high emphasis on quality, as expected. In addition, manufacturers in Cluster 1 are mainly focusing on delivery, and are hereafter called “Speedy Conformers.” Cluster 2 seems to have no distinct emphasis, and is named “Starters.” Cluster 3 is mainly focused on cost, and is referred to as “Efficient Conformers.” Cluster 4 seems to place an equally high emphasis on flexibility, delivery and cost, and is thus named “Agile” manufacturers. The above interpretation is based on (a) the relative emphasis on competitive priorities among clusters, and (b) the relative emphasis on competitive priorities within a cluster.

Competitive Orientation, Leadership Practices and Performance

The descriptive statistics of the study variables are presented in Table 3. Please note that the correlation coefficients of average manufacturing performance with the individual performance measures are quite high, ranging between 0.60-0.70, but since these variables are not used concurrently in any single model they do not pose any statistical challenge.

Insert Table 3 About Here

The study hypothesis was tested by the significant additional variance explained in the manufacturing performance by effective leadership in light of the competitive orientation and industry membership of the organization. Since it is plausible that organizations select leaders for their specific styles that are consistent with the organization’s competitive orientation, which is known to be related to organizational performance (cf., Kathuria 2000), we included the competitive orientation (an organizational variable) as a fixed-effect in order to minimize the potential for any omitted-variable bias. Similarly, the type of industry was introduced as a control variable, and was coded as a dummy variable with six types of industries.

The overall model effects were tested using the *hierarchical regression* analysis in SPSS, since we had *a priori* reasons for ordering predictors in the model. The order of entry was first industry type (6-1=5 dummy variables), then competitive orientation type (4-1=3 dummy variables), followed by the exogenous variable of interest, effective leadership. The regression models are expressed as under:

Model 1: Dependent variable = fn{intercept, industry type (k-1 dummies)}

Model 2: Dependent variable = fn{intercept, industry type (k-1 dummies), configuration (q-1 dummies)}

Model 3: Dependent variable = fn{intercept, industry type (k-1 dummies), configuration (q-1 dummies), leadership}

First, we ran the above models with average manufacturing performance as the dependent variable. The test results are presented in Table 4. The industry effect was generally found to be non-significant at $p < 0.10$. The corresponding change in R-squared, when the industry dummy block is added, is 0.032 and the associated change in *F* is 0.600 (n.s. at $p \leq 0.10$). Though the overall industry effect on manufacturing performance is non-significant, the Fabricated Metal industry group seems to have statistically significantly ($p \leq 0.10$) higher performance than the referent (omitted) group comprised mainly of Chemical and Pharmaceutical firms. There is no specific reason for choosing this as the referent group except that it happens to be the largest group.

Insert Table 4 About Here

In Model 2, we added the three competitive orientation dummies; the Agile group is the referent (omitted) group as we expect this group to have the highest performance compared to the other three groups. The incremental variance explained in manufacturing performance on account of the competitive orientation dummies is non-significant (change in *R-squared* = 0.031; *F-change* = 0.977, n.s.). We, however, noted that manufacturing performance for Starters is statistically significantly lower than that of the Agile manufacturers at $p \leq 0.05$, which is consistent with the extant literature.

In Model 3, we added leadership—the variable of special interest in this study. The leadership variable's beta coefficient is statistically significant at $p \leq 0.01$, which supports Hypothesis H1 as it explains an incremental variance of 8.8 percent in manufacturing performance, beyond the fixed effects of competitive orientation and industry type. The beta coefficient for Fabricated Metal industry group continues to be positive and statistically significant ($p \leq 0.10$), which means that this group has higher performance than the referent (omitted) group when the industry membership and leadership practices across groups are kept unchanged. The beta coefficient for Starters also continues to be negative and statistically significant ($p <= 0.10$), which implies that the Agile manufacturers perform better than Starters when the industry membership and leadership practices across groups are kept unchanged.

The estimate regarding the effect of leadership on manufacturing performance is consistent (i.e., unbiased) as we controlled for the fixed effects of competitive orientation and industry type. The positive and statistically significant beta coefficient for the leadership variable (*beta* = 0.312, $p \leq 0.01$) indicates that the manufacturing manager's leadership enhances manufacturing performance as the industry membership and competitive orientation are kept unchanged. That is, above and beyond the differences in manufacturing performance on account of the industry membership and competitive priorities of an organization, if a manufacturing manager demonstrates effective leadership practices, such as planning, inspiring, networking, etc., the manufacturing performance of the organization is further improved.

We further tested the hypothesis with the individual performance items as respective dependent variables. The same procedure as described above was followed; first the industry dummies were entered, next the competitive orientation dummies, and finally the leadership variable. For sake of brevity, only Model 3 results for each of the seven individual performance items as the dependent variable are presented in Table 5. The incremental variance explained (change in R-squared) and the corresponding change in F-value, when the leadership variable is added, is statistically significant at $p \leq 0.10$ in six of the seven cases. The only exception is in the case of Customer Satisfaction, which is further discussed below. The associated leadership beta coefficients are similarly statistically significant in the same six of the seven cases.

Insert Table 5 About Here

The manufacturing manager's leadership practices do not seem to enhance customer satisfaction, which represents an aspect of manufacturing performance. The other six manufacturing performance items that are positively affected by leadership are: accuracy, quality, productivity, efficiency, timeliness, and quantity of output. A closer examination reveals that the manufacturing manager's leadership is able to influence these six measures of performance as they all seem to be under the direct reach of the manufacturing group. Their efforts can directly impact these six aspects of the output. If the manufacturing manager is able to lead effectively, the employees will pay extra attention to ensuring the accuracy and quality of the output, they will produce the desired quantities and in a timely manner, and they will do so efficiently and without wasting resources (i.e., high productivity). If these aspects of the manufacturing performance are ensured, one would expect that the output might satisfy the customer. The customer satisfaction, however, is a function of the expectations and perceptions of the customer. For example, if the customer's expectations exceed his/her perceived value of the output, the customer is not satisfied, and vice-versa. The manufacturing manager and his/her employees may not have as much influence in forming or managing customer expectations and hence the leadership practices of the manufacturing manager do not seem to directly impact customer satisfaction. It is, however, important to note that customer satisfaction is influenced by the competitive orientation of the organization. That is, customers dealing with the Agile group seem to be more satisfied than the other three groups of manufacturers—Starters, Speedy

Conformers and Efficient Conformers, but the leadership practices of the manufacturing manager do not seem to have any extra impact on customer satisfaction. It may be that since agile manufacturers are more flexible to accommodate customer preferences than the rest, they seem to fare better on customer satisfaction.

CONCLUSION AND IMPLICATIONS

This study illustrates the use of behavioral theory of leadership in the context of managing operations with varying competitive orientations in different industries. The results support our contention that the use of effective leadership is positively associated with performance beyond the fixed effects of organizational variables, such as competitive orientation and industry membership.

Theoretical Implications

The findings of this study lend empirical support to Skinner's (1969) general assertion that manufacturing leadership practices are important to successfully pursue operations strategies or goals. Further, by simultaneously examining the competitive orientation of manufacturers as configurations along with the leadership practices, this study has added to the call and works of contemporary researchers (cf., Ahmad and Schroeder, 2003; Bendoly et al., 2006; de Treville and Antonakis, 2006; Liden and Antonakis, 2009) in integrating behavioral theories in operations management. It is our hope that future researchers would further develop and integrate the application of leadership theory in operations management.

With the use of up to three respondents for ascertaining the leadership style of each participating manufacturing manager, this study underscores the importance of using multiple respondents in empirical operations management studies as also noted by Ketokivi and Schroeder (2004) and Boyer et al. (2005). Finally, by using two additional high-ranking respondents, one each for the other two study variables (manufacturing performance and competitive priorities), we have vigorously attempted to moderate the incidence of common methods variance due to mono-respondent bias. Though it is difficult to collect data from multiple respondents from within an organization, the richness of it outweighs the difficulty. Hence, we assert that future studies should strive to collect data on different study variables from different individuals from each participating organization, and, if possible, use multiple individuals for each variable of interest.

Practical Implications

As manufacturers make their progression from sole cost consciousness—traditional approach in manufacturing—to pursuing a combination of priorities identified as their unique competitive orientation, their manufacturing managers need to use a gamut of effective leadership practices, such as planning, delegating, inspiring, mentoring, etc., which help further augment the overall manufacturing performance. The use of leadership practices in a manufacturing company with a given competitive orientation is likely to enhance a manager's effectiveness in pursuing the manufacturing unit's competitive priorities. Manufacturers may also take note that effective manufacturing leadership enhances performance on a host of measures, such as quality, timeliness, efficiency, quantity, etc., which are directly influenced by the manufacturing group. For measures, such as customer satisfaction, manufacturers should note that effective manufacturing leadership by itself is not adequate to enhance customer satisfaction, but needs to be augmented by other means. For example, manufacturers should, perhaps, work on managing customer expectations of their products and simultaneously enhance their experience (perceptions) by being more flexible in accommodating customers' dictates regarding the product and schedule changes.

Limitations and Directions for Future Research

The findings of this study may be viewed in light of its limitations that open up avenues for further research in this area. First, the cross-sectional design used in this study precludes causality. Thus, we cannot say with certainty whether the use of leadership practices for a given competitive orientation leads to better performance or if the better performing manufacturing managers are more aware of what leadership practices to use. In future, longitudinal studies or experimental designs may be considered to explore this issue further, but we could not use that approach in this study due to the problems of cost and sample attrition over time, among others.

Second, though we were successful in getting multiple respondents from each participating company, the commitment from five individuals, including two high-ranking officials, might have deterred many companies from participating in the study. Though total number of respondents in this study is in excess of 480, our attempt to overcome potential criticisms of survey research, such as mono-respondent bias and CMV, yields 98 data points from as many manufacturing units. Given the limited sample size, we were unable to disentangle the unique effects of different leadership styles for different manufacturing configurations. Future research should attempt to match different leadership practices/styles to different competitive orientations.

Third, the measures of competitive priorities used in this study are well-grounded in the literature, which lends credibility to their validity. Further, the wide range of ratings on each priority and the resultant four clusters with different competitive orientation may suggest that the manufacturing managers understood the questions properly and filled out the surveys with minimal ‘social bias.’ Future research should, however, try to incorporate the suggestions of Boyer and Pagell (2000), such as reverse coding some items, among others. Attempt should be made to refine measures for the quality-of-design construct and avoid the use of double-barreled questions.

Fourth, even though we tried to isolate the effects of some organizational factors by including them as fixed effects in the regression model or by considering perceptual manufacturing performance and not the organizational performance as our outcome variable, it is quite likely that even the perceived group performance may be influenced by other factors not included in this study. For example, as previous research has shown, the fit between competitive orientation and the environment may affect performance (Ward and Duray, 2000). Similarly, the process choice may influence a company's competitive orientation (Safizadeh et al., 2000).

Finally, employee characteristics, such as subordinates' prior experience, training, or skills may influence the need for demonstrating the leadership practices differently for different competitive orientation, but we didn't collect data on employee variables. Incorporating these employee characteristics in future endeavors may further enhance our understanding of the critical links between leadership practices, competitive orientation, and manufacturing performance.

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Table 1
Sample Description: Frequency Distribution

Type of Industry	N	Percent
1 - Fabricated Metal	15	15
2 - Machinery except Electrical and Computers	08	09
3 - Electrical Machinery and other Electric Goods	11	11
4 - Transportation and Aerospace	07	07
5 - Consumer Nondurable	19	20
6 - Chemical / Pharmaceuticals/ Packaging	37	38

Table 2
Manufacturing Configurations Based on Competitive Orientation of Clusters

	Cluster #1 *n* = 40	**Cluster #2** *n* = 32	**Cluster #3** *n* = 11	**Cluster #4** *n* = 15	*F* = Value (*p* = probability)
Configuration → / **Competitive Priority ↓**	**Speedy Conformers**	**Starters**	**Efficient Conformers**	**Agile**	
Cost Cluster Mean Std. error	4.10 (2, 4) 0.09	3.51 (1, 3, 4) 0.10	4.51 (2) 0.10	4.64 (1, 2) 0.07	$F = 19.75$ $p < 0.0001$
Delivery Cluster Mean Std. error	4.35 (2, 3) 0.06	3.63 (1, 3, 4) 0.09	2.93 (1, 2, 4) 0.10	4.51 (2, 3) 0.10	$F = 40.27$ $p < 0.0001$
Flexibility Cluster Mean Std. error	3.96 (2, 3) 0.06	3.33 (1, 4) 0.09	3.05 (1, 4) 0.07	4.58 (1, 2, 3) 0.08	$F = 42.11$ $p < 0.0001$
Quality Cluster Mean Std. error	4.43 (2, 4) 0.05	3.78 (1, 3, 4) 0.09	4.48 (1, 4) 0.12	4.93 (1, 2, 3) 0.03	$F = 31.93$ $p < 0.0001$

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

Table 3
Descriptive Statistics

	Mean	S.D.	Range	2	3	4	5	6	7	8	9
1. Timeliness	5.45	1.15	2.00-7.00	0.34	0.47	0.34	0.47	0.33	0.37	0.28	0.70
2. Accuracy	5.49	0.96	2.00-7.00		0.28	0.67	0.30	0.38	0.26	0.24	0.65
3. Customer Satisfaction	5.38	1.00	3.00-7.00			0.31	0.38	0.18	0.34	0.10	0.60
4. Quality	5.44	0.92	2.00-7.00				0.35	0.40	0.15	0.19	0.66
5. Efficiency	5.01	0.94	3.00-7.00					0.49	0.72	0.27	0.77
6. Quantity	5.35	1.04	3.00-7.00						0.46	0.22	0.67
7. Productivity	4.98	1.03	2.00-7.00							0.10	0.69
8. Leadership*	42.39	6.14									0.30
9. Manufacturing Performance**	5.29	0.69									-

Note: Correlation coefficients of value 0.17 or higher are significant at $p < 0.05$.
*Aggregate of 14 managerial practices **Average of items 1(timeliness)—7(productivity).

Table 4
Effects of Leadership on Manufacturing Performance Beyond the Fixed Effects of Configuration and Industry Membership

Parameter	**Model 1**		**Model 2**		**Model 3**	
	B (Std. Error)	**Standardized Beta**	**B (Std. Error)**	**Standardized Beta**	**B (Std. Error)**	**Standardized Beta**
Intercept	5.266 (0.113)		5.487 (0.205)		4.006 (0.530)	
Ind. Dummy_FM	0.272 (0.211)	0.145*	0.292 (0.219)	0.156*	0.315 (0.210)	0.168*
Ind. Dummy_MC	-0.123 (0.268)	-0.050	-0.073 (0.274)	-0.030	0.060 (0.266)	0.024
Ind. Dummy_EM	0.102 (0.236)	0.048	0.134 (0.238)	0.063	0.061 (0.229)	0.029
Ind. Dummy_TA	-0.164 (0.283)	-0.063	-0.149 (0.285)	-0.057	-0.217 (0.274)	-0.083
Ind. Dummy_CN	0.018 (0.194)	0.011	0.040 (0.195)	0.024	-0.027 (0.188)	-0.016
Config. Dummy_Speedy			-0.211 (0.220)	-0.153	-0.188 (0.211)	-0.137
Config. Dummy_Starters			-0.373 (0.223)	-0.259**	-0.299 (0.215)	-0.208*
Config. Dummy_Efficient			-0.241 (0.284)	-0.113	-0.151 (0.274)	-0.071
Leadership					0.034 (0.011)	0.312***
R^2 (Adj. R^2)	0.032 (-0.021)		0.063 (-0.022)		0.151 (0.064)	
ΔR^2 (ΔF)	0.032 (0.600)		0.031 (0.977)		0.088 (9.046)***	

Dependent Variable: Manufacturing Performance based on average of seven measures of performance;
Referent/omitted groups: Chemical/Pharmaceutical industry, and Agile configuration;
Ind. Dummy_FM=Industry Dummy_Fabricated Metal; *MC*=Machinery except Electrical and Computers; *EM*=Electrical Machinery and Electric Goods
TA=Transportation and Aerospace; *CN*=Consumer Nondurable;
All p-values are one-tailed; *p-value ≤ 0.10 **p-value ≤ 0.05 ***p-value ≤0.01.

Table 5
Regression Models for Individual Performance Items:
Effects of Leadership Beyond the Fixed Effects of Configuration and Industry Membership

Dependent →	**Accuracy**	**Quality**	**Productivity**	**Efficiency**	**Quantity**	**Customer satisfaction**	**Timeliness**
Parameter	**Standardized Beta**	**Standardized Beta**	**Standardized Beta**	**Standardized Beta**	**Standardized Beta**	**Standardized Beta**	**Standardized Beta**
Intercept							
Ind. Dummy_FM	.166*	.155*	.076	.066	.097	.214**	.071
Ind. Dummy_MC	-.079	.027	.128	.079	-.057	-.005	.003
Ind. Dummy_EM	-.068	.107	.042	.018	.015	.173*	-.140
Ind. Dummy_TA	-.186**	-.149*	-.038	-.065	.069	.014	-.099
Ind. Dummy_CN	-.080	.017	-.061	.005	-.019	.010	.046
Config. Dummy_Speedy	-.186	-.093	-.068	-.061	-.119	-.244*	-.084
Config. Dummy_Starters	-.285**	-.309**	.034	-.073	-.041	-.415***	-.119
Config. Dummy_Efficient	-.148	-.192*	.069	.071	.065	-.225**	-.060
Leadership	.270**	.172**	.143*	.297***	.219**	.053	.307***
R^2 (Adj. R^2)	0.177 (0.087)	0.164 (0.078)	0.049(-.051)	0.096(0.000)	0.095(-0.006)	0.138(0.042)	0.137(0.045)
ΔR^2 (ΔF) Due Leadership	0.065 (6.492)**	0.027 (2.801)**	0.019 (1.685)*	0.080 (7.546)***	0.044 (3.907)**	0.003 (0.238)	0.086 (8.382)***

Referent/omitted groups: Chemical/Pharmaceutical industry, and Agile configuration;
Ind. Dummy_FM=Industry Dummy_Fabricated Metal; *MC*=Machinery except Electrical and Computers; *EM*=Electrical Machinery and Electric Goods
TA=Transportation and Aerospace; *CN*=Consumer Nondurable;
All p-values are one-tailed; *p-value ≤ 0.10 **p-value ≤ 0.05 ***p-value ≤0.01.

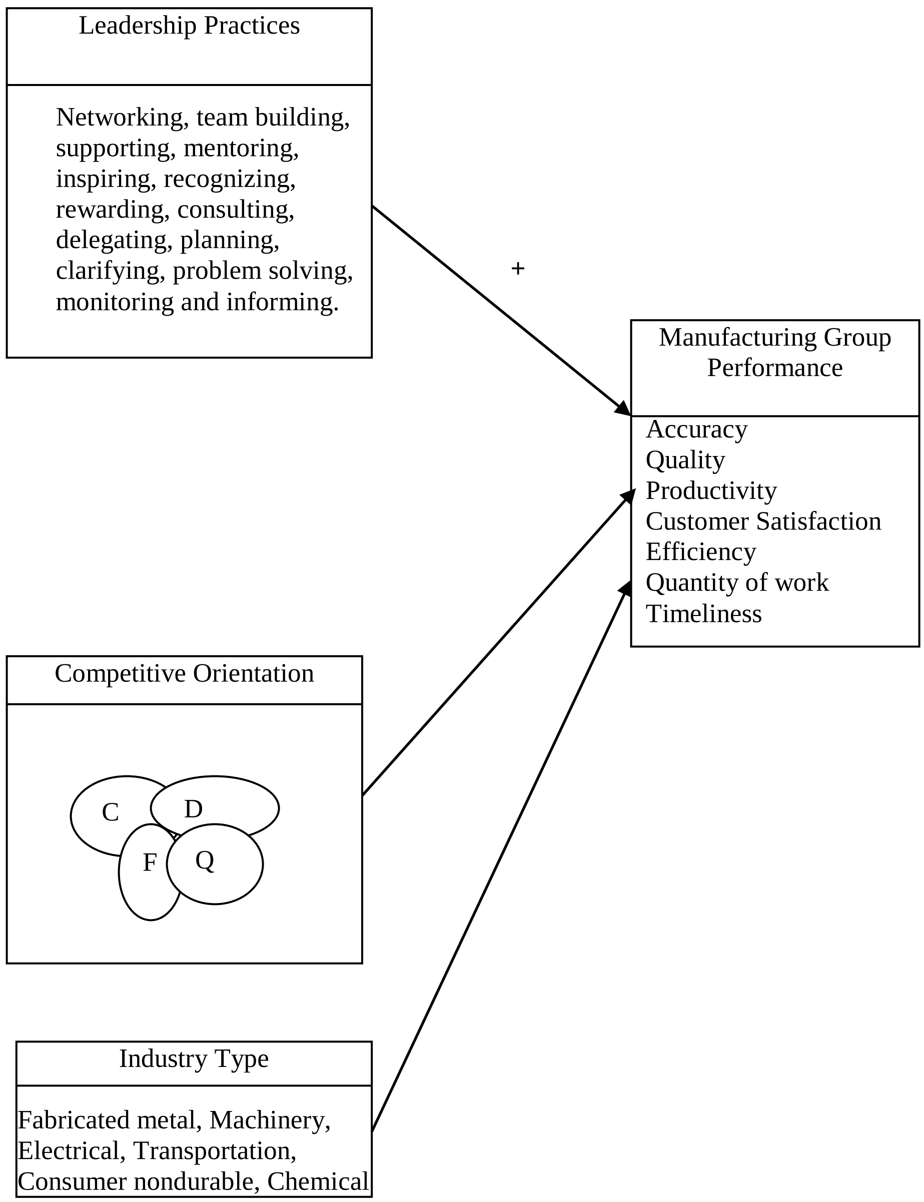

Figure 1. The Conceptual Model Linking Leadership Practices, Competitive Orientation, Industry Type and Manufacturing Group Performance.

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

Appendix

I. Manufacturing Manager's Survey

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

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 - continued

II. General Manager's Survey

Section I

Manufacturing 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

III. Employee Survey (Leadership Practices)

(A copy of this questionnaire may be obtained from Professor Gary Yukl of NYU (G.Yukl@albany.edu))

Describe how often this manager uses the following specific leadership behaviors.
(4– Usually, To a Great Extent ---to--- 1– Never, Not At All)

This manager...
1.
…
…

Consulting

This manager...
17.
18. consults with you to get reactions and suggestions before making major changes ...
...
21. etc.
…

Monitoring

This manager...
34. …
…
38. checks work progress against plans …
…

Team Building

This manager...
51. encourages cooperation and teamwork …
…
…

69. etc.