Arab Journal of Administrative Sciences

2006, Vol. 13, No. 2, 215 - 235

M. Tawfik Mady

Kuwait University, Kuwait

THE IMPACT OF PLANT SIZE AND TYPE OF INDUSTRY ON KUWAITI MANUFACTURING COMPETITIVE PRIORITIES: AN EMPIRICAL INVESTIGATION

Key Words

Competitive Priorities; Manufacturing Strategies; Trade-off Model; Plant Size; Type of Industry; Kuwait.

Abstract

This paper reports and discusses the competitive priorities in two different Kuwaiti industries. It also investigates the impact of plant size and type of industry on these priorities. Findings indicate that plant size is an indicator of the emphasis on some priorities. The three size groups differ significantly in the emphasis on on-time delivery and flexibility, but not on quality improvement, cost reduction and innovativeness. The two industries do not differ significantly in their level of focus on all priorities. Delivery and quality are the two main competitive priorities in both. The study does not support the competitive priorities trade-off model.

Introduction

With the growing role of the operations function as a key strategic element for competitive success, manufacturing companies are faced with the need to formulate operations strategies which help and support the implementation of their corporate competitive strategies. In early manufacturing strategy literature, research defined manufacturing competitive priorities as the ways in which a firm chooses to compete in the marketplace and the types of markets it pursues (Hayes and Wheelwright, 1984; Buffa, E. S., 1984, Skinner, W., 1985). Referred to as "the content variables of manufacturing strategy" (Adams and Swamidass, 1989), "organizational priorities and generic capabilities" (Ferdows and De Meyer, 1990), "production competence"

Submitted May 2004, accepted May5 2005.

(Vickery, *et al*., 1993) and "competitive manufacturing capabilities" (Ward, *et al*., 1996), these competitive priorities have become an increasingly important research topic in operations strategy empirical studies during the past decade.

Regardless of the used terminology, there is a general agreement among operations strategy researchers in both conceptual and empirical studies that these competitive priorities comprise four basic dimensions: cost, quality, delivery and flexibility (Swamidass and Newell, 1987; Anderson, *et al*., 1989; Leong *et al*., 1990; Noble, 1995; Swink and Way, 1995; Ward, *et al*., 1995; Boyers, 1998; Ward *et al*., 1998; Dangayach and Deshmukh, 2001, and Boyer and Lewis, 2002). The comprehensive literature review by Anderson, *et al*. (1989) and Swink and Way (1995) showed a general consensus regarding the composition of these four key competitive priorities which comprise the content of a firms operations strategy. Some researchers, however, suggested innovativeness as a fifth competitive priority (Leong, *et al*., 1990).

Miller and Roth (1988) conducted a study (the Manufacturing Future Project) to investigate manufacturing strategies, competitiveness, and competitive priorities among 160 senior manufacturing executives in the U.S. and Canada. In 1983, the survey was expanded internationally and administrated to 7600 executives in the U.S., Canada, Japan, and 11 European countries. Since then, the survey has been administrated annually. A similar effort to investigate manufacturing priorities and policies of the large Spanish industrial companies was reported by Avella, *et al*. (1999) and a comparison of these Spanish companies with American and other European manufacturers was provided (Avella, 1999). Also, the differences in the manufacturing competitive priorities adopted by the Canadian and Australian plants were empirically investigated by Gordan and Sohal (2001). They also examined the effect of these priorities, and other manufacturing practices, on plant performance. Similar surveys were also conducted in Taiwan (Chen, 1999), China (Zhao, at el., 2002), India (Dangayach and Deshmukh, 2003) and Denmark (Christiansen, *et al*., 2003).

An extensive review of the literature revealed that manufacturing competitive priorities were carried out in small and newly emerged economies in the Middle East and the Arab Gulf areas. Mady (1999) and Badri, *et al*. (2000), for example, investigated the level of focus on different competitive priorities in Egypt and the United Arab Emirates

respectively. The current study focuses on small country studies by using the manufacturing competitive priorities that were espoused by Kuwaiti manufacturers during the past three years. In particular, the study focuses on five selected competitive priorities: quality improvement, on-time delivery, cost reduction, flexibility, and innovativeness.

Furthermore, the study investigates the impact of plant size and industrial sector on the level of emphasis on these priorities. In their review of the literature, Dangayach and Deshmukh (2001) concluded that the bulk of manufacturing strategy empirical research was conducted in highly industrialized nations with a focus on large world-class firms. Indeed, very few studies focused on operations strategy of small and medium enterprises (See for example: Chen, 1999; Aranda, 2000; and Kathuria, 2000). Kathuria (2000), however, represents the very few empirical studies which address directly the effect of size on firm competitive priorities. Accordingly, the second goal of this study is to verify whether plant size and type of industry have a significant impact on its competitive priorities. Specifically, the study investigates and contrasts the level of focus on the five competitive priorities in small, medium and large Kuwaiti plants.

Finally, the study explores the level of association between different manufacturing competitive priorities. This allows testing the traditional competitive priorities trade-off model, which was frequently argued by early operations strategy researchers (Skinner 1969, 1974; Fine and Hax, 1985; Hayes and Wheelwright, 1984, Richardson, *et al.*, 1985; New 1992). According to this model, it is difficult for a plant to focus on all priorities at the same time. Plants managers should prioritize their competitive strategic goals and develop certain manufacturing capabilities accordingly. Current researchers however, such as Ferdows and De Meyer (1990); Noble (1995); Mapes, *et al.* (1997); and Noble (1997), believe that a company can simultaneously do well on multiple competitive priorities. Adam and Swamidass (1989) argued that a major shortcoming of manufacturing strategy content research is its lack of empirical investigations of relationships among its variables. This debate over the relationship between competitive priorities was subject to serious empirical studies (Roth and Miller, 1992; Noble, 1995; Sink and Way, 1995; and Boyer and Lewis, 2002). Specifically, this study attempts to answer the following three research questions:

1. What are the levels of emphasis on different competitive priorities in Kuwaiti plants?
2. What is the impact of plant size and type of industry on this level of focus?
3. What is the level of association between different pairs of competitive priorities? In addition, what trade-off should be expected?

Research Hypotheses

Despite Berry, *et al*. (1991)'s argument that firm size is not even considered in many operations strategy empirical works, Rich (1992) asserted that the subject had been frequently addressed in strategic management literature. It was also argued that most empirical models in the field of operation strategy were tested and validated for manufacturing firms of significantly different sizes without further analysis (Minor, *et al*., 1994). Aranda (2000) investigated the impact of firm size on operations strategy. The study was carried out on engineering consulting firms, rather than manufacturing organizations. His findings showed a significant relationship between operations strategy and size. Specifically, he showed that small firms tend to follow custom-oriented operations strategies, medium-sized firms tend to follow process-oriented operations strategies and larger firms tend to follow service-oriented operations strategies.

When considering the link between plant size and competitive priorities in particular, empirical studies are even scarcer. The hypothesis that large firms behave differently than small firms in their competitive priorities was subject to careful empirical research. Motwani, *et al*. (1998) and Kathuria (2000) studied the possible effect of size on firm competitive priorities. Motwani, *et al*. found that large manufacturing organization in West Michigan area are more advanced when it comes to the implementation of six of the seven operations strategies that were used in their study. For his part, Kathuria developed a taxonomy of small manufacturers based on their emphasis on several competitive priorities. His findings indicate that different groups of manufacturers emphasize different sets of priorities, even within the same industry.

The assumption in most manufacturing strategy studies is that only large world-class firms pay attention to the formulating of its own specific set of competitive priorities. This study argues that small firms also address the question of which competitive priority to focus on and what importance level should be assigned to each priority. When both large and small plants work under the same

competitive business environment, large plants are not expected to invoke a different set of competitive priorities than small ones. Accordingly, the following null hypothesis was formulated:

Hypothesis 1:

Plant size has no significant effect on the level of emphasis on different competitive priorities.

Hayes and Wheelwright (1984) stressed that, within an industry, different firms or business units differ in the emphasis given to each competitive priority, thus creating their own unique strategic profile. Because each manufacturing unit and each industrial sector are working under their own peculiar business environments and deploy different manufacturing capabilities, they expect to differ in their manufacturing strategies. However, due to the preliminary nature of this research the second research proposition concerning the effect of type of industry on the level of emphasis placed on each of the different competitive priorities was formulated in a null hypothesis form as follows:

Hypothesis 2:

The two industrial sectors do not differ significantly in the level of focus placed on different competitive priorities.

The traditional operations strategy trade-off model suggests that it is difficult for a plant to focus on all priorities at the same time. Plants managers should prioritize their competitive strategic goals and develop certain manufacturing capabilities accordingly (Skinner 1969, 1974; Fine and Hax, 1985; Hayes and Wheelwright, 1984, Richardson, *et al*., 1985; New 1992). Other researchers however, such as Ferdows and De Meyer (1990); Noble (1995); Mapes, *et al*. (1997); and Noble (1997), believe that a company can simultaneously do well on multiple competitive priorities. Adam and Swamidass (1989) asserted that a major shortcoming of manufacturing strategy content research is that it lacks empirical investigations of relationships among its variables.

This debate over the relationship between competitive priorities was subject to investigation (Roth and Miller, 1992; Noble, 1995; Swink and Way, 1995; Mapes, *et al*., 1997; Ward, *et al*., 1998; Flynn, *et al*., 1999; Kathuria, 2000 and Boyer and Lewis, 2002). Some of these studies addressed indirectly the expected trade-off between pairs of priorities and found support for this claim. For example, Ward, at al. (1998) concluded that plants must make choices between achieving low costs or high flexibility. They showed that line flow and job shop manufacturing processes are

linked to cost reduction and flexibility, respectively. On the other hand, findings of several empirical studies seem to contradict the traditional trade-off model by confirming that competitive priorities are positively correlated (see for example, Roth and Miller, 1992; Noble, 1995; Mapes, *et al.*, 1997; and Kathuria, 2000). Through introducing two different ways of measuring the relative importance of four competitive priorities to each of the participating plants, Boyer and Lewis (2002) reached two contradictory conclusions. When priorities were reported directly from respondents, on a Likert ordinal scale, the significant correlation among them was statistically confirmed. On the other hand, after transforming the measures within each plant to provide a more sensitive weighing of priorities by identifying the relative importance of various priorities for respondents that have very similar ratings for all constructs, according to their claim, correlations between priorities were not all significant. To contribute to this direction, the current study investigates the trade-off model through testing the following null hypothesis:

Hypothesis 3:

Levels of association between different pairs of competitive priorities are insignificant.

Research Methodology

Sampling:

This study forms part of a broader research project that was funded and administrated by the Public Authority for Industry (PAFI) of the State of Kuwait. The project was conducted between May 2000 and March 2001, and aimed at documenting and assessing the manufacturing policies and practices in two of the main manufacturing sectors in the country, namely, food processing and refractors industries. Only the data related to manufacturing competitive priorities are reported and analyzed in this paper.

The sampling frame consisted of all manufacturing companies in the Food processing (96) and Refractors (198) industries working in Kuwait. According to PAFI classification, the food processing industry comprises seven different divisions while the refractory-products industry includes eight. The food-processing industry comprises dairy products, meat processing, juice and soft drinks, bread and bakery, seafood processing, chattels & chickens food, and no-classified products. The refractors industry produces most of the construction materials used in the country. It includes concrete mix, glass, marble and granite, ceramic and tile, cement, gyps, and other products. Its sub-divisions stratified each industry and a proportion-

ate number of plants were selected from each division. Therefore, a relative representation of each division within the same industry was secured. In addition, a random number of observations proportional to size distribution, based on PAFI experience, within each division was selected. It is important to indicate here that most of the refractors plants are relatively small, especially in the brick and tile divisions. This stratified sampling approach was used to select a broadly representative sample. Accordingly, 55 plants from the food processing industry and 50 plants from the refractors industry were included in the sample. Table 1 provides information about the sampling frame, response rates and sample profile in the two industrial sectors.

Data Collection:

The data collection method used in this study is that of the questionnaire. Although the original questionnaire that was developed for the whole research project comprised more than 400 questions, the current study focuses on only a partial set of these questions. This includes a profile of the plant and manufacturing competitive priorities. The plants profile section includes type of industry and number of employees. The manufacturing competitive priorities question is directly related to the level of focus that management placed during the last three years on each of the five competitive priorities covered in the study.

In order to check the suitability and face validity of the questionnaire design, the initial design of the questionnaire was pre-tested on a pilot sample of few plant managers in both sectors, and all received questionnaires underwent strict checks to insure completeness and consistency.

Cooperation was obtained by first writing a formal letter from PAFI to

Table 1
Sampling Frame and Response Rate

	Food industry	Refractors industry	Total
Total number of plants in Kuwait	96	198	294
Sample size (plants)	55	50	105
Response rate	54.5%	62%	58.1%
Number of valid respondents	30	32	62
Plant size (employment)			
Small (35 employees or less)	8 (26.7%)	15 (46.9%)	23 (37.1%)
Medium (36 to 70 employees)	10 (33.3%)	9 (28.1%)	19 (30.6%)
Large (more than 70 employees)	12 (40.0%)	8 (25.0%)	20 (32.3%)

each company's president explaining the purpose of the study and assuring the full confidentiality of the data. Questionnaires were then handed over to plant managers and site visits were arranged to explain the questions. This contact strategy was successful since the response rate was about 58 percent for a total of 62 plants. The collected data allow for comparisons of the manufacturing strategies intended by 30 and 32 plants from food and refractors industries respectively. Non-response bias was analyzed both with type of industry and employment size. Response rates were quite similar across categories. Table 1 provides a profile for the 62 respondents indexed by type of industry and plant size.

Research Variables:

Manufacturing competitive priorities

In this study, five content variables were used as the main dimensions of the "manufacturing competitive priorities" variable, namely, cost, delivery, quality, flexibility, and innovativeness. These variables were defined and included in previous research (e.g., Boyers 1998; Ward, *et al*., 1998; Swamidass and Newell, 1987; Ferdows and De Meyer, 1990, Vickery, *et al*., 1993; Ward, *et al*, 1995; Noble, 1995; Boyer and Lewis, 2002). In developing measures for each of these five dimensions, perceptual questions were used. Each plant manager was asked to indicate, on a five-point Likert scale, the level of focus he placed on each of these priorities in the past three years, where 1 represents "no focus" and 5 represents "extreme focus".

Plant size

Different firm and plant size measures such as annual revenue, total investments, and number of employees are usually used in several operations management empirical studies. Although respondents, in the current

Table 2
Test for Normality
(Kolmogorov-Smirnov test results and level of sign.)

	Food (n = 30)		Refractors (n = 31)		Entire Sample (n = 61)	
Competitive Priorities	Z	Sig.	Z	Sig.	Z	Sig.
On-Time Delivery	0.302	0.000	0.267	0.000	2.053	0.000
Quality Improvement	0.332	0.000	0.395	0.000	2.833	0.000
Cost Reduction	0.284	0.000	0.233	0.000	2.010	0.001
Innovativeness	0.288	0.000	0.335	0.000	2.388	0.000
Flexibility	0.241	0.000	0.202	0.004	1.650	0.009

study were asked to provide information about the three measurements, most of them were very reluctant to reveal any information about sales and investments. In addition, size, in terms of employment, of only a number of large plants was known in advance of defining the sample. This is due to inaccurate and outdated employment records in most small plants. This is especially true in the Refractors industry. In order to encourage respondents to provide employment data, the employment size question was in an interval form. Based on the experience of PAFI classification, three employment size brackets were defined in the questionnaire: small (35 employees or fewer), medium (36 to 70 employees), and large (71 employees or higher). Each plant manager was asked to classify his plant as small, medium or large according to these intervals. The sizes of the responding plants for the entire sample were distributed as follows: 37.1% small; 30.6% medium; 32.3% large.

Statistical Analysis:

Ordinal scales were used to measure plant priorities. The goodness of fit Kolmgorov-Smirnov test was performed on the data to test for normality. Results, reported in Table 2, revealed an obvious non-normality for all measures. To overcome this problem the non-parametric Kruska-Wallis test for k independent samples was used to investigate the statistical differences between the three size brackets in terms of the level of focus on the five competitive priorities. Mann-Whitney test for two independent samples, however, was used to test for the effect of type of industry on competitive priorities. Nonparametric tests have the advantages of making the minimal assumption about the underlying distribution of data and are often called distribution-free methods (Aczel, 1996). In order to investigate the level of associations between degree of emphasis on different pairs of competitive priorities, Goodman and Kruskal's Gamma was utilized. Coefficient Gamma is appropriate when two variables have categories that are ordered (Voelkl and Gerber, 1999).

Results

This part of the paper includes three sections. The first section reports the level of focus on different competitive priorities in the entire sample. In the second section competitive priorities in the three size groups are discussed. This includes testing the first null hypothesis. Levels of focus on each of the five competitive priorities in the two industrial sectors are reported in the third section. The statistical impact of type of industry

on competitive priorities is also tested. Finally, testing the validity of the competitive priorities trade-off model is reported in the last section of this part.

Manufacturing Competitive Priorities in Kuwait:

The level of focus that Kuwaiti manufacturers placed on different competitive priorities in the last three years is presented in Table 3. As for the entire sample, the table shows that "on-time delivery" was the number one strategy emphasized by Kuwaiti plants with a relatively high score (4.31). About 91.5 percent of the respondents put a "strong" and "extreme" focus on on-time delivery as a competitive strategy. Almost none of the plants reported "no" or "little" emphasis on this competitive priority. While "product quality improvement" ranked second (4.13), "cost reduction" and "innovativeness" scored a moderate emphasis with a score of 3.90, and 3.68 respectively. About 90 percent of the responding plants reported "strong" and "extreme" emphasis on quality improvement. Obviously, "flexibility" was the least emphasized priority by Kuwaiti manufacturers.

Competitive Priorities and Plant Size:

Table 4 provides the level of focus on different competitive priorities for the three size groups. The data indicate that both small and medium size plants have the same ranks for the five competitive priorities. The most emphasized priorities in these two size brackets are on-time delivery and quality improvement.

Ranked number three is cost-reduction, followed in order of impor-

Table 3
Level of Focus on Different Competitive Priorities
(Frequencies, Mean and S.D.)

Please indicate the level of focus that you placed on each of the following competitive priorities in the last three years.

	No Focus		Little Focus		Moderate Focus		Strong Focus		Extreme Focus		Entire Sample		
Rank	n	%	n	%	n	%	n	%	n	%	N	Mean	S.D.
1. On-Time Delivery	0	0.0	1	1.7	4	6.8	30	50.8	24	40.7	59	4.31	.676
2. Quality Improvement	0	0.0	0	0.0	6	9.8	41	67.2	14	23.0	61	4.13	.562
3. Cost Reduction	0	0.0	1	1.6	17	27.9	30	49.2	13	21.3	61	3.90	.746
4. Innovativeness	1	1.7	5	8.3	14	23.3	32	53.3	18	13.3	60	3.68	.873
5. Flexibility	1	1.7	6	10.3	22	37.9	22	37.9	7	12.1	58	3.48	.903

- Level of focus: (1) no focus; (2) little focus; (3) moderate focus; (4) strong focus; and (5) extreme focus.

tance by innovativeness, then flexibility. This is the same rank order that was reported for the entire sample in the above section. Large size plants, however, tend to exhibit a different rank order. Their top competitive priority is reported to be quality improvement (4.20), followed in order of level of focus by cost reduction (4.10), on-time delivery (4.00), innovativeness (3.84), and finally flexibility (3.70).

In order to investigate the relationship between plant size and level of focus on each competitive priority, Kruska-Wallis test was utilized. The results, reported in Table 4, show significant ($p < 0.05$) differences among different size brackets in terms of the level of emphasis on "on-time delivery" and "flexibility". Therefore, the second null hypothesis was not rejected for these two priorities only. Plant size, in terms of employment, seems to be a determinant factor of the level of emphasis that Kuwaiti manufacturers placed on delivery and flexibility as two competitive priorities. However, the three groups do not differ significantly in terms of the level of focus on "quality improvement", "cost reduction", and "innovativeness". Accordingly, the second null hypothesis was rejected for these three priorities.

When considering the on-time delivery means of the three size groups, the data show that small (35 employees or less) and medium (36 to 70 employees) plants, with almost the same mean response (4.48 and 4.7 respectively), differ noticeably from large plants. In order to confirm this observation, a post-hoc Mann-Whitney U-testes was used to test for the significant differences between all pairs of size groups. As shown in the first row of table 5, small (35 employees or less) and medium (36 to 70 employees) plants differ significantly ($p < 0.05$) in their delivery focus. Also a significant ($p < 0.05$) difference exists between medium (36 to 70 employees) and large (more than 70 employees) size plants. On the other hand, both small (35 employees or less) and medium (36 to 70 employees) plants do not behave differently in terms of the priority attached to on-time delivery as a competitive weapon.

Although flexibility is the least emphasized priority across the three size levels as shown in Table 4, the three groups differ significantly ($p < 0.05$) in their level of focus on it as a competitive priority. The table indicates that medium and large plants tend to focus more than small plants on flexibility as a competitive tool. The post-hoc Mann-Whitney U-test results in table 5 seem to combine medium and large plants in one group for the level of focus on flexibility.

Competitive Priorities and Type of Industry:

In order to test for the industry effect on the level of focus on each of the five different competitive priorities, Mann-Whitney test was utilized. The test results in Table 6 show that the two industries do not differ significantly ($p < 0.05$) in their emphasis on the five priorities.

Accordingly, the first null hypothesis was not rejected. Type of industry does not seem to be a determinant of Kuwaiti manufacturers emphasis on different competitive priorities. Indeed, the two sectors were also identical in terms of the relative rank of these priorities. Most of the emphasis was on ''On-time delivery'', then ''Quality improvement'' in the two industrial sectors. On the other hand, flexibility was the least emphasized competitive priority in both sectors. Based upon these different results, industry type was not controlled for in all subsequent analysis.

Level of Association between Different Kuwaiti Competitive Priorities:

The levels of association between different competitive priorities, in terms of Goodman and Kruskals Gamma, are included in Table 7. Results show that a significant correlation exists between most pairs of priorities. Six out of the ten investigated pairs are reported to be significantly and positively correlated. This indicates that the simultaneous emphasis on pairs of competitive priorities is common among Kuwaiti manufacturers. More closely, the significant positive Gamma coefficients in the first column show that Kuwaiti plants seem to be able to put high, or

Table 4
Level of Focus on Different Competitive Priorities in the Three Size Groups (Mean, S.D. and Kruskal-Wallis test results)

Please indicate the level of focus that you placed on each of the following competitive priorities in the last three years.

	Small (n = 22)		Medium (n = 17)		Large (n = 20)		Kruskal-Wallis Test Results	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Chi-squ.	Sig
On-Time Delivery	4.48	.512	4.47	.717	4.00	.745	5.774	.050*
Quality Improvement	4.00	.436	4.29	.470	4.20	.696	3.111	.211
Cost Reduction	3.73	.827	3.88	.781	4.10	.671	2.448	.294
Innovativeness	3.45	.912	3.81	.981	3.85	.745	2.848	.240
Flexibility	3.05	.973	3.80	.862	3.70	.733	6.673	.036*

- Level of focus: (1) no focus; (2) little focus; (3) moderate focus; (4) strong focus; and (5) extreme focus.
- * $p < 0.05$

low, emphasis on both "quality improvement" and "on-time delivery" simultaneously. The level of focus on "quality improvement" and "flexibility" as two strategic priorities tend also to move in the same direction.

This is also true when considering improving quality and innovativeness at the same time. In general, the level of emphasis Kuwaiti manufacturers place on quality improvement is positively associated with their focus on all other competitive priorities, with only one exception. That is quality improvement and cost reduction priorities do not show any significant correlation.

For those trying to place emphasis on cost reduction as a strategic goal, Table 6 indicates that they were also able to focus on a flexible and innovative production system. Obviously, they have to be more innovative in developing creative methods to achieve cost reduction. Interestingly, delivery has no significant correlation with cost,

Table 5
Pairwise Comparisons between Different Size Groups
(Mann-Whitney test results)

	Difference between Small and Large		Difference between Medium and Large		Difference between Small and Medium	
	M-W U	Sign.	M-W U	Sign.	M-W U	Sign.
On-time Delivery	130.000	0.032*	104.000	0.046*	169.500	0.765
Flexibility	128.500	0.024*	146.000	0.886	95.000	0.035*

- Small (35 employees or less), Medium (36 to 70 employees), and Large (more than 70 employees).

- * $p < 0.05$

Table 6
Level of Focus on Different Competitive Priorities by Type of Industry
(Mean, S.D. and Mann-Whitney test results)

Please indicate the level of focus that you placed on each of the following competitive priorities in the last three years.

	Food (n = 30)		Refractors (n = 31)		Mann-Whitney Test Results	
	Mean	S.D.	Mean	S.D.	M-W U	Sig.
On-Time Delivery	4.22	.641	4.38	.707	367.500	.273
Quality Improvement	4.10	.607	4.16	.523	443.500	.708
Cost Reduction	4.07	.651	3.75	.803	358.500	.098
Innovativeness	3.73	.702	3.65	1.018	444.000	.929
Flexibility	3.66	.769	3.31	1.004	343.500	.204

- Level of focus: (1) no focus; (2) little focus; (3) moderate focus; (4) strong focus; and (5) extreme focus.

flexibility, or innovativeness. Of course, the significant positive Gamma correlation coefficient, like any other correlation measure, implies that manufacturers tend to rate every pair of priorities either high or low. Simply, the degrees of emphasis on two priorities (i.e. flexibility and innovativeness) move in the same direction.

The above results do not seem to support the main argument of the trade-off model advocates who suggest that plants must make choices and prioritize their strategic goals. None of the reported significant correlations in Table 6 has a negative coefficient in order to support this argument. This is especially obvious for Kuwaiti plants that are trying to improve their quality competitiveness. On the contrary, this study shows that Kuwaiti manufacturers tend to view competitive priorities as complementary, rather than mutually exclusive strategic choices. According to Boyer and Pagell (2000), a researcher should be cautious about such a conclusion. They argue that the way competitive priority data are obtained, on a separate ordinal Likert-type scale for each priority, does not force the relative ranking of the importance of different priorities.

Discussion and Conclusion

Results of the present study show that the most important priority emphasized by Kuwaiti manufacturers, by far, is "on-time delivery", followed in order of level of focus by "quality improvement". On the other hand, plants in the sample view flexibility as the least important competitive priority, with a relatively low mean of 3.48 on a 1 to 5 scale. This relatively high emphasis on on-time delivery and quality improvement is partially due to the small size of the Kuwaiti market and the high standard of living in Kuwait. Also the relatively small size of the Kuwaiti manufacturing plants might be behind the less emphasis on innovativeness. Almost identical results were found in Taiwan, where quality and dependability are perceived as the most important among seven priorities, followed by cost, flexibility, then innovation (Chen, 1999). This similarity might be due to the fact that most of the plant managers of Kuwaiti plants are Asian nationals who tend to follow the same competitive priorities practiced in their home countries. Quality and timing were also among the top three priorities in Canada and Australia (Gordan and Sohal, 2001).

Based on these preliminary results, Kuwaiti manufacturers could be labeled as "Speedy deliverers" (Christiansen, *et al.*, 2003) and "Speedy conformers" (Kathuria, 2000) with their extreme emphasis on delivery and strong focus on quality. The study

shows mixed results for the competitive priorities indexed by plant size. Kuwaiti plants, when defined by varying levels of size, exhibit significant differences in only two of the competitive priorities: (1) on-time delivery and (2) flexibility. However, plants of varying size possess the same level of emphasis on the rest of these priorities: (1) quality improvement, (2) cost reduction, and (3) innovativeness. Plant size seems to be a useful indicator of the different levels of emphasis that plants place on only two of the five competitive priorities: on-time delivery and flexibility. This also indicates that quality, cost and innovativeness are equally important across all Kuwaiti plants, regardless of size.

Pairwise comparisons highlight some differences between several pairs of size groups in the two statistically significant competitive priorities: on-time delivery and flexibility. When compared with large plants, small and medium plants were distinguished by their higher emphasis on on-time delivery as a competitive priority. To some extent, this is not surprising since small and medium sized plants tend to focus on few segments of customers in such a way that delivery systems are designed to customize the delivery process. Therefore, on-time delivery is expected to be a top priority under this manufacturing and distribution environment.

In contrast, medium and large plants place a significantly more emphasis than small plants on flexibility. This result might be due to the fact that a small firm is usually specialized in delivering few standard products and most of its resources are tuned toward this goal. Therefore, both product and volume flexibility are difficult to achieve in small plants. In addition, acquisition of advanced technology that allows product or volume flexibility is usually not available for these

Table 7
Correlations between Different Competitive Priorities
(Goodman and Kruskals Gamma and its significance levels)

	Focus on quality	Focus on delivery	Focus on cost	Focus on flexibility
Focus on Delivery	.649 (.000)**			
Focus on Cost	.157 (.465)	-.055 (.799)		
Focus on Flexibility	.424 (.026)*	.211 (.268)	.402 (.018)*	
Focus on Innovativeness	.700 (.000)**	.296 (.101)	.413 (.019)*	.661 (.000)**

** Correlation is significant at the.01 level (2-tailed).
* Correlation is significant at the.05 level (2-tailed).
- Significant correlation is in bold while significance level is in italic.

small plants. On the other hand, medium and large plants are able to combine both standardization and customization through the combination of general use, specialized technologies and workforce. Therefore, these relatively larger plants try to implement the so-called "delay differentiation strategy" by standardizing early stages of production and customizing final specifications.

In general, the pair wise comparison results suggest combining small and medium size plants in one group when trying to predict the level of focus on on-time delivery. Similarly, it is possible to combine medium and large plants in one group to understand the impact of plant size on the level of focus on flexibility.

The most striking finding overall, however, was the lack of differences between the two industries for all competitive priorities. Kuwaiti plants defined by industrial sector exhibited similar levels of focus on the five competitive priorities. Fierce competition faced by the two industrial sectors and the very limited local market may be behind the absence of the difference between the two sectors.

Finally, the study provides strong support for the significant positive correlation between several pairs of competitive priorities. Quality improvement, flexibility, and innovativeness are all positively correlated. This finding seems to be consistent with Ferdows and DeMeyers (1990) proposed sand cone model. They argue that quality improvement provides the basis for long-term improvement in other competitive priorities. Thus, compatibility between different competitive priorities will be more common between quality and each of the other priorities.

Additionally, the current study indicates that all pairs of cost reduction, flexibility, and innovativeness have significant levels of association. Again, compatibility is confirmed. The widespread growth of innovative managerial practices, such as JIT and TQM, and the use of advanced manufacturing technologies which have taken place in the last two decades helped to overcome some of these trade-offs. Most of these practices help manufacturers achieve multiple competitive priorities simultaneously.

Noticeably, on-time delivery is significantly correlated with quality improvement only. According to the cumulative models advocates, high quality enables plants to become more responsive to customer needs, more reliable in delivery and more efficient in their operations (New, 1997). In the current study, cost and quality have no significant correlation with each other. However, they are not nega-

tively correlated. Thus, any trade-off between these two priorities should not be concluded.

Ultimately, these results augment the development of a better contingency theory of plant competitive priorities to capture the complexity of different plant characteristics. This research, through investigating size and type of industry effects, is a step in that direction..

However, this research can be improved and extended in a number of ways. Due to the limitation of our data, employment was the only indicator of plant size. Total revenue and total assets could be used in future studies to verify or deny our findings. Using a better multidimensional construct in measuring the level of focus on each competitive priority represents another way of improving this study.

This study, like most studies on competitive priorities, employs responses from a single manager within each site. While this approach was criticized by some researchers in the field (Swink and Way, 1995; Boyer and Verma, 2000), it could be justified in relatively small plants. All surveyed plants in this study were "relatively small" in terms of employment, total sales, and total investments when compared with the surveyed samples in similar published field studies. Under this environment, it is valid to assume that the plant manager has a clear vision regarding the competitive priorities of his plant. However, this does not mean that the degree of strategic consensus within a plant is not important. The alignment of competitive priorities represents a needed and timely area of research. In addition, this study could be also extended to the development of strategic groups based on their competitive priorities. With a larger sample size, cluster analysis could be used to identify these groups.

References

Aczel, A. D. 1996. *Complete Business Statistics, Third Edition*. Boston, Massachusetts: Irwin/McGraw-hill.

Adam, Jr., E.E. and Swamidass, P. M.1989. Assessing operations management from a strategic perspective. *Journal of Management*, 15(2): 181-203.

Anderson, J. C., Cleveland, G., & Schroeder, R. G. 1989. Operations Strategy: A Literature Review. *Journal of Operations Management*, 8(2): 133-158.

Aranda, D. A. 2002. Relationship between operation strategy and size in engineering consulting firms. *Inter-*

national Journal of Service Industry Management, 13(3,4): 263-286.

Avella, L. 1999. Focal points in manufacturing strategic planning in Spain: Comparison with American and other European manufacturers. *International Journal of Production and Operations Management*, 19(12): 1292-1317.

Avella, L., Fernandez, E., & Vazquez, C. 1999. The large Spanish industrial company: Strategies of the most competitive factories. *Omega: International Journal of Management Science*, 27: 497-514.

Badri, M. A., Davis, D., & Davis, D. 2000. Operations strategy, environmental uncertainty and performance: A path analytic model of industries in developing countries. *Omega: International Journal of Management Science*, 28: 155-173.

Berry, W., Bozarth, C., Hill, T., & Klompmaker, J. 1991. Market segmentation analysis in formulating operations analysis. *Journal of Operations Management*, 10: 363-87.

Boyer, K. K. 1998. Longitudinal linkages between intended and realized operations strategies. *International Journal of Operations and Production Management,* 18(4): 356-373.

Boyer, K. K., & Lewis, M. W. 2002. Competitive priorities: Investigating the need for trade-offs in operations strategy. *Production and Operations Management*, 11 (1): 9-12.

Boyer, K. K., & Pagell, M.(2000. Measurement issues in empirical research: Improving measures of operations strategy and advanced manufacturing technology. *Journal of Operations Management*, 18: 361-374.

Boyer, K. K., & Verma, R. 2000. Multiple raters in survey-based operations management research: A review and tutorial. *Production and Operations Management*, 9(2): 128-140.

Buffa, E. S. 1984. *Meeting the Competitive Challenge*, Homeland, IL.: Irwin.

Chen, Wen-Hsien. 1999. The manufacturing strategy and competitive priority of SMEs in Taiwan: A case Survey. *Asia Pacific Journal of Management*, 16 (3): 331-349.

Christiansen, T., Berry, W., Bruuun, P., & Ward, P. 2003. A mapping of competitive priorities, manufacturing practices, and operational performance in groups of Danish manufacturing companies. *International Journal of Operations & Production Management*, 23(10): 1163-1183.

Danagyach, G. S., & Deshmukh, S. G. 2001. Manufacturing strategy: Literature review and some issues. *International Journal of Production and Operations Management,* 21(7): 884-932.

Danagyach, G. S., & Deshmukh, S. G. 2003. Evidence of manufacturing strategies in Indian industry: A survey. *International Journal of Production Economics*, 83(3): 279-298.

Ferdows, K., & DeMeyer, A. 1990. Lasting improvements in manufacturing performance: In search of a new theory. *Journal of Operations Management*, 9(2): 168-84.

Fine, C. H., & Hax, A.C. 1985. Manufacturing strategy: A methodology and an illustration, *Interfaces*, 15 (6): 28-46.

Flynn, B. B., Flynn, E. J., Filipini, R., Forza, C., Vinelli, A., & Schroeder, R. G. 1999. Configuration of compatible dimensions of competitive performance: An international analysis. *The Decision Science Institute International Conference Proceedings*, 1609-1611.

Gordan, J., & Sohal, A. S. 2001. Assessing manufacturing plant competitiveness: An empirical field study. *International Journal of Operations and Production Management*, 21(1,2): 233-253.

Hayes R. H., & Wheelwright, S. C. 1984. *Restoring our Competitive Edge*. New York, Wiley.

Kathuria, R. 2000. Competitive priorities and managerial performance: A taxonomy of small manufacturers. *Journal of Operations Management*, 18(6): 627-641.

Leong, G. K., Snyder, D. L., & Ward, P. T. 1990. Research in the process and content of manufacturing strategy. *Omega: International Journal of Management Science*, 18(2): 109-22

Mapes, J., New, C., & Szwejczewski, M. 1997. Performance trade-offs in manufacturing plants. *International Journal of Operations and Production Management*, 17(10): 1020-1033.

Mady, M. T. 1999. Privatization and manufacturing strategy: The unperceived relationship during the transition process in Egypt. *Accounting, Management & Insurance Review*, Faculty of Commerce, Cairo University, Egypt, 4: 181-209.

Miller, J. G., & Roth, A. V. Fall 1987 & Winter 1988. Manufacturing strategies. *Operations Management Review*, 6(1,2): 8-20.

Minor III, E. D., Hensley, R. L., & Wood Jr, D. 1994. A review of empirical manufacturing strategy studies. *International Journal of Operations & Production Management*, 14: 5-25.

Motwani, J., Jiang, J., and Kumar, A. 1998. A comparative analysis of manufacturing practices of small versus large West Michigan organizations.*Industrial Management and Data Systems*, 98(1): 8-11.

New, C. C. 1992. World class manufacturing versus trade offs. *International Journal of Operations and Production Management*, 12(4): 19-31.

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

Noble, M. A. 1997. Manufacturing competitive priorities and productivity: An empirical study. *International Journal of Operations & Production Management*, 17(1): 85-99.

Richardson, P., Taylor, A., & Gordon, J. 1985. A strategic approach to evaluating manufacturing performance. *Interfaces*, 15(6): 15-27.

Roth, A. V. and Miller, J. G. 1992. Success factors in manufacturing. *Business Horizon*, 35(4): 73-81.

Rich, P. 1992. The organizational taxonomy: Definition and design. *Acad-*

emy of Management Review, 17(4): 758-81.

Skinner, W. May-June,1969. Manufacturing - missing link in corporate strategy. *Harvard Business Review*, 136-45.

Skinner, W. 1985. *Manufacturing: The Formidable Competitive Weapon*. New York: Wiley.

Swamidass, P. M., & Newell, W. T. 1987. Manufacturing strategy, environmental uncertainty and performance: A Path analytical Model. *Management Science*, 33(4): 509-524.

Swink, M., & Way, M. H. 1995. Manufacturing Strategy: Propositions in current research, renewed direction. *International Journal of Operations & Production Management*, 15(7): 4-26.

Voelki, K. E., & Gerber, S. B. 1999. *Using SPSS for Windows: Data Analysis and Graphics*. New York, Springer.

Vickery, S. K., Droge, C., & Markland, R. R. 1993. Production competence and business strategy: Do they affect business performance? *Decision Sciences*, 24(2): 435-456.

Ward, P. T., McCreery, J. K., Ritzman, L. P., & Sharma, D. 1998. Competitive priorities in operations management. *Decision Sciences*, 29(4): 1035-1046.

Ward, P. T., Duray, R., Leong, G. K., & Sum, Chee-Chuong. 1995. Business environment, operations strategy, and performance: An empirical study of Singapore manufacturers. *Journal of Operations Management*, 13: 99-115.

Ward, P. T., Deborah J. B., & Leong, G. K. 1996. Configurations of manufacturing strategy, business strategy, environment and structure. *Journal of Management*, 22(4): 597-626.

Zhao, Xiande; Hoi, J.; Yeung, Y., & Zhou, Q. 2002. Competitive priorities of enterprises in mainland China. *Total Quality Management*, 13(3): 285-300.

الملخص

أثر حجم المصنع ونوع الصناعة على التوجهات الاستراتيجية التنافسية للشركات الصناعية الكويتية: دراسة ميدانية

محمد توفيق ماضي
جامعة الكويت

تتناول الدراسة توصيفاً لأولويات الاستراتيجية التنافسية التي مارستها المصانع الكويتية في قطاعي الصناعات الغذائية والتعدينية غير المعدنية خلال السنوات الثلاث السابقة. كذلك فإنها تختبر أثر كلٍّ من حجم المصنع ونوع الصناعة على درجة التركيز على تلك الأولويات، بالإضافة إلى تحليل درجة الارتباط بين تلك الاستراتيجيات لتعرُّف قدرة المصانع الكويتية على المواءمة Trade-off بين تلك الأولويات. وقد أوضحت نتائج الدراسة وجود فروق معنوية بين مجموعات الحجم المختلفة فيما يتعلق بإستراتيجيتي "التسليم في المواعيد" و "المرونة"، بينما لم تختلف تلك المجموعات بالنسبة لدرجة التركيز على "الجودة" و "التكاليف المنخفضة" و "الابتكار". أما فيما يتعلق بأثر نوع الصناعة، فقد أوضحت الدراسة عدم وجود تأثير معنوي لهذا المتغير على أي من الإستراتيجيات الخمس محل الدراسة. كما أوضحت علاقات الارتباط المعنوية الموجبة بين تلك الإستراتيجيات، مما يعني توجه المصانع الكويتية نحو الاعتماد على أكثر من إستراتيجية في وقت واحد، مما يدعم إلى حد كبير نموذج المواءمة Trade-off الذي يميل إليه الفكر الكلاسيكي في مجال إستراتيجيات الإنتاج.

M. Tawfik Mady (Ph. D., Louisiana State University, 1984) Former Professor of Operations Management, Alexandria University, Egypt. Associate Professor, Kuwait University. His research interests include Demand Forecasting, Productivity Measurement, Inventory Management, Manufacturing Strategy, TQM, Production Planning and IS in Operations. He has published in IJOPM, IMDS, IJF, AJAS, IJSOM, IJEIS.