An analysis of sources of competitiveness and performance of Chinese manufacturers

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Abstract *An exploratory model of competence and performance is presented and tested in the study. Competence in marketing, product innovation, manufacturing, and human resource development across a list of 42 items have been analyzed. Marketing competence was ranked high by Chinese managers. Elements contributed to manufacturing competence regarding process reengineering have not been emphasized as much by Chinese managers. Human resource competence, on the other hand, has been found to be significantly correlated with performance. The results clearly show a trend moving from the state-planned economy to the market economy.*

Introduction

Today, business managers have realized the importance of involving the whole organization in making strategic decisions in order to compete globally. A study by Porter (1990) showed that companies that achieved international leadership employed strategies that took advantage of their distinctive competencies. These competencies include designing new products, installing new production technologies, adapting training programs, using quality control techniques, and improving supplier relationships. Some innovations resulted from revolutionary changes in strategy, but others were a series of small, incremental changes.

Over time, the pattern of economic competition has changed. Traditionally, competition was static, and success or failure hinged on production factors. Modern competition is dynamic. More and more countries have joined the global economic competition. New technology, new products, new markets, and new management concepts are constantly emerging to change an industrial competitive advantage. Therefore, the impact of sources of competencies on organizational performance is still an empirical question of significance, especially when the concept is applied to the emerging economies.

Recently, China has emerged as a new economic power in the world market and is doing business with many nations. For example, Sino-US manufacturing cooperation and bilateral trade have developed rapidly during the past 15 years. The total value of bilateral trade in 1994 amounted to $35.43 billion, an increase of about 14 times that of 1979 (Chen, 1996). However, some issues in Sino-US business cooperation have arisen in recent years, including a lack of understanding of the Chinese business environment and Chinese managers'

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decisions and practices. To date, there are few studies that have been devoted to the analysis of marketing, product innovation, manufacturing, and human resource decisions adopted by Chinese manufacturers. Responding to the need for a greater understanding, this research aims at investigating the sources of competitiveness and performance of manufacturers in the context of the Chinese business environment using empirical data.

Background

Companies must be competitive to sell their goods and services in the market place. Market competitiveness based on a firm's internal competence determines whether the firm prospers, barely gets by, or fails (Corbett and Wassenhove, 1993). A customer-driven manufacturing capability development focus reflects a clear understanding of the long-term goals of the organization and a cross-functional effort between marketing and operations to follow the needs of the market place and translate those needs into desirable capabilities. Therefore internal competence is the corner stone for a business to compete successfully in the market place (Corbett and Wassenhove, 1993).

Previous research has tended to study the impact of one business functional area competence on a firm's overall performance (Capon *et al.*, 1990; Drucker, 1973; Ettlie, 1997; Hayes and Wheelwright, 1984; Tunalv, 1992). Recent studies show that only when a firm can concert its functional area competencies can it be more competitive on the market place (Evans and Lindsay, 1996; Hill and Jones, 1989; Porter, 1990). Therefore, we have, in this paper, integrated several functional areas to examine the relationship between sources of competencies and performance.

We first argue that competencies in marketing, product innovation, manufacturing, and human resource development are sources of competencies of a manufacturing firm. We choose these four functional areas because they have long been hypothesized to be vital factors that positively contribute to corporate performance (Droge *et al.,* 1994). For example, Drucker (1973) argued that marketing and innovation were essential competencies of a firm. Capon *et al.* (1990) suggested that a firm's profitability was particularly sensitive to product innovation and market development. Researchers (Hayes and Wheelwright, 1984; Skinner, 1969, 1985; Tunalv, 1992) have either hypothesized or used field data to illustrate the importance of manufacturing function of a firm. Recently, human resource has been recognized as a key competency to serve customers and increase market shares (Deming, 1986; Evans and Lindsay, 1996; Simerly, 1997).

Based on the literature in the manufacturing, product innovation, marketing, and human resource areas (Clark, 1982; Conant *et al.*, 1990; Craig and Douglas, 1982; Droge *et al.,* 1994; Evans and Lindsay, 1996; Hayes and Wheelwright, 1984; Porter, 1980, 1985; Simerly, 1997; Tunalv, 1992), a comprehensive list of 42 competency items was developed. The 42 competency items were viewed as potential strategic abilities that a firm would like to acquire, sustain, or improve on with the objective of improving market share and financial performance. The overall research hypothesis is that marketing, product

innovation, manufacturing, and human resource development will individually or jointly affect performance (Figure 1). Each construct used in the study is discussed below.

Marketing

In marketing, the Profit Impact of Market Strategy (PIMS) program and its associated database results in a comprehensive finding on the determinants of performance, which includes the effect of marketing promotion and product quality on market share and return on investment (Droge *et al.,* 1994). Literature concerning marketing and production interface shows that one key to success in developing a firm's competencies is to understand what the customer wants and how to provide it better than the competitor does (Conant *et al.,* 1990; Hill, 1994; Hill and Jones, 1989; Krajewski and Ritzman, 1996). Emphasizing responsiveness, meeting the customer's needs through providing pre-sale, transactional, and post-sale services can improve sales volume and financial performance (Conant *et al.,* 1990; Hill, 1994; Hill and Jones, 1989; Krajewski and Ritzman, 1996).

Product design and development

Product design and development are considered as innovation capabilities. While the measurement of new product success or failure is multi-dimensional, many studies in the product innovation literature have suggested that innovation has a significant impact on a firm's overall performance, such as profitability or revenue growth (Calantone and di Benedetto, 1990; Ettlie, 1997; Hayes and Wheelwright, 1984). A recent study (Ettlie, 1997) empirically tested several key success factors of new products design and development. These factors include market need understanding, early mover strategy, and integrated design practices. In his landmark study of *The Competitive Advantage of Nations*, Porter highlighted the strategic importance of innovation to Japanese industry (Porter, 1990, p. 48). The question pertaining to

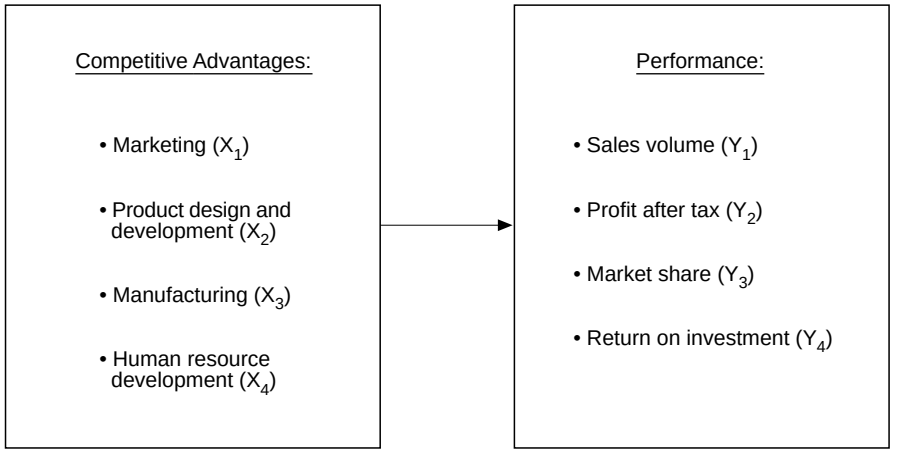

Figure 1.
Competitive advantages and performance

how important product lines compete in the market place has included two dimensions: rapid new product introduction; and improvement of the existing products (Ettlie, 1997; Porter, 1980, 1990).

Manufacturing

The major theme of manufacturing competencies described in the literature is manufacturers' choice of emphasis among key tasks (Hayes and Wheelwright, 1984; Hill, 1994; Krajewski and Ritzman, 1996). These tasks include materials management, production planning and control, capacity management, etc. (Hayes and Wheelwright, 1984; Hill, 1994; Krajewski and Ritzman, 1996). Materials management concerns suppliers, inventories, production level, staffing patterns, and distribution. Decisions in these areas affect the entire organization, either directly or indirectly. Production planning and control, on the other hand, focus on planning, scheduling, process quality control, production cost reduction, etc. (Krajewski and Ritzman, 1996). An appropriate capacity level and good capacity management enable a firm to meet current and future demand and seize opportunities for growth and profits.

Human resource

The most valuable resource any organization has is its employees (Evans and Lindsay, 1996; Simerly, 1997). Better or superior economic performance require greater organizational efficiencies in order to achieve global competitiveness (Simerly, 1997). A plant can be much more competitive if it gives its employees more latitude in the operations of the plant (Evans and Lindsay, 1996; Hill, 1994; Simerly, 1997). Many global competitors, such as Singapore and Switzerland, have few natural resources, and have used the same technologies as the USA. They have been forced to develop their competitive edge primarily through human resource development and have proven to be successful (Porter, 1990). The human resource is the only competence that competitors can not replicate (Evans and Lindsay, 1996). Employee empowerment, job enlargement, labor-management relationship improvement, and performance measure criteria development were considered elements of human resource development (Evans and Lindsay, 1996; Simerly, 1997).

Performance

A company's market share and financial performance are vital to a company's existence. It was reported that above average financial performance was associated with above average emphasis on a wide variety of operational competencies (Droge *et al.,* 1994). The measures of performance of this study include sales volume, profit after tax, market share, and return on investment (ROI). The performance data are self-reported changes in the above mentioned areas. These measures have been used in published literature (Clark, 1982; Hill and Jones, 1989; Nobel, 1995). ROI and profit after tax are consistent with historic emphasis on manufacturing's contribution to cost-oriented goals. Manufacturing costs have substantial impact on ROI by virtue of their inclusion in the cost of goods sold figures in a profit and loss statement (Clark,

1982; Hill and Jones, 1989). Additionally, those "first to market" firms have an advantage in capturing a larger market share, which can positively affect a firm's revenue.

Given the wide variation in definitions and usage of the concepts in the literature, the competency constructs suggested in this study are just one of many ways that can be applied to capture the overall thrust of competitive sources. We selected these 42 items in accordance with the literature and the results of personal interviews with Chinese managers. The data collected from a large sample of Chinese managers does offer face validity and generalizable insights.

Research methodology and hypotheses

Data

A sample of 300 Chinese manufacturing firms were contacted. Table I shows the breakdown of the respondents categorized by number of employees, ownership, and industry. Respondents were asked to fill out the research instrument (see Table IIaand Table IIb) regarding competitive priorities and performance. A total of 72 companies responded. The response rate was 24 percent.

Questions related to the sources of competencies and performance are based on a five-point Likert scale. The instrument was validated in advance through several personal interviews with Chinese managers on site. A total of 42

Number of employees	*N*	Per cent	Cumulative per cent
Number of employees			
Less than 100	6	13	13
100 to < 1,000	15	21	34
1,000 to < 2,000	17	24	58
2,000 to < 3,000	14	19	77
over 3,000	13	18	95
Did not report	4	5	100
Ownership			
State owned	52	72	72
Non-state owned	20	28	100
Industry			
Textile	26	36	36
Machinery and tools	7	10	46
Consumer goods	18	25	71
Electronics	10	14	85
Construction materials	1	1	86
Metal	1	1	87
Chemical	2	3	90
Parmaceutical	3	4	94
Service[a]	3	4	99
Did not report[a]	1	1	100

Note: [a] Dropped from the analysis

Table I.
Plant factor analysis

competency items in four functional areas (marketing, product design and development, manufacturing, and human resource development) are listed in Table II. The plant managers were asked to rate the importance of competencies with end points from "no emphasis" (equals 1) to "extreme emphasis" (equals 5).

Business performance was evaluated along the following dimensions:

Item	Rank (mean)
1. Marketing (MKT)	
Enhance company's reputation	4.191
Establish brand name	3.897
Establish competitive price	3.750
Develop new promotion methods	3.471
Improve pre-sale service	3.470
Develop special markets	3.441
Improve transactional service	3.397
Improve post-sale service	3.397
2. Product design and development (PDD)	
Develop new product or services	3.926
Improve existing products or services	3.559
Reduce new product development lead time	3.088
Improve product durability	2.765
3. Manufacturing (MFG)	
Materials management	
Reduce inventory level	3.735
Improve vendor's quality	3.618
Reduce number of vendors	2.794
Purchase parts	2.662
Standardize number of parts used for manufacturing	2.279
Manufacturing parts in house	2.103
Product planning and control	
Improve manufacturing process quality control	3.941
Deliver customer's order on time	3.882
Reduce production, material and overhead cost	3.838
Improve delivery reliability	3.662
Reduce production rework rate	3.412
Improve delivery speed	3.397
Reduce production scrap rate	3.294
Realize product mix flexibility	3.279
Realize size flexibility	2.706
Outsource non-manufacturing tasks	1.882
Capacity management	
Effectively schedule early/late and large/small jobs	3.559
Improve capacity utilization	3.412
Effectively arrange set-up schedules	3.235
Expand production capacity	3.206
Reduce machine set-up time and material	2.691

(continued)

Table II.
Means and rank orders for the competitive advantage scores by area

Item	Rank (mean)
4. Infrastructure development (HMN)	
Employee empowerment	
Improve employee's responsibility	3.779
Improve employee's quality control responsibility	3.779
Improve employee's task flexibility	3.265
Job enlargement	
Increase professional training for managers	3.309
Increase job training for workers	3.162
Increase employee's autonomy in performing their jobs	3.059
Labor-management relationship improvement	
Enhance employee-management relationship	3.235
Improve labor relationships	2.941
Performance measure criteria development	
Establish compensation and recognition systems based on performance	3.721
Establish manual of production procedures and work rules	3.544

Table II.

- sales revenues;
- profit after tax;
- market share; and
- return on investment.

It is important to have different business performance measures because firms' emphases are different (Droge *et al.,* 1994). The performance items were ranked from "dramatically decreased" (equals 1) to "dramatically increased" (equals 5).

Analysis

The analysis phase includes two parts. First, the results from descriptive statistics were analyzed to illustrate the importance of competitive sources. Then, the relationships between competitive sources and performance were tested using correlation and regression analysis (Droge *et al.,* 1994). Regression relates a factor or factors to a specific outcome (Aczel, 1996). For each performance factor, the technique of least-squares was used to estimate the simple regression coefficient (b_i) in an equation of the form:

$$\text{Performance} = b_{01} + b_1 X_1 (\text{MKT}) + u_1 \quad (1)$$

$$\text{Performance} = b_{02} + b_2 X_2 (\text{PDD}) + u_2 \quad (2)$$

$$\text{Performance} = b_{03} + b_3 X_3 (\text{MFG}) + u_3 \quad (3)$$

$$\text{Performance} = b_{04} + b_4 X_4 (\text{HMN}) + u_4 \quad (4)$$

The least square technique was also applied to estimate the multiple regression coefficients (b_i) in an equation of the form:

$$\text{Performance} = b_{05} + b_1 X_1 (\text{MKT}) + b_2 X_2 (\text{PDD}) + b_3 X_3 (\text{MFG})$$

$+ b_4 X_4$ (HMN) + u_5(5)

where u denotes a random disturbance term. The regression coefficient (b_i) represents the expected change in the performance indicator associated with one-unit change in the ith independent variable, i.e. competitive sources.

Figure 1 illustrates the proposed model for Sources of Competitiveness and Performance. Sources of competitiveness, i.e. competence areas, studied in this research are listed in the box on the left-hand side. The box on the right-hand side contains performance measures, which are affected by sources of competitiveness.

The hypotheses were developed according to the Sources of Competitiveness and Performance Model presented in Figure 1 and will be tested in the next section. The hypotheses presented here are alternative hypotheses. The first four hypotheses test the relationship between individual competency area and performance outcome. We hypothesize that competencies have an influence on a firm's performance.

H1: Marketing capability (X_1, MKT) positively relates to performance outcome.

H2: Product design and development capability (X_2, PDD) positively relates to performance outcomes.

H3: Manufacturing capability (X_3, MFG) positively relates to performance outcomes.

H4: Human resource capability (X_4, HMN) positively relates to performance outcomes.

H5: deals with the joint influence of the four competencies on performance. We expected to find statistically significant support for the following hypothesis.

H5: Marketing capability (X_1, MKT), product innovation capability (X_2, PDD), manufacturing capability (X_3, MFG), and human resource capability (X_4, HMN) jointly lead to performance outcomes.

Results

Sources of competitiveness

The sources of competitiveness are described in four areas. The means and rank orders for the importance ratings of the 42 competitive priorities are given in Tables II and III. Table II ranks the importance by each competence area and Tables III provides an overall ranking including all 42 items. There was a considerable degree of consensus in the sample concerning the importance of the top five items in the four competence areas. This suggests that firms tend to perform better on items viewed as most important.

Two out of the five most important items are in the marketing area, regarding product reputation and brand name (Table III). The mean for company's product reputation is 4.191 out of the maximum value of five and the mean for brand name establishment is 3.897. These results indicate a change of competency focus in the Chinese manufacturing industries. In the

Item	Major area	Rank by mean
Enhance company's product reputation	MKT	4.191
Improve manufacturing process quality control	MFG	3.941
Develop new product or services	PDD	3.926
Establish brand name	MKT	3.897
Deliver customer's orders on time	MFG	3.882
Reduce production, material and overhead cost	MFG	3.838
Improve employee's responsibility	HMN	3.779
Improve employee's quality control responsibility	HMN	3.779
Establish competitive price	MKT	3.750
Reduce inventory level	MFLG	3.735
Establish compensation and recognition systems based on performance	HMN	3.721
Improve delivery reliability	MFG	3.662
Improve vendor's quality	MFG	3.618
Improve existing products or services	PDD	3.559
Establish manual of production procedures and work rules	HMN	3.544
Develop new promotion methods	MKT	3.471
Improve pre-sale service	MKT	3.470
Develop special markets	MKT	3.441
Reduce production rework rate	MFG	3.412
Improve delivery speed	MFG	3.397
Improve transactional service	MKT	3.397
Improve post-sale service	MKT	3.397
Effectively schedule early/late and large/small jobs	MFG	3.559
Improve capacity utilization	MFG	3.412
Increase professional training for managers	HMN	3.309
Reduce production scrap rate	MFG	3.294
Realize product mix flexibility	MFG	3.279
Improve employee's task flexibility	HMN	3.265
Effectively arrange set up schedules	HMN	3.235
Enhance employee-management relationship	HMN	3.235
Expand production capacity	MFG	3.206
Increase job training for workers	HMN	3.162
Reduce new product development lead time	PDD	3.088
Increase employee's autonomy in performing their jobs	HMN	3.059
Improve labor relationships	HMN	2.941
Reduce number of vendors	MFG	2.794
Improve product durability	MFG	2.765
Realize size flexibility	MFG	2.706
Reduce machine set up time and material	MFG	2.691
Purchase parts and components	MFG	2.662
Standardize parts and components used for manufacturing	MFG	2.279
Manufacturing parts and components in house	MFG	2.103

Table III.
Means and rank orders of competitive advantages scores

past, under the state-planned economy, Chinese manufacturers were reluctant to enhance their product reputation and establish their own brand name because their products would be sold according to the plan (Byrd, 1992). There

was not much competition in the market place. Now, under the economic reform, Chinese manufacturers are aware of the importance of quality products and brand names for the sake of the very existence of the company.

Another two of the five top items are in the manufacturing competency area: improving manufacturing process quality control (with a mean of 3.941) and delivering customers' order on time (with a mean of 3.882). Quality has gained more attention from Chinese manufacturers now than it had a few years ago. A study on quality management in China (Zhao *et al.,* 1995) reported that the sample of Chinese workers studied was not current in modern quality philosophies and quality management techniques. The results of our study indicate that there is a change of emphasis on quality management in Chinese manufacturing firms. This reflects the market requirement for quality products.

The three least emphasized competence items were in the manufacturing materials management area: purchasing parts and components (with a mean of 2.662); standardizing parts used for manufacturing (with a mean of 2.279); and manufacturing parts and components in house (with a mean of 2.103). Purchasing or making parts and components in-house are strategic alternatives that can help a manufacturing firm reshape or rebuild the business. A possible reason for not emphasizing the make or buy decision is that these elements have not appeared to be as urgently required by customers as compared to the product reputation and brand name. In the past, the state-planned economy was in favor of full-scaled organizations including all production process and tasks. However, the business environment has now changed in China. Large state-owned Chinese firms are now facing low productivity, low or negative profit margins, and are willing to trim the organizational size to meet the competition (Chao, 1997; Cheng, 1997).

Correlation of competitive sources and performance

The means and standard deviations for MKT, PDD, MFG, HMN and for the four performance measures are shown in Tables IV, V and VI. The mean overall performance measures are all slightly higher than the mid point of 2.5. This reflects a positive growth in business of Chinese manufacturers in the changing economic environment.

Competencies	Mean	Standard deviation	Correlation with X_1	X_2	X_3	X_4
X_1 (MKT)	29.0	6.91	1.000			
X_2 (PDD)	13.34	3.95	0.48*	1.000		
X_3 (MFG)	64.71	14.49	0.50*	0.68*	1.000	
X_4 (HMN)	43.53	13.01	0.60*	0.49*	0.58*	1.000

Notes: * Significant at 0.01

Table IV.
Descriptive statistics and correlation for competencies

Correlations are shown in the table. As seen in Table IV, MKT, PDD, MFG, and HMN are significantly correlated with each other at a significant level of $p < 0.01$ or better. Table V shows that all performance measures correlate with one another at less than $p < 0.01$ significant level. Table VI shows the correlations of MKT, PDD, MFG, and HMN with the four performance measures. The wide range of correlation for the competitive sources and performance measures (from 0.06 to 0.45) supports our use of multiple performance measures. It appears that profit after tax is not significantly correlated with product innovation and manufacturing capability building. The rationale is that developing new products and improving manufacturing capability require investment, which affects profit after tax. However, these investments may have long-term benefits for the company. Emphasizing human resource development positively contributes to profit after tax. These results are consistent with the result for a study of a group of manufacturing firms from the *Fortune 500* (Simerly, 1997).

Results from regression analysis

Two types of regression models were analyzed. Simple regression models with four competency areas as independent variables (MKT, PDD, MFG, and HMN) and four performance factors as dependent variables were first conducted. In all, 16 simple regression models were run individually. Then, a multiple regression model with MKT, PDD, MFG, and HMN as independent variables was run for each performance factor. A total of four multiple regression models were run.

Competencies	Mean	Standard deviation	Correlation with Y_1	Y_2	Y_3	Y_4
Y_1 (sales revenue)	3.41	1.17	1.000			
Y_2 (profit after tax)	3.16	1.23	0.79*	1.000		
Y_3 (market share)	3.14	0.93	0.77*	0.65*	1.000	
Y_4 (ROI)	2.88	0.98	0.70*	0.64*	0.65*	1.000

Notes: * Significant at 0.01

Table V. Descriptive statistics and correlation for performance

Competencies	Correlation with X_1 (MKT)	X_2 (PDD)	X_3 (MFG)	X_4 (HMN)
Y_1 (sales revenue)	0.35*	0.23**	0.35*	0.26**
Y_2 (profit after tax)	0.20***	0.06	0.16	0.23**
Y_3 (market share)	0.31*	0.15	0.28**	0.27**
Y_4 (ROI)	0.45*	0.30*	0.45*	0.42*

Notes: * Significant at 0.01; ** Significant at 0.05; *** Significant at 0.10

Table VI. Correlation for competencies and performance

The results of the simple regression for each of the competence area (MKT, PDD, MFG, and HMN) as independent variables are given in Tables VII to X. Tables VII to X show the model R^2, the two-tail p-value for the significance of beta (or the regression model itself), the intercept estimate, and both the unstandardized and standardized slope (beta) estimate. All the intercept estimates were significant at less than 0.01 level. The magnitude of the slope estimates appears small. However, the results must be put into perspective. The overall performance measure ranges from 1 to 5, while X_1 (MKT) ranges from 8 to 40 (the sum of all elements of the construct), X_2 (PDD) ranges from 4 to 20, X_3 (MFG) ranges from 22 to 91, and X_4 (HMN) ranges from 13 to 65.

The simple regression results show that emphasizing MKT will have a positive impact on all four performance measures at $p < 0.05$ (Table VII). PDD does not appear to be a strong predictor of performance (Table VIII). Product innovation is not significantly related to profit after tax or market share growth. MFG (Table IX), on the other hand, is strongly correlated with sales volume, market share growth, and return on investment, but does not have a significant predictive relationship with profit after tax. HMN is significantly

Table VII.
Simple regression results of marketing advantage (X_1) as independent variable

Variable	Model R^2	Intercept	β for X_1 Unstandard	Standard
Y_1 (sales volume)	0.13*	1.649*	0.061	0.357
Y_2 (profit after tax)	0.06**	1.940*	0.042	0.236
Y_3 (market share)	0.13*	1.771*	0.047	0.351
Y_4 (ROI)	0.07**	1.812*	0.037	0.259

Notes: * Significant at 0.01; ** Significant at 0.05

Table VIII.
Simple regression results of product design and development (X_2) as independent variable

Variable	Model R^2	Intercept	β for X_2 Unstandard	Standard
Y_1 (sales volume)	0.04***	2.877*	0.021	0.068
Y_2 (profit after tax)	0.01	1.940*	0.042	0.236
Y_3 (market share)	0.03	2.629*	0.039	0.164
Y_4 (ROI)	0.06**	2.096*	0.059	0.236

Notes: * Significant at 0.01; ** Significant at 0.05; *** Significant at 0.10

Table IX.
Simple regression results of manufacturing (X_3) as independent variable

Variable	Model R^2	Intercept	β for X_3 Unstandard	Standard
Y_1 (sales volume)	0.10*	1.770*	0.025	0.313
Y_2 (profit after tax)	0.03	2.301*	0.013	0.156
Y_3 (market share)	0.08**	1.962*	0.019	0.284
Y_4 (ROI)	0.08**	1.662*	0.019	0.277

Notes: * Significant at 0.01; ** Significant at 0.05

correlated with all four performance indicators (Table X), with a p-value of at least $p < 0.05$. Thus on an individual basis, all four competencies are important determinants of at least some measures of overall business performance. This result not only supports the predictive validity of our operational definition of competency, but also is consistent with the literature cited earlier (Clark, 1982; Droge *et al.*, 1994; Evans and Lindsay, 1996; Nobel, 1995; Simerly, 1977).

The multiple regression analysis used MKT, PDD, MFG, and HMN as independent variables and the four performance variables as dependent variables. The model was run four times with each performance variable as the dependent variable at a time. The results are given in Table XI, which lists the model R_2, the model p-value, the parameters (betas) for the independent variables and the intercept. The multiple regression models with dependent variables, sales volume, market share growth, and ROI, are all significant at $p < 0.05$. The result shows that emphasizing human resource development through empowering employees and establishing appropriate compensation and recognition systems will positively affect a firm's financial performance. In the past, under the state-planned economy, compensation was not based on performance. The results of the regression analysis suggested that the days of "eating from the big pot" (meaning everyone would get same amount of food no matter how well he/she performed) have gone.

In summary, all five hypotheses have been supported by the results of the statistical analysis. Examining the 20 regression models of business performance as a set, a couple of conclusions can tentatively be drawn. First, all four competencies – marketing, product innovation, manufacturing, and human resource development – have played significant roles in determining

Variable	Model R^2	Intercept	β for X_4 Unstandard	Standard
Y_1 (sales volume)	0.21*	1.627*	0.041	0.454
Y_2 (profit after tax)	0.09**	1.902*	0.029	0.306
Y_3 (market share)	0.21*	1.736*	0.032	0.451
Y_4 (ROI)	0.18*	1.496*	0.032	0.421

Notes: * Significant at 0.01; ** Significant at 0.05

Table X. Simple regression results of human resources (X_4) as independent variable

Variable	Model R^2	Intercept	β for X_1	X_2	X_3	X_4
Y_1 (sales volume)	0.23*	1.17**	0.024	–0.038	0.009	0.033**
Y_2 (profit after tax)	0.11***	1.80**	0.021	–0.048	0.003	0.027***
Y_3 (market share)	0.23*	1.465*	0.020	–0.039	0.006	0.028**
Y_4 (ROI)	0.18**	1.376*	–0.001	0.005	0.003	0.030**

Notes: * Significant at 0.01; ** Significant at 0.05; *** Significant at 0.10

Table XI. Multiple regression results

sales volume, profit after tax, market share, and return on investment. Second, either alone or in tandem with other independent variables, human resource development has appeared to be the most critical competency in today's business environment in China.

Discussion

Determinants of competitive sources

In this research 42 competitive items were rated according to their importance. The results suggest that more important items tend to engender more attention from plant managers than less important items. Product reputation and brand name have been emphasized most by Chinese managers. This result is consistent with the findings in the previous literature (Hill, 1994) and reflects the demands of customers in the changing business environment in China. Before the economic reform, managers' top concern was to implement the production plans determined by the government. Now companies need to build their own reputation in order to gain market share and improve profit margin. The results provide a strong indication of the importance of marketing competency in the journey to the market economy.

Quality management has gained enormous attention from Chinese managers. This result is consistent with the study from other nations (Evans and Lindsay, 1996; Nobel, 1995). Quality management and delivering customers' order on time were highly emphasized by Chinese managers. A solid quality foundation serves as the basis for other sources of competitive advantages, such as cost efficiency and delivery (Nobel, 1995). Striving for higher quality leads to higher materials yield and less rework and scrap. Reducing rework and scrap, in turn, contributes to on-time delivery. Thus, an accomplishment in higher manufacturing process quality is a positive indicator for manufacturing competency.

Manufacturing process reengineering, regarding developing core tasks and outsourcing non-core tasks, has not yet gained as much emphasis from Chinese managers as product reputation. This, however, does not mean it is a neglected topic in China. On the contrary, manufacturing process reengineering (which is phrased as "reform the industry structure" in the Chinese language) is a frequent topic in the most recent Chinese media reports (Chao, 1997). It may take time for the managers to implement the issue at the business unit level. Infrastructure development requires time and investment and sometimes takes decades to implement (Skinner, 1969, 1985). Hill (1994) stresses that production planning controls, procedures, and systems are important components of infrastructure. Determining core tasks and outsourcing less important tasks in the transition from the pure state-planned economy to a market economy or a combination of state-planned economy and market economy is an important future research topic.

Determinants of performance

The results from simple linear regression analysis indicate that emphasizing marketing and human resource development positively relate to every measure of performance, followed by manufacturing and product innovation competence. The most interesting finding from the multiple regression analysis is the effects of human resource competence on performance. It was reported in the literature that manufacturing focus alone would not directly affect performance because production decisions were only one part of an overall business strategy (Wathen, 1995). On the other hand, no organization could survive without good people (Deming, 1986). Job enlargement, employee empowerment, and compensation system seem to motivate Chinese employees in every functional area to perform at their best and contribute to the overall growth of the company. Porter (1985, 1990) suggested that the ability to upgrade existing industries would require a stronger and better-trained human resource foundation. The old paradigm was that the manufacturing process needed to be controlled externally to be productive, and managers had to control carefully what people did. The new paradigm is that people design and improve the process, and managers must obtain the commitment of people to design, control, and improve manufacturing processes.

Conclusions

This study has presented an exploratory model of sources of competitiveness and performance. We analyzed competence in marketing, product innovation, manufacturing, and human resource developments across a list of 42 items.

We tested the general hypothesis that sources of competitiveness affect a firm's performance. Emphasizing marketing competence was highly ranked by Chinese managers. On the other hand, elements contributing to manufacturing competence regarding process reengineering were not emphasized as much by Chinese managers. Human resource competence was found to be significantly correlated with performance. The data suggest that competing on the basis of multiple competencies is associated with higher performance.

For managers, this study provides several important implications. By building on the work of previous studies conducted in the industrialized countries, this study helps to provide a better understanding of manufacturing competence emphasis in a changing business environment, and to flesh out what manufacturing strategy means for Chinese manufacturers. The results underscore the importance of human resource development – the basis of all functional area competencies. Manufacturers can no longer be comfortable competing on the basis of one or two functional area competencies. The global market requires that manufacturers have multiple competencies.

There are a number of directions in which this research can be extended. First, identify why one functional area competence is more important than another in the same business environment. Second, investigate the effects of Chinese business environment and enterprise ownership on the choice of competitive priorities and performance. Third, compare the manufacturing

strategy of industrialized countries (such as US and UK), four dragon tail countries (Hong Kong, South Korea, Singapore, and Taiwan), and the developing economies (such as China, Malaysia, and Mexico). The comparison can be conducted to gain deeper insight about global economic competition and cooperation.

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