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# Analyzing and Evaluating Some Factors to Affect to Taiwanese Steel Industry

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## *Abstract*

*The current development makes Taiwan promote their focus and interest to invest more on heavy industries in which steel industry plays the central part of the development. Until recent years, the costs of raw materials, product competition, and other factors have affected the business performance of the steel industry in Taiwan. In this study, we established a research model to investigate the influence of the organizational capabilities of Taiwan's steel industry on manufacturing strategy and business performance, the influence of manufacturing strategy on business performance, and the influence of organizational capabilities on business performance through the mediating effect of manufacturing strategy in the research model. Questionnaires were adapted to collect data, which was analyzed using structural equation modeling (SEM). The empirical results indicate that organizational capabilities positively influence manufacturing strategy and business performance. Manufacturing strategy positively influences business performance. Simultaneously, organizational capabilities significantly influence business performance through the mediating effect of manufacturing strategy. Therefore, this study verifies empirically that improvements in organizational capabilities have the most critical influence on improving manufacturing strategy and business performance. We recommend that steel companies in Taiwan strengthen their organizational capabilities to set manufacturing strategies for increasing business performance.*

JEL code: L23; M51; P23; C12; C90

Keywords: Taiwanese, Organizational capabilities, Manufacturing strategy, Business performance

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## 1. Introduction

The most fundamental purpose of enterprise management is to create business performance for the organization and pursue goals to obtain operating income. When enterprises have strong internal organizational capabilities, they can create business performance through the development and use of strategies. Helfat and Peteraf (2003) stated that organizational capabilities are the capabilities to use, execute, and coordinate resources to achieve organizational goals. Stalk and Sgulman (1992) indicated that established organizational capabilities are not easily imitated but have higher value. Lewis et al. (2009) held that effective strategic management could significantly influence overall team performance. Aaker and

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Mascarenhas (1984) stated that enterprises with superior organizational flexibility are able to adjust their organizational capabilities and internal allocations of resources quickly to gain better operational performance within rapidly changing industry environments. Amoako-Gyampah and Acquaah (2008) found that the direct, indirect, and overall effects of the four dimensions of manufacturing strategy (delivery, flexibility, cost, and quality) influence business performance

The steel industry in Taiwan has grown along with the Taiwanese economy. Improvements in infrastructure and the rise of related industries have resulted in a cluster effect. The upstream, midstream, and downstream segments of the industry chain are closely connected. This has simultaneously driven the flourishing development of plastic products, transportation vehicles, and mechanical equipment (Wang et al., 2015). However, with the trend of economic recovery in steel, mainland China's steel industry has also begun mass production. With China's overheated economy, steel products from mainland China have been marketed internationally with low prices, damaging market conditions and creating substantial competitive pressure for Taiwan's steel industry. Additionally, the land and labor costs of Taiwan's steel industry are relatively high in comparison to other emerging countries. At the same time, the industry faces increases in the price of raw materials, such as iron ore. This has increased the operating costs of steel businesses in Taiwan.

Taiwan is an island economy. It lacks resources in itself and relies on imports for all raw materials, particularly for the foundational steel industry. Additionally, the steel industry is a capital- and technology-intensive industry. It requires substantial capital, long plant construction time, and sophisticated equipment and technologies. Production flexibility is low, payback periods are long, and energy consumption ratios are high (Nguyen and Tran, 2015).

The development of Taiwan's steel industry was transformed in 1973. That year, the government began to promote its Ten Major Infrastructure Projects for economic development. Much of Taiwan's public infrastructure, such as roads, harbors, airports, and power plants, were in poor condition. In addition, the first oil crisis occurred in October 1973, and the resulting global economic downturn affected Taiwan. To improve Taiwan's overall economic development, the Ten Major Infrastructure Projects were conducted. Among these projects, "major steelworks" were intended to prevent Taiwan's dependence on foreign steel products, reduce the foreign exchange burden, and solve the effects of the inconsistency in steel sources on the precision of products. Thus, the government decided to construct a continuously operating steelworks and established "China Steel Corporation". Taiwan's steel industry currently possesses complete upstream, midstream, and downstream systems. Structural development is quite thorough. Figure 1 shows an association graph of the steel industry in Taiwan (Nguyen et al., 2015). The associations of the steel industry in Taiwan include construction, transportation vehicles (automobiles, motorcycles, bicycles, ships), metal products (screws, hand tools, hardware), industrial machinery, and electrical and electronic machinery (home appliances, motors, personal computers, electronic components).

The steel industry in Taiwan experienced oil crises and financial turmoil in a period of economic. The steel industry in Taiwan experienced oil crises and financial turmoil in a period of economic downturn between 1990 and 2001. The global steel market has gradually recovered since that time. Since 2002, this recovery has been rapid, driven primarily by the increase in steel demand for mainland China's economic development. International steel prices rallied, and numerous steel businesses in Taiwan gained substantial revenue and profits. Demand and prices reached new heights in 2004. In recent years, as the global steel economy has recovered, steel production capacity in mainland China has also increased. Mainland Chinese steel products have been exported abroad, damaging the market with low prices. This combined with increases in raw material prices has resulted in massive competitive pressure for Taiwan's steel businesses (Thanh-Tuyen and Nguyen, 2016).

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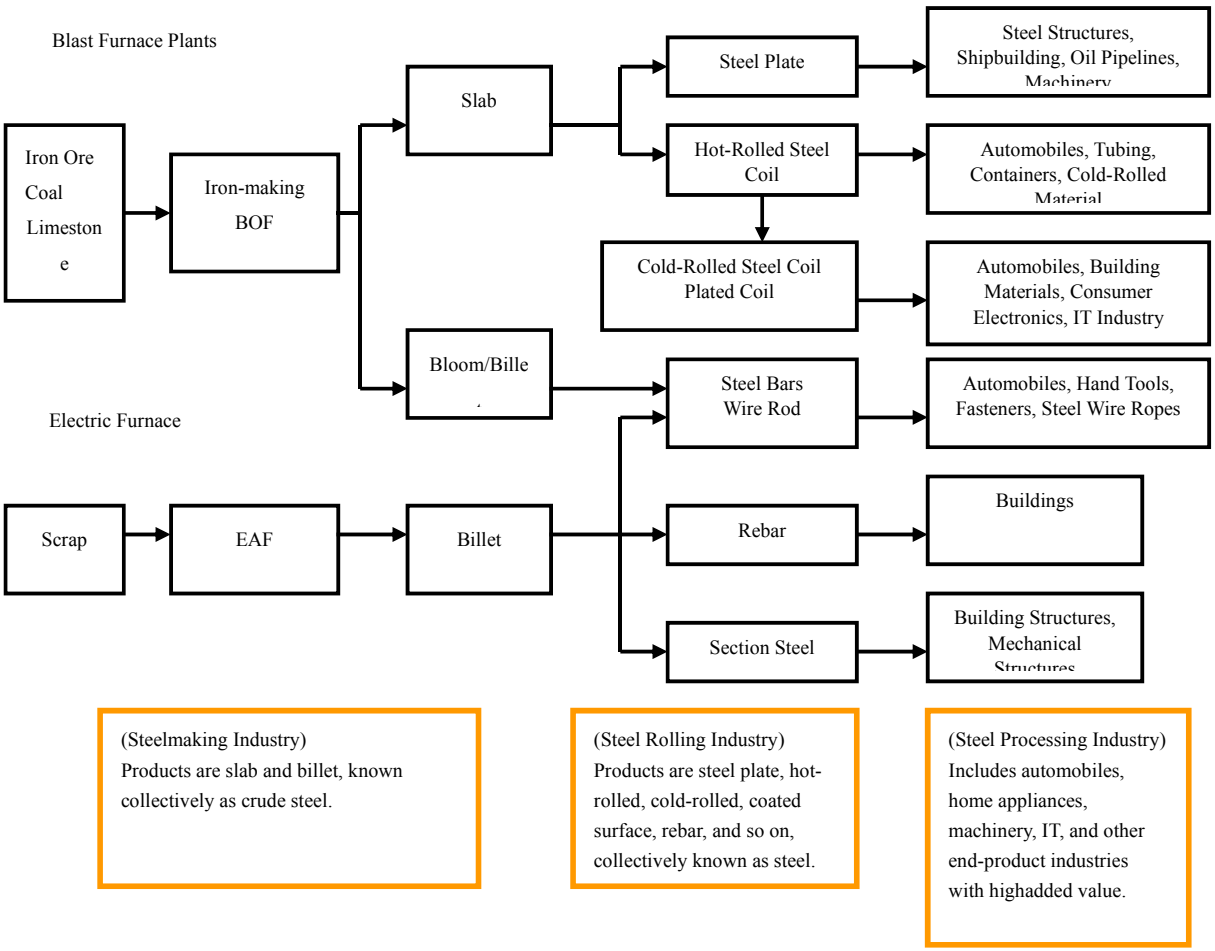


*Figure 1. Association graph of the steel industry in Taiwan*

## 2. Theoretical framework

As the steel industry in Taiwan pursues sustainable management and faces change in industrial structures, in this study, we used statistical methods to perform data analysis on the operating conditions of steel businesses. Structural equation modeling (SEM) was also used for verification analysis. The research literature and the discourse of scholars were integrated to explore the correlations between organizational capabilities, manufacturing strategy, and business performance in Taiwan's steel industry. We established a theoretical foundation and integrated development management models to propose recommendations for reference in the operations and management of the steel industry in Taiwan.

We used the theoretical foundations of the literature on organizational capabilities, manufacturing strategy, and business performance to form a research model for investigating the relationships between organizational capabilities, manufacturing strategy, and business performance in Taiwan's steel industry.

In response to changing enterprise competition, businesses must be profitable and develop sustainably. Thus, the organizational capabilities of a business are extremely crucial. Numerous studies have explained the nature and sources of organizational capabilities. Much of the literature has also indicated that organizational capabilities are closely connected with enterprises' use and development of strategies. Therefore, organizational capabilities are also closely correlated with business performance. Hill and Jones (1998) stated that organizational capabilities refer to the coordination and integration of resources and the ability to use resources

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productively. Grant (1991) indicated that a business's organizational capabilities coordinate and integrate different functions. Grant (1991) held that organizational capabilities originate in resources. They are the ability to use the organization's resources to execute tasks or activities. Organizational capabilities are sources of competitive advantage. Henri (2006) held that an enterprise organization's innovation, organizational learning capability, and market orientation capability are the main organizational capabilities that create competitive advantages. The use of these three types of capabilities can help businesses create advantages to gain unique competitiveness. Chandler (1993) analyzed European, American, and Asian economies and found that historical creation and the development of organizational capabilities in modern management enterprises are critical forces in shaping economic growth and competitive modern industrial countries. King et al. (2001) stated that organizational capabilities are the integration of the knowledge and skills needed to executive organizational tasks or activities. They come from all of the personnel and units within an organization and are accumulated over long periods of time. Therefore, they are also key factors of differentiation between organizations and sources of competitive advantage. The organizational capabilities of a company allow it to use, coordinate, and integrate its resources effectively to create value and performance.

Prahalad (1990) stated that organizational capabilities comprise technical capability, management processes, and overall learning. Technical capability is part of a company's core capabilities. Measurements of technical capability focus on the results of output, such as productive forces, the number of patents, and the unit value of products. Lado and Wilson (1994) indicated that organizational capabilities are divided into four dimensions: management capabilities, input capabilities, conversion capabilities, and output capabilities. Management capabilities include the unique ability of strategic leaders to propose and communicate the vision throughout the organization and to empower employees to understand this vision. Input capabilities include the ability to use and convert physical resources, organizational capital resources, human resources, knowledge, and skills to create and convey valuable products and services to customers. Conversion capabilities refer to the organizational capability to convert input into output efficiently and include innovation, entrepreneurship, organizational culture, and organizational learning. Output capabilities include all intangible strategic assets that are based on knowledge, such as corporate reputation or image, product or service quality, and customer loyalty. Helfat and Peteraf (2003) divided organizational capabilities into operational capabilities and dynamic capabilities. Operational capabilities refer to providing organizational managers with choices of decisions for output in specific patterns during the investment process. Dynamic capabilities do not involve products and services; rather, they are used to establish, integrate, and reconstruct operational capabilities. Dynamic capabilities do not influence organizational output directly, but insteadcontribute to organizational output indirectly through their influence on operational capabilities.

Fine and Hax (1985) indicated that manufacturing strategy is a critical part of a business's overall and business strategy. It comprises a group of coordinated goals and actions plans and must be consistent with the direction of the organization and other functional strategies to ensure long-term competitive advantage for the enterprise. Skinner (1969) stated that manufacturing functions must be included within a company's strategic planning and development processes. Zahra and Das (1993) held that manufacturing strategy refers to the management guidelines for manufacturing tasks. These guidelines detail how to manufacture products, allocate production resources, and organize software to support production. Brown (1998) stated that manufacturing strategy must consider the degree of vertical integration in the supply chain, determine the manufacturing range, increase the capacity of existing factories, make decisions on new facilities and locations, increase product depth, add new products to existing markets, add new products to new markets, or invest in new process technology. Hayes and Wheelwright (1984) stated that manufacturing strategy is a resource allocation method displayed collectively in eight decision-making dimensions: capacity decisions, equipment decisions, technical decisions, vertical integration, manpower decisions, quality decisions, production planning and material control decisions, and organizational decisions. Dekkers

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(2003) indicated that overall strategies for an enterprise include marketing, product development, and manufacturing strategies. These strategies must be powerfully linked. Tunälv (1992) stated that manufacturing strategy is formed from company strategy, business strategy, to manufacturing strategy. Competitive areas are quality, the reliability of deliveries, cost, and flexibility in order. Roth and Miller (1992) held that the key factors of manufacturing strategy include quality with low defect rates, unique quality, punctual delivery, rapid delivery, low costs, production flexibility, and product flexibility. Ward and Duray (2000) stated that manufacturing strategy comprises four dimensions: flexibility, quality, delivery, and cost. Flexibility includes the ability to change manufacturing in factories to reduce lead time, reduce set time, or produce priority or urgent orders when necessary (Tran and Nguyen, 2016). Quality includes statistical process control, timely process control systems, updating process equipment, and developing new products and processes. Delivery includes providing fast delivery and committing to delivery on schedule. Cost includes reducing stock, increasing capacity, equipment utilization, and reducing production costs.

Business performance is the achievement of a business's strategic objectives. It is also an indicator of the overall competitiveness of an enterprise. Duquette and Stowe (1993) indicated that performance refers to a measurement of the degree to which an organization achieves its goals. Indicators and measurement methods are used to display the degree of the achievement of missions, targets, and goals in plans. Evans et al. (1996) stated that business performance is a measurement of the degree to which an enterprise achieves strategic goals. In other words, it is an indicator of an enterprise's overall competitiveness. Performance evaluation is a part of management control. Performance evaluation and performance management help a company manage its resources and measure and control its targets more effectively. Vickery (1991) stated that business performance can be divided into financial performance and marketing performance. Financial performance is measured using pre-tax return on assets and return on total assets. Marketing performance is assessed using market share and market growth rate. Papp (1999) stated that internal financial measurement indicators for an enterprise include return on investment (ROI), return on equity, gross profit, cash turnover, pre-tax income, net sales, growth in earnings per share, revenue growth, sales growth, earnings per share, cash, and long-term debt-to-capitalization ratio. Eccles et al. (1992) indicated that enterprises place increasing emphasis on the importance of non-financial indicators. This is primarily because enterprises focus more and more on quality and customer service, driving the development of the new performance assessment indicators of quality and customer satisfaction. The development of competitive benchmarking has prompted more emphasis on non-financial performance. This is because benchmarking systems shift from internal assessments to assessments of external markets, giving management personnel a comparison tool. Information technology also plays a critical role in performance evaluation systems. Sabherwal and Chan (2001) stated that indicators to measure enterprise performance include reputation among customers, the frequency with which new products or services are introduced, product quality, technical development and innovation, ROI, net profit, earnings growth, and market share. Venkatraman and Ramanujam (1986) divided performance indicators into three main categories: financial performance, entrepreneurial performance, and organizational performance. Financial performance includes sales growth rate, ROI, profitability, and earnings per share. Entrepreneurial performance includes market share, new product launches, product quality, marketing effectiveness, manufacturing added value, and technological efficiency. Organizational performance adds consideration of stakeholders to the two indicators described above. Kaplan and Norton (1992) indicated that organizational performance includes financial, customer, internal, and learning and growth performance. Financial performance includes sales growth, profitability (ROA, ROE), and earnings per share. Customer performance includes customer satisfaction and market share. Internal performance includes new product development cycles, process costs, and other aspects of operational efficiency. Learning and growth performance includes employee satisfaction and skills. Youndt et al. (1996) stated that measurement indicators of organizational performance cover three aspects: machine efficiency,

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customer satisfaction, and employee productivity. Machine efficiency includes equipment utilization and defect rates. Customer satisfaction includes product quality and timely deliveries. Employee productivity includes employee morale and productivity. MADU*et al. (1996) stated that indicators for the measurement of organizational performance include comprehensive short-term performance, comprehensive long-term performance, productivity, cost, profit, competitiveness, sales growth rate, profit growth rate, and market share.

Helfat and Peteraf (2003) indicated that organizational capabilities are the capabilities to use organizational resources to execute and coordinate related tasks to achieve specific targets. Luo (1999) stated that managers should possess information on their organizations' internal conditions and the external industry environment and use the organization's management skills for analysis and integration to review and develop new competitive strategies for their enterprises. Grant (1991) proposed a strategic analysis framework using the resource-based view. Through the identification and classification of enterprise resources, the identification of organizational capabilities, the assessment of resources and capabilities with potential competitive advantages, the strategic examination, selection, and distinction of the resources gaps that must be filled, an enterprise's internal and external operating conditions can be coordinated. Davies and Brady (2000) held that enterprises can develop organizational capabilities to execute more business (such as contracting or outsourcing). Learning can improve an enterprise's competitive position. Enterprises can take action quickly and view the learning cycle as a strategic asset to facilitate victory in future business.

Ulrich and Lake (1990) indicated that because organizational capabilities can increase customers' perceived value and their uniqueness is difficult for competitors to emulate, they help organizations obtain competitive advantage and exceptional organizational performance. Sabherwal and Chan (2001) held that among organizational capabilities, organizational flexibility, organizational efficiency, and degree of coordination and integration are suitable for enterprises in the prospector, defender, and analyst strategic patterns. Enterprises can use organizational capabilities that match their strategic patterns to improve organizational performance effectively. Amit and Schoemaker (1993) indicated that organizations increase their behavior decisions and complete the directions of the organization to strengthen the enterprise's resource perspective on mobile or replicable resources and capabilities. Organizations deploy tangible and intangible assets to execute tasks or activities to improve performance capabilities. Barth (2003) stated that the influence of management skills in different industry environments shows that growing industries can cover up or ignore the importance of management skills to enterprises because of their high growth rates. However, in more stable and mature industries, firms must use management skills to match enterprise strategies with organizational structures, facilitating survival in the industry or better performance.

Aaker and Mascarenhas (1984) indicated that strategic flexibility is the capability of an organization to adapt to sudden influential and uncertain environmental changes. These environmental changes substantially influence the operating performance of the enterprise. Therefore, enterprises with superior organizational flexibility can gain better operating performance in environments or industries with relatively large amounts of changes because they can quickly adjust their organizational capabilities and internal resource allocations. Tunälv (1992) suggested the importance of matching overall organizational strategy with competitive factors. Clear competitive factors result in superior financial performance. Vickery et al. (1993) proposed pre-tax return on assets, market share, and growth as performance measurements and indicated that manufacturing performance is ultimately reflected in financial and marketing performance. Amoako-Gyampah and Acquaah (2008) investigated the influence of competitive strategies (cost leadership, differentiation) on enterprise operating performance. They use four dimensions of manufacturing strategy (delivery, flexibility, cost, quality) for analysis and found direct, indirect, and overall effects on enterprise business performance.

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Based on the above literature review and the development of Taiwan's steel industry, we investigated organizational capabilities, manufacturing strategy, and business performance in the steel industry in Taiwan and proposed the research model shown below in Figure 2.

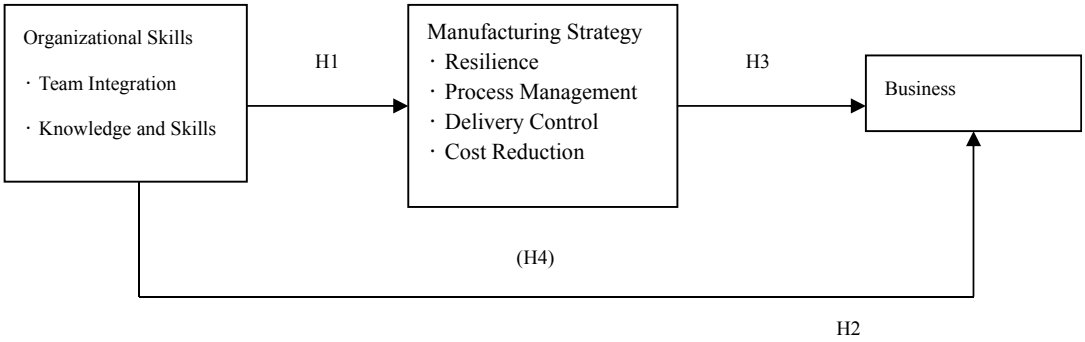


*Figure 2. Research model*

## 3. Research Hypotheses

Helfat and Peteraf (2003) indicated that organizational capabilities are the capabilities to use organizational resources to execute and coordinate related tasks to achieve specific targets. Luo (1999) stated that managers use the organization's management skills for analysis and integration to develop new competitive strategies for their enterprises. Davies and Brady (2000) held that enterprises can develop organizational capabilities to execute more business. Learning can improve an enterprise's competitive position. Enterprises can take action quickly and view the learning cycle as a strategic asset to facilitate victory in future business. Ulrich and Lake (1990) stated that organizational capabilities can increase customers' perceived value. Their uniqueness is difficult for competitors to imitate. This helps the organization obtain competitive advantages and excellent organizational performance. Sabherwal and Chan (2001) indicated that enterprises can use the organizational capabilities among organizational flexibility, organizational efficiency, and degree of coordination and integration that fit their strategic patterns to enhance organizational performance effectively.

Based on the literature review and the research model, we propose the following hypotheses:

*H1: Organizational capabilities are significantly correlated with manufacturing strategy.*

*H2: Organizational capabilities are significantly correlated with business performance.*

Aaker and Mascarenhas (1984) indicated that strategic flexibility is the ability to adapt to changes in influential and uncertain unexpected environments. Environmental changes substantially influence an enterprise's operating performance. Enterprises with superior organizational flexibility can quickly adjust their organizational capabilities and internal resource allocation to gain better operating performance in environments or industries with relatively large amounts of changes. Vickery et al. (1993) proposed pre-tax return on assets, market share, and growth as performance measurements and indicated that manufacturing performance is ultimately reflected in financial and marketing performance. Amoako-Gyampah and Acquaah (2008) examined the association between competitive strategies and business performance and found that the four dimensions of manufacturing strategy (delivery, flexibility, cost, and quality) have direct, indirect, and overall effects on business performance.

Based on the literature review and the research model, we propose the following hypotheses:

*H3: Manufacturing strategy and business performance are significantly correlated.*

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*H4: Organizational capabilities significantly influence business performance through the mediating effect of manufacturing strategy.*

## 4. Methodology

In this study, we administered questionnaires and testing using a 7-point Likert scale through the organizational network of "Taiwan Steel & Iron Industries Association". The subjects of the study were employees engaged in the manufacturing of steel products at the supervisory level or higher at 240 member firms registered with "Taiwan Steel & Iron Industries Association". The questionnaires were administered to supervisory manufacturing personnel in roles such as section chief (deputy section chief), manager (assistant manager), factory director (deputy factory director), and general manager (deputy general manager) to ensure that the quality and reliability of the survey reached certain quality standards and to achieve ideal results. The questionnaires were delivered and recovered through the organizational system of "Taiwan Steel & Iron Industries Association". A total of 1212 questionnaires were distributed. Because Taiwan's steel companies are distributed throughout the entire country, distributing and recovering the questionnaires was difficult. After 2 months, the total number of valid questionnaires recovered was 265, for a valid questionnaire recovery rate of 21.86%. Because we used the organizational association system of "Taiwan Steel & Iron Industries Association" to gain actual questionnaire data from steel businesses in Taiwan, although the valid questionnaire recovery rate was only 21.86%, the results still have discussion value.

Regarding the operational definition of the variable of organizational capabilities in this study, we followed the division of this variable suggested by Lado and Wilson (1994) into four dimensions: management capabilities, input capabilities, conversion capabilities, and output capabilities. Management capabilities include the unique ability of strategic leaders to propose and communicate the vision throughout the organization and to empower employees to understand this vision. Input capabilities include the ability to use and convert physical resources, organizational capital resources, human resources, knowledge, and skills to create and convey valuable products and services to customers. Conversion capabilities refer to the organizational capability to convert input into output efficiently and include innovation, entrepreneurship, organizational culture, and organizational learning. Output capabilities include all intangible strategic assets that are based on knowledge, such as corporate reputation or image, product or service quality, and customer loyalty.

Regarding the operational definition of the variable of manufacturing strategy, we followed the division of this variable by Ward and Duray (2000) into four dimensions: flexibility, quality, delivery, and costs. Flexibility includes the ability to change manufacturing in factories to reduce lead time, reduce set time, or produce priority or urgent orders when necessary. Quality includes statistical process control, timely process control systems, updating process equipment, and developing new products and processes. Deliveryincludes providing fast delivery and committing to delivery on schedule. Cost includes reducing stock, increasing capacity, equipment utilization, and reducing production costs.

Regarding the operational definition of this variable of business performance, we adopted the division of performance indicators by Venkatraman and Ramanujam (1986) into financial performance, entrepreneurial performance, and organizational performance. Financial performance includes sales growth rate, ROI, profitability, and earnings per share. Entrepreneurial performance includes market share, new product launches, product quality, marketing effectiveness, manufacturing added value, and technological efficiency. In addition, Morgan and Strong (2003) proposed as measurement indicators for business performance market share, customer satisfaction, competitive position, customer retention, sales growth, ROI, and overall company performance.

We used a 7-point Likert scale for measurement on the questionnaire adapted from Ward and Duray (2000). The responses were "strongly disagree", "disagree", "somewhat disagree",

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"neutral", "somewhat agree", "agree", and "strongly agree". These were scored from 1 to 7. Higher scores indicate that the questionnaire item for the variable had a greater influence on organizational capabilities.

We used the STATISTICS 7.0 software for reliability analysis to measure the stability or consistency of the questionnaire results. The Cronbach's α coefficient was used as an indicator to judge reliability. Coefficients higher than 0.7 represent high reliability, which means that the internal consistency of the items within the dimension is high. Coefficients between 0.35 and 0.7 represent moderate reliability, which means that the scale for this dimension is at an acceptable level for this study. Coefficients lower than 0.35 represent low reliability, which means that the dimension should be rejected for having low reliability (Cuieford, 1965). Table 1 shows the reliability analysis results. Within organizational capabilities, the Cronbach's α of the team integration dimension was 0.903 and that of the knowledge and skills dimension was 0.872. Within manufacturing strategy, the Cronbach's α of the resilience dimension was 0.918, that of the process management dimension was 0.876, that of the delivery control dimension was 0.836, and that of the cost reduction dimension was 0.921. The Cronbach's α of the business performance dimension was 0.932. Each of the Cronbach's α coefficients for the above dimensions was higher than 0.7, indicating that each dimension had high internal consistency.

Validity (accuracy) refers to the reliability or validity of the results obtained from a testing instrument. Validity refers to the accuracy of a questionnaire and the degree to which it can measure the qualities or functions it aims to measure.High validity indicates that a questionnaire can achieve its measurement goals.

**Table 1.Reliability analysis**

| Dimension | | Cronbach's α |
|---|---|---|
| Organizational Capabilities | Team Integration | 0.903 |
| | Knowledge and Skills | 0.872 |
| Manufacturing Strategy | Resilience | 0.918 |
| | Process Management | 0.876 |
| | Delivery Control | 0.836 |
| | Cost Reduction | 0.921 |
| Business Performance | Business Performance | 0.932 |

Therefore, after confirming that the questionnaire was reliable, we performed validity testing. We used first-order confirmatory factor analysis (CFA) to test the fitness of each dimension of the factor measurement model, investigate the correlations within the framework, and analyze the discriminate validity and convergent validity of the factors on each dimension.

Discriminate validity refers to the lack of significant relationships between any two variable dimensions in a framework. In other words, it indicates that the dimensions differ. Discriminate validity refers to the degree of variance between one dimension and other dimensions in a theoretical system with regard to traits. In this study, we referred to the viewpoints of Anderson and Gerbing (1998) and Bogozzi et al. (1991) and adopted the sequence difference chi-square test. We performed this test between the dimensions of each variable. Table 2 shows the analysis results. The results of the discriminate validity analysis for the

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variable dimensions in Table 2 shows that the $\Delta\chi^2$ , among the increased profitability, enhanced competitiveness, and increased credibility dimensions of business performance were all less than 3.84. This indicates that increased profitability, enhanced competitiveness, and increased credibility did not differ. Thus, they were combined into a single business performance dimension. The results of the sequence difference chi-square test on the remaining dimensions of organizational capabilities and manufacturing strategy indicated $\Delta\chi^2$ , consistently higher than 3.84. Thus, these dimensions differed. See Table 3 for more information.

**Table 2. Discriminates validity analysis of each variable dimension**

| Variable | Paired Dimensions | | Unrestricted Model | | Restricted Model | | $\Delta\chi^2$ , |
|---|---|---|---|---|---|---|---|
| | | | X-Square Value | DoF | X-Square Value | DoF | |
| Organizational Capabilities | Team Integration | Knowledge Skills | 71.284 | 13 | 75.292 | 14 | 4.008 |
| Manufacturing Strategy | Resilience | Process Management | 153.916 | 19 | 164.491 | 20 | 10.575 |
| | | Delivery Control | 156.842 | 13 | 163.047 | 14 | 6.205 |
| | | Cost Reduction | 196.184 | 13 | 206.363 | 14 | 10.179 |
| | Process Management | Delivery Control | 59.674 | 13 | 69.504 | 14 | 9.830 |
| | | Cost Reduction | 102.972 | 13 | 106.839 | 14 | 3.867 |
| | Delivery Control | Cost Reduction | 103.316 | 8 | 112.810 | 9 | 9.494 |
| Business Performance | Increased Profitability | Enhanced Competitiveness | 10.407 | 4 | 11.548 | 5 | 1.141 |
| | | Increased Credibility | 10.990 | 4 | 12.811 | 5 | 1.821 |
| | Enhanced Competitiveness | Increased Credibility | 3.031 | 1 | 3.213 | 2 | 0.812 |

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**Table 3. Convergent validity analysis of each variable dimension**

| Variable | Dimension | Construct Reliability (CR) | Average Variance Extracted (AVE) |
|---|---|---|---|
| Organizational Capabilities | Team Integration | 0.904 | 0.704 |
| | Knowledge and Skills | 0.877 | 0.706 |
| | Resilience | 0.917 | 0.734 |
| Manufacturing Strategy | Process Management | 0.879 | 0.646 |
| | Delivery Control | 0.850 | 0.657 |
| | Cost Reduction | 0.930 | 0.817 |
| Business Performance | Business Performance | 0.955 | 0.753 |

A study by Fornell and Larcker (1981) indicated that if all loads are greater than 0.5 and the t value exceeds 2, the dimension has convergent validity. Indicators to assess the reliability of a measurement system include construct reliability (CR) and average variance extracted (AVE). In general, CR must be at least 0.7, whereas AVE should be at least 0.5. We performed first-order standardized CFA on the variables of organizational capabilities, manufacturing strategy, and business performance. The loads were all greater than 0.5 and the t values exceeded 2. Table 3 shows that the CR of organizational capabilities, manufacturing strategy, and business performance was consistently above 0.7 and AVE reached at least 0.5. The variables had convergent validity.

SEM refers to the relationship between exogenous latent variables and endogenous latent variables. Path diagrams were used to display the correlations in the related causal processes between the variables in the proposed model system. This study had three latent variables: organizational capabilities, manufacturing strategy, and business performance in the Taiwan steel industry. A "two-measurement" method was used with AMOS 18.0 to conduct SEM analysis. Figure 3 shows the path diagram for the non-standardized model from the analysis results, whereas Figure 4 shows the SEM path diagram for the standardized model. The related parameter indicators were used primarily to measure the overall model and to observe data fit; that is, analysis was performed using absolute fit measures and incremental fit measures. Table 4 shows the analysis of the fitness indicators for the overall model.

Absolute fit measures refer to confirming the degree to which the overall model can forecast covariates or correlation matrices. The measurement indicators include chi-square values ($\chi^2$), the ratio of chi-square values to degree of freedom ($\chi^2$/d.f.), the goodness-of-fit index (GFI), the root mean square residual (RMR), and the root mean square error of approximation (RMSEA). Table 4 lists the values of fit measures for the overall model in this study: chi-square value = 6.396; degree of freedom = 6; P value = 0.380, which is greater than 0.05, $\chi^2$/df = 1.066, which is less than 3, GFI = 0.992, which is greater than 0.9, RMR = 0.012, which is less than 0.05, and RMSEA = 0.016, which is less than 0.05. This study satisfied the absolute fit measures.

Incremental fit measures refer to comparing the degree to which fit may increase after the theoretical model and null model are developed. The measurement indicators include the adjusted goodness-of-fit index (AGFI), the normed fit index (NFI), the relative fit index (RFI), and the comparative fit index (CFI). Table 4 shows the values of incremental fit measures for the research model: AGFI = 0.973, NFI = 0.987, RFI = 0.995, and CFI = 1.000. These values are all higher than the standard of 0.9. This study satisfied the incremental fit measures.

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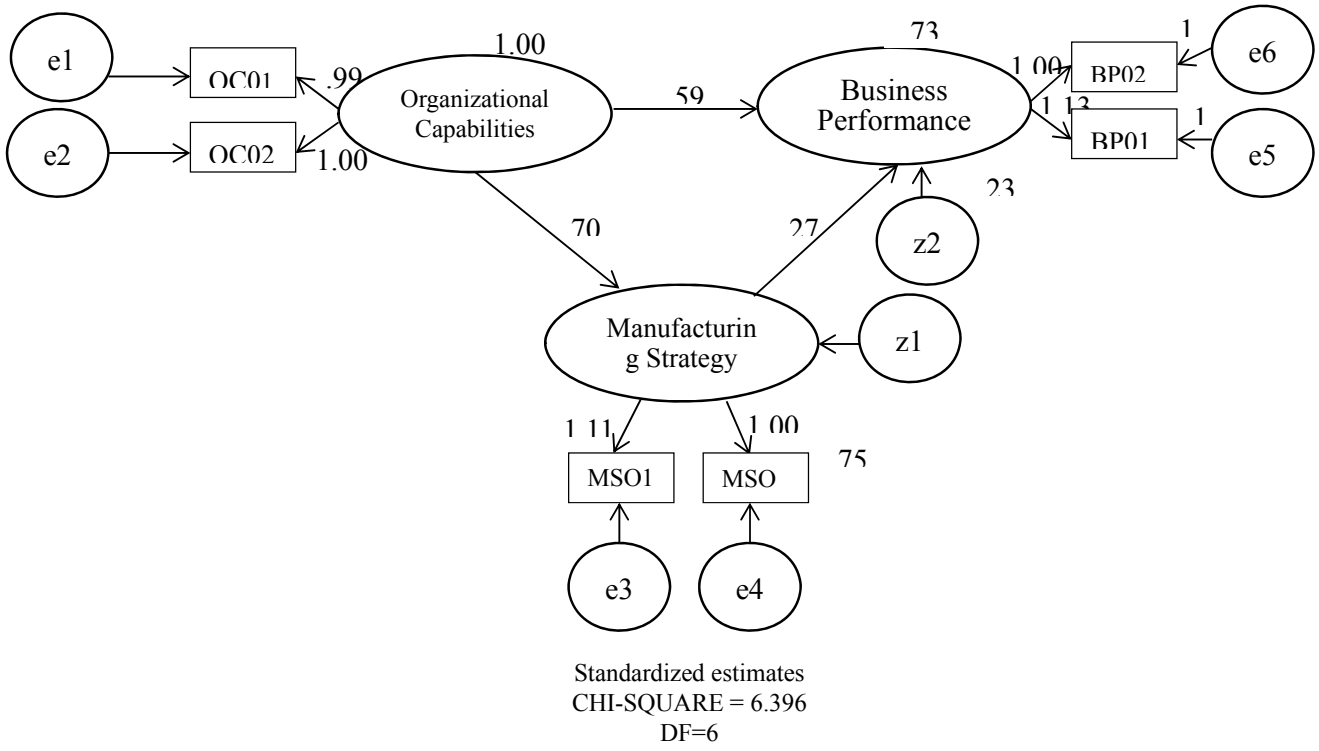
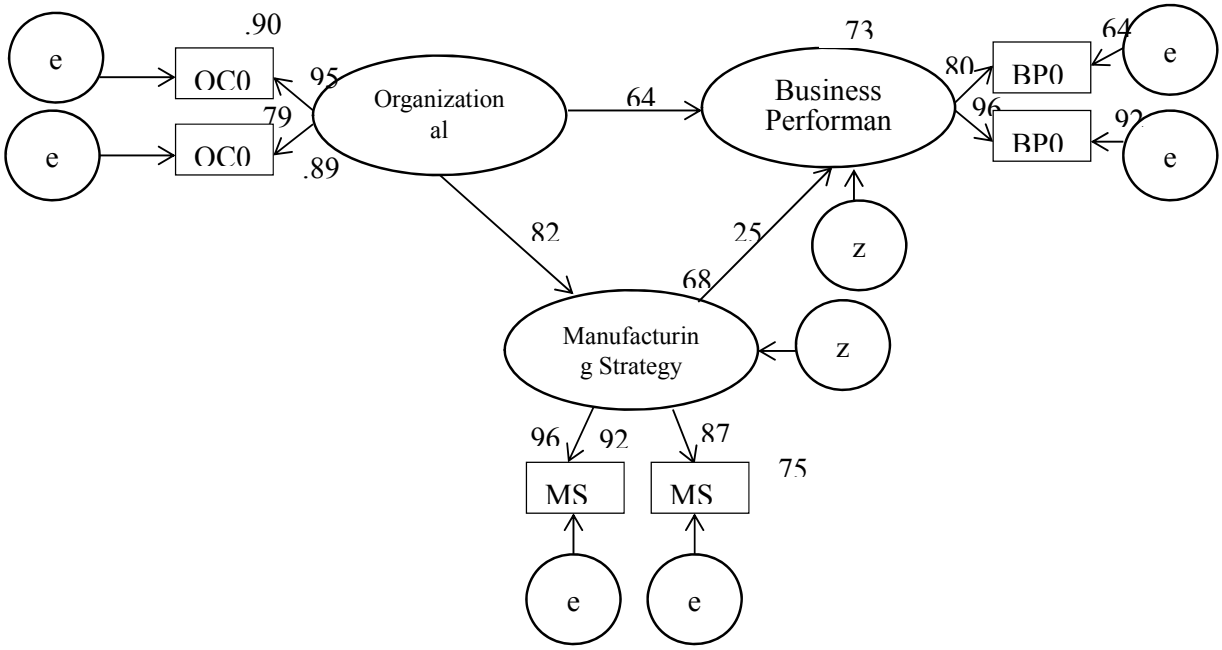



*Figure 3. SEM path diagram (non-standardized model)*




Standardized estimates
CHI-SOUARE =

*Figure 4. SEM path diagram (standardized model)*

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## 5. Results

The purpose of this study was to investigate the influence of organizational capabilities and the use of manufacturing strategy on business performance among steel enterprises in Taiwan. SEM was used to analyze the causal relationships between each factor and verify the research hypotheses.

The non-standardized and standardized SEM path diagrams in Figure 3 and Figure 4 show the path analysis results for the overall model. Table 5 shows the structural coefficients for each variable path and the hypothesis verification results.

The path coefficient of organizational capabilities against manufacturing strategy was 0.823. The test statistic (C.R.) was 14.154 > 2 and the P value was less than 0.001. Organizational capabilities and manufacturing strategy were significantly correlated. H1 was supported. This confirms that the relationship between organizational capabilities and manufacturing strategy in the Taiwan steel industry is significant.

The path coefficient of organizational capabilities against business performance was 0.640. The test statistic (C.R.) was 7.147 >2 and the P value was less than 0.001. Organizational capabilities and business performance were significantly correlated. H2 was supported. This confirms that the relationship between organizational capabilities and business performance in the Taiwan steel industry is significant (see Table 4).

**Table 4. Analysis of the goodness-of-fit indicators for the overall model**

| Goodness-of-Fit Indicator | Measurement Indicator | Evaluation Criteria | Model Results | Compliance |
|---|---|---|---|---|
| Absolute Fit Measures | Chi-Square | Smaller the Better (P＞0.05) | 6.396 | P=0.380 |
| | $\chi^2$/df | ＜3 | 1.066 | Yes |
| | GFI | ＞0.9 | 0.992 | Yes |
| | RMR | ＜0.05 | 0.012 | Yes |
| | RMSEA | ＜0.05 | 0.016 | Yes |
| Incremental Fit Measures | AGFI | ＞0.9 | 0.973 | Yes |
| | NFI | ＞0.9 | 0.995 | Yes |
| | RFI | ＞0.9 | 0.989 | Yes |
| | CFI | ＞0.9 | 1.000 | Yes |

The non-standardized and standardized SEM path diagrams in Figure 3 and Figure 4 show the path analysis results for the overall model. Table 5 shows the structural coefficients for each variable path and the hypothesis verification results.

The path coefficient of organizational capabilities against manufacturing strategy was 0.823. The test statistic (C.R.) was 14.154 > 2 and the P value was less than 0.001. Organizational capabilities and manufacturing strategy were significantly correlated. H1 was supported. This confirms that the relationship between organizational capabilities and manufacturing strategy in the Taiwan steel industry is significant.

The path coefficient of organizational capabilities against business performance was 0.640. The test statistic (C.R.) was 7.147 >2 and the P value was less than 0.001. Organizational capabilities and business performance were significantly correlated. H2 was supported. This

confirms that the relationship between organizational capabilities and business performance in the Taiwan steel industry is significant.

The path coefficient of manufacturing strategy against business performance was 0.248. The test statistic (C.R.) was 3.002 >2 and the P value = 0.03 < 0.05. Manufacturing strategy and business performance were significantly correlated. H3 was supported. This confirms that the relationship between manufacturing strategy and business performance in the Taiwan steel industry is significant.

The SEM path diagram of the standardized model in Figure 4 and the standardized path coefficients and hypothesis verification table for the overall model in Table 5 indicate that the value of organizational capabilities on business performance through the indirect (mediating) effect of manufacturing strategy was 0.823 x 0.248 = 0.204. H4 was supported.This indicated that organizational capabilities in the Taiwan steel industry significantly influence business performance through the mediating effect of manufacturing strategy.

**Table 5. Standardized path coefficients and hypothesis verification for the overall model**

| H | Structured Path | Path Coefficient | Test Statistic (C.R.) | P Value | Test Result |
|---|---|---|---|---|---|
| H1 | Organizational Capabilities→Manufacturing Strategy | 0.823 | 14.154 | 0.000*** | Sig. |
| H2 | Organizational Capabilities →Business Performance | 0.640 | 7.147 | 0.000*** | Sig. |
| H3 | Manufacturing Strategy → Business Performance | 0.248 | 3.002 | .003* | Sig. |

Note: *Table P < 0.05; **Table P < 0.01; ***Table P < 0.001

## 6. Discussion and Management Implications

### 6.1 Discussion

The relationship between organizational capabilities and manufacturing strategy in the Taiwan steel industry is significant. With strong organizational capabilities in the form of team integration, the manufacturing strategy displayed can defeat industry competitors. Increasing employees' professional knowledge and skills through education and training is bound to increase a company's manufacturing and innovation capabilities, allowing it to formulate manufacturing strategies in response to operational changes. This is consistent with Luo (1999), who stated that managers should possess internal organizational information and information on the external industry environment and use organizational management skills to analyze, integrate, and develop competitive strategies for their enterprises. It is also consistent with the viewpoint of Davies and Brady (2000), who stated that enterprises can develop organizational capabilities to execute more business. Learning can improve an enterprise's competitive position. Enterprises can take action quickly and view the learning cycle as a strategic asset to facilitate victory in future business.

The knowledge and skills possessed by organizational employees within enterprises in the Taiwan steel industry are bound to increase their companies' manufacturing and innovation capabilities. Internal organizational systems can be adjusted in coordination with business targets to display the organizational capability of overall team integration. This is bound to exert

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a considerable influence on business performance. Enterprise employees who possess the organizational capabilities of team integration and knowledge and skills will focus more on company business targets, increasing business performance. Organizational capabilities and business performance are significantly correlated among enterprises in the Taiwan steel industry. This is consistent with the viewpoints of Ulrich and Lake (1990), Stalk et al. (1992), Amit and Schoemaker (1993), Sabherwal and Chan (2001), Barth (2003), Kaul (2003), and Lewis et al. (2009).

The relationship between manufacturing strategy and business performance in the Taiwan steel industry is significant. The Taiwan steel industry is largely composed of small and medium enterprises that focus primarily on processing and manufacturing. They rely on upstream suppliers or foreign imports as sources of raw materials for their products. Raw material costs are difficult to control. Correct manufacturing strategies are necessary to create business performance. This is consistent with the viewpoints of Aaker and Mascarenhas (1984), Tunälv (1992), Vickery et al. (1993), and Amoako-Gyampah and Acquaah (2008). These studies indicated that enterprises with superior organizational flexibility can adjust their organizational capabilities and internal resources rapidly to gain superior business performance in industry environments with large amounts of changes. Within manufacturing strategy, the four dimensions of delivery, flexibility, cost, and quality have direct, indirect, and overall effects on performance.

Figure 4 shows the standardized SEM paths. These results indicate that organizational capabilities in the Taiwan steel industry significantly influence business performance through the mediating effect of manufacturing strategy. Manufacturing strategy is an intervening variable of business performance, implying the direct influence of organizational capabilities and manufacturing strategy on business performance among enterprise in Taiwan's steel industry.

### 6.2.Management Implications

The empirical results indicate that organizational capabilities and manufacturing strategy are significantly correlated. Communication skills can be used to increase the efficiency of team integration. Education, training, and learning can be used to improve professional skills, allowing companies to formulate manufacturing strategies in response to operational changes. The manufacturing strategies displayed through organizational capabilities with powerful team integration can defeat industry competitors.

The empirical results indicate that organizational capabilities and business performance are significantly correlated. Increases in organizational capabilities can enhance an enterprise's team integration and professional skills. At the same time, the use of organizational capabilities that match with strategic patterns effectively increases organizational performance. Effective strategic management can be adopted to influence overall team efficacy. Organizational capabilities can allow teams to maintain chances to win. Enterprises with superior organizational flexibility can adjust their organizational capabilities and internal resources rapidly to gain better operating performance in industry environments with substantial amounts of changes.

The empirical results indicate that manufacturing strategy and business performance are significantly correlated. Enterprises with superior organizational flexibility can adjust their organizational capabilities and internal resources quickly. By using resilient manufacturing strategies with process control, delivery control, and reduced costs, production processes can be controlledin a timely and effective manner to reduce lead time, effectively integrating and reducing arrangement and preparation time. Therefore, the guidance of correct manufacturing strategies increases an enterprise's business performance, allowing the company's profitability and operating income and profit to grow.

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## 7. Conclusion

In this study, we summarized the literature on organizational capabilities, manufacturing strategy, and business performance. The majority of these studies focused primarily on individual dimensions and integrated competitive strategy, competitive advantage, strategic orientation, diversification strategy, business strategy, manufacturing decisions, organizational change, organizational culture, organizational learning, strategic innovation, innovation capabilities, production capacity, product innovation, product differentiation, supply chain management, human resource management, work satisfaction, market orientation, and customer satisfaction. Scholars have yet to investigate the relationships between organizational capabilities, manufacturing strategy, and business performance. In this study, we established a framework and model and performed empirical analysis. The results confirmed significant positive relationships between organizational capabilities, manufacturing strategy, and business performance. This indicates that increasing organizational performance can look toward creating business performance in changing industry environments and increasing the flexibility of manufacturing strategy to create business performance. The empirical results of this study can serve as a reference for related studies. The empirical results on the correlations between organizational capabilities, manufacturing strategy, and business performance in the Taiwan steel industry indicate that the factors associated with the influence on business performance lie in improvements in organizational capabilities. By continually strengthening organizational capabilities, enterprises can face competitive environments and use timely manufacturing strategies to create business performance.

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