

CHINA'S HIGH-TECH FIRMS: STRATEGIC PATTERNS AND PERFORMANCE

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ABSTRACT

This study examines the performance implications of strategic patterns in China's high-tech industry through a survey of 126 Chinese high-tech companies. The results show that the Chinese high-tech companies with technology-strategy integration perform significantly better, while those with a market orientation are also associated with superior performance. Successful Chinese companies tend to develop a technology culture as a competitive strength influencing their strategies and performance. Also, the Chinese government exerts a strong influence on Chinese high-tech companies and their performance. Research and managerial implications are discussed.

INTRODUCTION

Technology is a major determinant of success in many industries, strengthening the competitive position of national economies (Zahra and Covin, 1993; 1994; Price, 1996). Technological advances provide opportunities for new products, new markets and new industries (McCarthy, Spital and Lauenstein, 1987), rapidly changing the nature of competition (Bettis and Hitt, 1995). High-technology (high-tech) industry has become a locus of organizational research in the last three decades (Rogers, 2001).

The strategic fit paradigm developed based on Western market economies can be applicable in transitional economies only after it is refined (Lukas, Tan and Hult, 2001). Transitional economies pose severe environmental challenges for international firms (Li and Atuahene-Gima, 2001; Peng and Heath, 1996). The Chinese government continues to protect its strategic industries through high entry barriers (Luo and Park, 2001). The business environment in China is uncertain (Tan and Litschert, 1994). These indicate that the business environment of China's high-tech industry presents hugely different characteristics from that in the West.

To effectively examine a company's strategic behavior and associated performance implications, strategies are commonly distinguished and classified into different types or 'patterns', such as Miles and Snow's (1978) typology for four responsive strategies, Porter's (1980) three generic strategies and Mintzberg

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and Waters' (1985) eight types of strategies, based on firms' strategic objectives, investment choices and competitive advantages (Galbraith and Schendel, 1983). However, there is no universal strategic typology that is optimal for all businesses (Ginsberg and Venkatraman, 1985).

Given the limited studies on environment-strategic pattern-performance in China's high-tech industry, this study is intended to identify the major patterns of business strategies adopted by Chinese high-tech firms and the associated influential factors as well as assess the performance implications of these strategic patterns. It makes a contributing addition to the literature concerning strategic management in Chinese high-tech firms.

LITERATURE REVIEW

In the 1970s and 1980s, research into high-tech industries was mainly descriptive, generalizing their characteristics (e.g. Maidique and Hayes, 1984; Quinn and Paquette, 1990) and addressing how to manage high-tech firms successfully (e.g. McCarthy et al, 1987; Schoonhoven, 1984). In the 1990s, the successful development of high-tech firms attracted much attention from academics, and a number of theories have been developed especially for high-tech companies, such as Gersick's Time Pacing (1994) and Eisenhardt's and Sull's Simple Rules (2001). A strategic pattern labeled 'competing on the edge', combining the 'edge of chaos' and 'high velocity' systems developed by Brown and Eisenhardt (1998), is changing traditional mindsets in strategic classification and thinking.

The integration of technology with market opportunities is seen as a key to success in high-tech companies (Hughes, 1990; Song and Montoya-Weiss, 2001). 'Technology strategy' has emerged to support firms' long term strategic direction (Dowling and McGee, 1994). An alignment between strategy and environment is associated with superior performance in high-tech industries (Lee and Miller, 1996; Lukas, Tan and Hult, 2001). Strategies for technological development are closely tied to the success of high-tech industries (Chang and Tsai, 2000). Strategic alliance as a strategy has been an area of interest in research on high-tech industry (Peng and Heath, 1996; Tsang, 1996), to gain market access and obtain strong manufacturing or distribution capability and R&D expertise or good management capability (Cyr, 1999) as well as to seek successful product innovation (Kotabe and Swan, 1995).

Concerning research on Chinese high-tech firms, the role played by Chinese returnees in China's high-tech industry is examined (Tan, 2005). National culture influences the strategic actions of Chinese high-tech entrepreneurial firms (Ahlstrom and Bruton, 2002). It is found that management cognitions on the future of the industry and current operation and performance of the firm are positively associated with firms' market-focused strategic orientation (Lau, Yiu, Yeung and Yuan, 2008). However, few studies have addressed the strategic patterns of Chinese high-tech firms and their performance implications.

A FRAMEWORK AND HYPOTHESES

Figure 1 presents a framework for this study. It is based on the strategic contingency theory that has been widely accepted in the field of strategic management (e.g. Venkatraman and Prescott, 1990; Lucas et al, 2001). The theory indicates that a co-alignment between task environmental factors and firms' strategies is positively associated with performance (Tan and Litschert, 1994; Lee and Miller, 1996). The external environment generally comprises the factors that influence the company's functioning and strategy, such as industrial dynamism, complexity and munificence (Dess and Beard, 1984; Luo and Peng, 1999). The internal environment consists of factors such as leadership (Maidique and Hayes, 1984), organizational culture (Riolli-Saltzman and Luthans, 2001) and organizational capabilities (Moorman and Slotegraaf, 1999). In this study, we focus on three external environmental factors: government effect, uncertainty and rapid change and a single internal factor organizational technological culture.

With regard to ‘Strategy’, Miller (1986) summarized some of representative strategic variables, and among others, ‘differentiation’ included ‘innovation’ and ‘marketing’. Zahra and Covin (1993) examined four strategy dimensions: commodity-to-specialty products, marketing intensity, cost leadership and product line breadth. Since this study focuses on Chinese high-tech firms, ‘strategy’ in the framework mainly focused on three dimensions: 1) technology-strategy integration, 2) market orientation and 3) cost leadership. Conceptually, technology-strategy integration and market orientation may be seen as Porter’s (1985) ‘differentiation’ strategies.

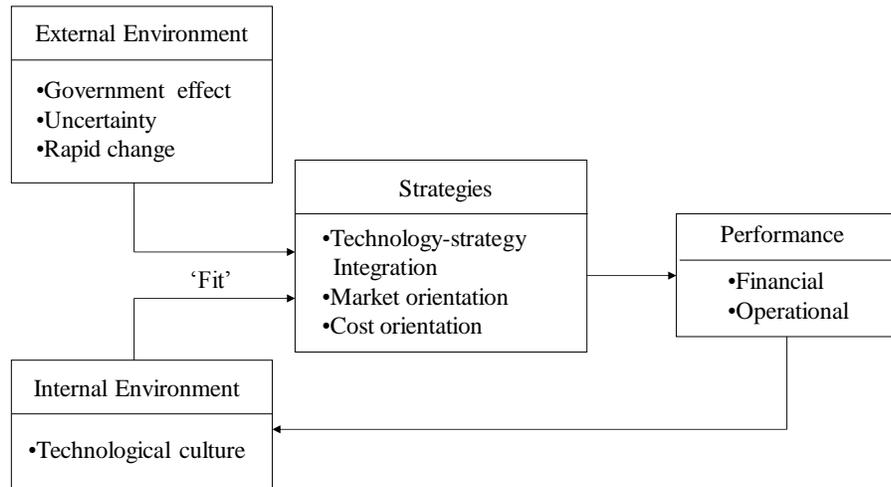


Figure 1. A Framework for Strategic Patterns of Chinese High-tech Firms

Strategy and Performance

Technology-strategy Integration

By ‘technology-strategy integration’ it means the degree to which the development or adoption of a technology by the firm is driven by the attainment of firms’ strategic objectives. It is related to the pursuit of Porter’s (1985) ‘differentiation’ strategy. A firm with a higher level of technology-strategy integration means that it has achieved a good ‘fit’ between strategy and technology, enabling the firm to attain better performance than its competitors (Iansiti and West, 1997). Technology-strategy integration can create technological synergy across business units and sustain a key technological competence (Chester, 1994). It is advocated that technology should be integrated with strategy to maximize its benefits and gain competitive advantage (Stacey and Ashton, 1990). The achievement of technology-strategy integration is seen as one of the important sources of sustainable competitive advantage (Bettis and Hitt, 1995). Superior performance may be gained when strategy and structure are congruent with the competencies and constraints of the firm’s technological choice (Parthasarthy and Sethi, 1992). In the context of Western countries, a type of strategy adopted by high-tech firms leading to better performance is ‘technology leadership’ (Porter, 1980), as evidenced by the practices of Japanese companies (Deshpande et al, 1993). However, as Chinese high-tech firms are latecomers, the overwhelming majority of them are technological followers or imitators, and it would be unlikely to find a notable number of the Chinese high-tech firms pursuing technology leadership. Thus, it can be hypothesized:

- H1a: Technology-strategy integration pursued by Chinese high-tech companies is positively associated with performance.

Market Orientation

Market orientation, a foundation of marketing management, is defined as ‘the organizationwide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organizationwide responsiveness to it’ (Kohli and Jaworski, 1990). The successful adoption of market orientation is found to result in better performance in traditional industries (Jaworski and Kohli, 1993). A recent study based on panel data indicates that market orientation has a positive impact on firms’ both short- and long-run performance (Kumar et al, 2011). The integration of technology and market opportunities is the most important determinant of success for high-tech companies (Hughes, 1990). Research indicates that market orientation is linked to innovativeness and product performance benefits (Atuahene-Gima and Li, 2004). Understanding customers and becoming customer-oriented and market-driven are recognized to be vital for high-tech firms (Iansiti and West, 1997). The survival and development of high-tech companies depend on their ability to integrate technology with market opportunities (Hughes, 1990). The implementation of market orientation is found to be conducive to generating dynamic capabilities, which would be beneficial for high-tech firms to attain superior performance (Zahra, 2008). Notably, there has been the view that the adoption of market orientation makes companies increasingly reliant on customer-orientated sources for new product ideas, resulting in a proliferation of imitative products at the expense of technological breakthrough (Hayes and Abernathy, 1980; Bennett and Cooper, 1981). However, on the whole, the positive tone of market orientation dominates in the literature. Therefore, the following hypothesis can be inferred:

- H1b: The Chinese high-tech companies that pursue market-orientated strategies tend to attain better performance.

Cost Orientation

Porter (1980) popularized the concept of cost leadership (Zahra and Covin, 1993) as one of the generic business strategies. A cost-leadership strategy includes finding ways to reduce production costs, achieve high capacity utilization, offer competitive prices and establish efficient operations in terms of raw materials procurement, internal production process and product distribution (Porter, 1980). It is similar to the approach adopted by Miles and Snow’s (1978) defenders (Dess et al, 1997). Chinese firms have been known to be in favor of pursuing cost-based competition both domestically and internationally. They focus on tight cost control through reducing product defects and increasing reliability (Garvin, 1984). Cost reduction is sometimes achieved by minimizing expenditures on innovation (Porter, 1980), limiting firm’s ability to develop. Balancing aggressive innovation and operational excellence is a challenge and the key to a high-tech company’s survival (Foster, 2000). Many cost-incurring activities such as innovation, risk taking and environmental scanning and monitoring may be seen as detrimental to a cost-oriented strategy (Dess, Lumpkin and Covin, 1997). Conceptually, in one industry, there can only be one cost leader, and thus other cost-orientated firms would be stuck in the middle, with resultant disappointing performance. Thus, we can hypothesize:

- H1c: The pursuit of cost orientation by Chinese high-tech firms is negatively linked to their performance.

External Environmental Factors and Strategy

Government

The survival and development of Chinese high-tech firms are dependent upon how they deal with environmental uncertainties and dysfunctional competition as well as on the degree of support from governmental institutions to alleviate their resource and managerial problems (Li et al, 2001). In an institutional environment with dysfunctional competition, where there is a lack of an effective legal framework to protect intellectual property rights, competitors can engage in widespread opportunistic and unlawful acts (Li et al, 2001). In China, to obtain necessary resources, senior managers have to make an effort to establish and maintain good relations with key officials (Shenkar, 1991) and favorably gain access to strategic industries (Davies and Walters, 2004). Various governmental agencies intertwine and have important and complex impacts on firms' strategy formulation and daily operations, whether consciously or unconsciously (Li et al, 2006). The Chinese government protects China's strategic industries, including high-tech sectors (Luo and Park, 2001), and this would affect the strategy formation of Chinese firms and confer on them a competitive advantage over foreign companies. Thus, the following hypotheses can be developed:

H2: Government has a positive effect on firms' strategies in the context of China

Uncertainty

Unpredictability and heterogeneity are regarded as the core elements of uncertainty (Dess et al, 1997). The current business environment has witnessed the increasing trend of technological uncertainty (Clark, 1989). The increasing number of strategic alliances and the unpredictability of rivals' activities require executives in technology-intensive firms to adjust their strategies dramatically and appropriately (Bettis and Hitt, 1995). To cope with environmental uncertainty firms should adapt to market changes, seek market opportunities and use improved technologies to satisfy existing opportunities or create new ones (Luo and Peng, 1999). Cost-oriented strategy puts emphasis on short-term profitability and budget controls in order to keep costs down (Miller, 1988). While a consensus about innovation may deal with production processes and some complex and unstructured problems to make costs lower, such activity is still costly and avoided by companies who apply cost efficiency strategy (Miller, 1986). Under uncertain environmental conditions, high-tech firms would be more actively seeking market opportunities and utilizing existing or newly developed technological capabilities to pursue these opportunities, and are less likely to focus on cost-orientated strategy. Therefore, we can hypothesize:

H4a: Technology-strategy integration is positively associated with environment uncertainty;

H4b: Market orientation is positively related to environmental uncertainty;

H4c: Cost orientation is negatively associated with environmental uncertainty.

Rapid Change

Technological change is fast, pervasive and unpredictable, resulting in increased risk and uncertainty, whilst predictability decreases (Bettis and Hitt, 1995). Industry dynamics or changes in high-tech industry involve the high rate of product obsolescence, frequent changes in technology and in the prices of suppliers and short product lifecycle (Miller, 1988). The rate of application of new knowledge is accelerating, the period between innovations is decreasing and technology fusion is taking place across and within industries (Song and Montoya-Weiss, 2001). Technological change increases or decreases the possibility of a firm's survival and development, depending on the benefits of technological change versus the hazards of entering a niche occupied by more technologically advanced organizations (Barnett, 1990). Akgun et al (2004) conclude that

rapid changes in customer preferences and technological development, along with readily available information, force firms to develop new products faster and better. A dynamic environment provides several opportunities for firms to explore and exploit markets based on experiential knowledge (March, 1991). In a turbulent environment, firms can boost the chances of success by investing in and developing a customer base (Chakravarthy, 1997). A highly dynamic environment makes it difficult for firms to choose from well-developed alternatives and requires them to adopt proactive approaches to dealing with it (Venkatraman, 1989). Rapid change increases the cost and difficulty in collecting, analyzing and integrating information (Atuahene-Gima and Li, 2004) and makes it difficult for firms to rely on reducing costs and prices, encouraging them to actively innovate, experiment and explore. Therefore, we can derive the following hypotheses:

- H5a: Technology-strategy integration is positively associated with rapid change.
- H5b: Market orientation is positively linked with rapid change.
- H5c: Cost orientation is negatively related with rapid change.

Internal Environmental Factors and Strategy

Techno-culture

Organizational culture is defined as “the pattern of shared values and beliefs that help individuals understand organizational functioning and thus provide them with the norms of behavior in the organization” (Deshpande and Webster, 1989). It is one of the most important characteristics of successful high-tech firms (Rioli-Saltzman and Luthans, 2001). Effective leadership is crucial for a firm to survive and develop in the marketplace (Akgun, Lynn and Byrne, 2004) and is irreplaceable as a factor in the successful development of high-tech firms (McDougall and Robinson, 1990). In addition, high-tech firm managers should understand the fundamentals of their technologies as well as their limits and potentials (Maidique and Hayes, 1984). In traditional industries organizational culture is found to be positively linked to firms' performance (Jassawalla and Sashittal, 2002). In the marketing literature, corporate culture has been identified as a major factor influencing market orientation positively (Deshpande, Farley and Webster, 1993) and can foster creative, innovative and initiative-taking behaviors in high-tech firms, leading to new product performance to satisfy customers better than their competitors (Jassawalla and Sashittal, 2002). In this study, an organizational culture that is manifested by shared values and beliefs developed through leadership that lead to the commitment to the excellence of innovation and R&D activities, team work, people and technological- competence development is defined as a technology culture or ‘techno-culture’. A firm's techno-culture is closely associated with firms' strategy through the node of leadership. Therefore, the following can be hypothesized:

- H3: Techno-culture has a positive impact on high-tech firms' strategies.

METHODOLOGY

The survey research method is deemed as appropriate in this study as it is suitable to test hypotheses, model building and the description of population (Czaja and Blair, 1996, p.4), focusing on contemporary events in general, but not to control behavioral events (Yin, 2003). It is designed to “discover facts about a population”, “find evidence about some of the likely causes of people's behavior or attitudes” (Buckingham and Saunders 2004: p13). A questionnaire was designed based on an extensive literature review and was pretested on 15 senior managers. To ensure validity in a cross-cultural setting, the method of back-translation was used to translate the questionnaire (Brislin, 1970).

In China, there are 54 national high-tech science parks, which host major Chinese high-tech companies. Three of these parks located in Beijing, Tianjin and Shenyang were chosen for the distribution of

questionnaire, because (1) they ranked among top five in China and (2) the senior management of these parks agreed to assist in distributing the questionnaire. The questionnaire was posted to CEOs or general managers of 350 Chinese high-tech companies randomly chosen in the three parks. 126 completed questionnaires were received, with a response rate of 36%. This sampling process is comparable to a study on marketing high-tech products (Gardner et al, 1999). Telephone calls to 60 of the responding companies verified the direct participation of their top executives in providing data for this study. The industrial categories of the sample companies fall into five groups, namely electronic information (40%), new energy and new materials (19%), integrated optical-mechanical and electric products (17%), new pharmaceuticals and bioengineering (8%) and others (16%). Of the sample companies, 42% were small and the rest were medium-sized (28%) and large (30%) ones.

Table 1. Results of Factor Analysis of Environmental and Organizational Variables

Techno-culture		Government		Uncertainty		Change	
Items	Loadings	Items	Loadings	Items	Loadings	Items	Loadings
Guidelines for R&D	0.84	Supported for funding	0.86	Rival imitation	0.75	Rapid growth	0.73
Executive Experiences	0.79	Guidelines	0.84	Global rivalry	0.74	Tough competition	0.70
Tech Priority	0.76	Information services	0.78	Potential new entry	0.67	Short life cycle	0.59
Decision procedures	0.76	<i>Guanxi</i>	0.74	Market unpredictability	0.66	Tech change	0.58
Visions & cooperation	0.70						
Information	0.58						
Cronbach's alpha	0.84	Cronbach's alpha	0.85	Cronbach's alpha	0.70	Cronbach's alpha	0.62

Table 2. Results of Factor Analysis of Strategy Variables

Integration		Cost-orientation		Market-orientation	
Items	Loadings	Items	Loadings	Items	Loadings
Incentives for R&D	0.79	Cost linkage to strategic objectives	0.93	Planning for long-term	0.91
R&D to sales ratio	0.76	Competing on cost	0.88	Clearly long-term objectives	0.90
Upgrading technology	0.65	Cost advantage in supplies	0.80	Functional coordination	0.56
Role of engineers in strategy	0.65	Applying technology to reduce cost	0.54	Marketing research	0.50
Tech training	0.63				
Investment in technology for strategy	0.61				
Technology defined in strategy	0.57				
Cronbach's alpha	0.82	Cronbach's alpha	0.82	Cronbach's alpha	0.77

All variables in the questionnaire were measured on a 5-point scale. The SPSS statistical package was used to perform data analyses, including factor analysis and regression analysis. A factor analysis of influencing variables has generated the constructs of Techno-culture, Government, Uncertainty and Change, as shown in Table 1. The Cronbach's alpha coefficient was applied to check the reliability of the four different scales. Nunnally (1978) suggests that a value exceeding the recommended standard of 0.7 indicates a good result; a value of at least 0.6 is considered desirable and acceptable (Homburg et al, 1999). Technology Culture, Government Support and Environmental Uncertainty have good internal consistency, with Cronbach's

alpha coefficients of .84, .85, and .70 respectively. The coefficient of Change is .62, making it reluctantly acceptable.

In the factor analysis of strategy variables, three factors emerged: Technology-strategy Integration ($\alpha=0.82$), Cost Orientation ($\alpha=0.82$) and Market Orientation ($\alpha=0.77$), as displayed in Table 2. A factor analysis of performance variables has generated two factors: Financial Performance ($\alpha=0.88$) and Operational Performance ($\alpha=0.90$), as exhibited in Table 3.

Table 3. Results of Factor Analysis of Performance Variables

Operational Performance		Financial Performance	
Items	Loadings	Items	Loadings
Change in competitive position vs. industry average	0.88	Change in profitability vs. industry average	0.85
Market share growth changes	0.85	Net return on investment changes	0.80
Change in market share growth vs. industry average	0.84	Profitability changes	0.80
Competitive position changes	0.83	Change in net return on investment	0.79
Productivity changes	0.78	Technology investment changes	0.75
Change in productivity vs. industry average	0.76	Change in technology investment vs. industry average	0.74
Cronbach's alpha	0.90	Cronbach's alpha	0.88

RESULTS AND DISCUSSION

Strategy and Performance

Table 4 presents the results of multiple regression analysis of strategy and performance factors. As seen in the table, technology-strategy integration was highly correlated with both financial performance ($\beta = 0.429$; $p < 0.01$) and operational performance ($\beta = 0.407$, $p < 0.01$), indicating that H1a was supported. This suggests that this strategy made a substantial contribution to explaining high-tech firms' performance and confirms the time-honored doctrine that a high level of technology-strategy integration results in enhanced performance in the context of China's high-tech industry.

Table 4. Results of Regression Analysis of Strategy and Performance

Independent Variables	Financial Performance			Operational Performance		
	B	β	sr^2	B	β	sr^2
Integration	0.45***	0.43	0.14	0.42***	0.41	0.13
Cost Orientation	-0.18**	-0.18	0.03	-0.15*	-0.16	0.02
Market Orientation	0.19*	0.16	0.02	0.22**	0.19	0.03
R ²	0.25			0.25		
Overall F	12.63			12.58		
p	0.00			0.00		

***p < .01 ^a Unique variability = .19; shared variability = .05 N = 120

**p < .05 ^b Unique variability = .18; shared variability = .06

*p < .10

As shown in Table 4, H1b was supported in that Market Orientation was positively related to both Financial ($\beta = 0.163, p < 0.10$) and Operational Performance ($\beta = 0.193, p < 0.05$). This is consistent with findings in the West, indicating that when high-tech firms apply their technologies to satisfy market requirements, they tend to achieve enhanced performance. It is suggested that Chinese high-tech firms should pay more attention to the importance of market orientation in order to have a better chance of surviving and prospering.

Table 4 shows that H1c was marginally supported, as Cost Orientation was significantly and negatively correlated with Financial Performance ($\beta = -0.21; p < 0.05$). The pursuit of cost orientation tends to be associated with a vicious cycle: when a firm performs badly, it would start to cut costs and exercise tight cost control, which further limit the firm's ability to recover and grow. When business is deteriorating, firms should find ways to be more proactive, innovative and market-driven in order to turnaround and stage a comeback.

Table 5. Results of Regression Analysis of Strategy and Influential Factors

Independent Variables	Strategy Factors								
	Integration			Cost Orientation			Market Orientation		
	B	β	sr ²	B	β	sr ²	B	β	sr ²
Techno-culture	0.67***	0.62	0.37	0.22**	0.19	0.04	0.62***	0.64	0.40
Government	0.35**	0.37	0.14	0.45***	0.46	0.21	0.15**	0.18	0.03
Uncertainty	0.07	0.07		0.04	0.04		-0.12*	-0.14	0.02
Change	0.12*	0.13	0.01	-0.12	-0.11		0.08	0.10	
R ²	0.53 ^a			0.27 ^b			0.48 ^c		
Overall F	31.97			10.47			25.97		
p	0.00			0.00			0.00		

***p < .01

^a Unique variability = .52; shared variability = .003

N = 120

**p < .05

^b Unique variability = .24; shared variability = .024

*p < .10

^c Unique variability = .45; shared variability = .024

Strategy and Influencing Factors

Table 5 displays the results of regression analysis with the influencing factors (Government, Techno-culture, Uncertainty and Change) as independent variables and strategy as the dependent variable. As can be seen in the table, H2 was supported in that Government was positively and significantly related to Integration ($\beta = 0.369, p < 0.01$), Cost Orientation ($\beta = 0.455, p < 0.01$) and Market Orientation ($\beta = 0.175, p < 0.05$). It is interesting to note that despite significantly influencing all strategies, the government had the strongest impact on cost-orientated firms which tended to underperform and the least effect on market-oriented firms. This suggests that the Chinese government gives more support for those that are underperforming or at a developing stage than those that are already firmly established in the marketplace.

Table 5 shows that Techno-culture was positively and strongly related to Integration ($\beta = 0.62; p < 0.01$) and Market Orientation ($\beta = 0.64; p < 0.01$) and marginally associated with Cost Orientation ($\beta = 0.19; p < 0.1$) respectively, indicating that H3 was supported. These results suggest that in high-tech firms, Techno-culture is a necessary condition for firms to pursue their intended strategies. However, the culture does have a much stronger effect on Integration and Market Orientation. Given the positive impact of Integration and Market Orientation on performance, it appears paramount that high-tech firms should focus on cultivating a technology culture to attain a competitive advantage.

As seen in Table 5, H4a, H4b and H4c were all rejected, as Uncertainty was insignificantly associated with Integration and Cost Orientation, but marginally and negatively related to Market Orientation ($\beta = -0.14; p < 0.1$). The tendency for Uncertainty to be negatively linked to Market Orientation suggests that with the environmental uncertainty, firms are likely to withhold their efforts (costs) to carry out marketing research and

initiatives. Table 5 further denotes that H5a was marginally supported as Change had a marginal correlation with Integration ($\beta=0.13$; $p<0.1$). This positive association suggests that in a highly dynamic industry, firms are more likely to resort to leading their technological development by strategy. H5b and H5c were rejected since Change was insignificantly related to Cost Orientation and Market Orientation.

CONCLUSIONS

This study examined the performance implications of Chinese high-tech firms' strategic patterns, with the following concluding results:

Chinese high-tech companies with a high level of technology-strategy integration perform significantly better both financially and operationally. A technology-strategy integrator clearly defines the role of technology in its business strategy; links its investment in technology to the need to implement its business strategy; continuously upgrades its products or services; provides an incentive scheme for employees' innovative initiatives with a high ratio of R&D spending to sales; and emphasizes the input of engineers into firms' strategy formulation.

In the context of China's high-tech industry, firms pursuing a market orientation tend to outperform their competitors. A market orientated firm clearly defines its long-term strategic objectives, develops a marketing plan, carries out marketing research and coordinates different departments or functions to satisfy customer requirements. A significant number of Chinese high-tech firms pursue a cost orientated strategy, which tends to be negatively associated with performance. The tendency can reflect the fact that when a firm underperforms, it is more likely to go for a cost orientation, resulting in a vicious cycle: underperforming – cutting costs and controlling spending – further deterioration.

The Chinese government has been an important factor strongly influencing the strategies of Chinese high-tech firms as well as their performance. Many successful Chinese high-tech firms view a technology culture as a competitive strength or resource, which is positively related with firms' competitive strategies as well as performance. It appears that China's task environment (uncertainty and rapid change) has little impact on firms' strategies, except that under the uncertain environment, firms become less market orientated.

This study suggests that in high-tech industry a firm's investment in technology should be linked to the implementation of its business strategy to achieve a competitive edge. The process of strategy formulation in a high-tech firm should have inputs from both marketing and engineering, while marketing input should be based on the research-based understanding of market requirements and trends. To keep up competitiveness, firms should cultivate an innovative organizational culture and incentivize staff to be creative. Given limited technological and financial resources within Chinese high-tech firms, organizational culture proves to be an effective 'soft power' to gain competitiveness in the fiercely competitive marketplace. When businesses become stagnating or declining, instead of curtailing investment, firms should actively seek for investment opportunities.

This study indicates that the Chinese economy still bears the legacy of the past planned economic system, in which the government had been a key player in businesses. To compete or cooperate with Chinese high-tech firms in China, multinationals must take the government factor into consideration. The insignificant effect of the task environment contrasts the strong impact of the institutional environment in China, and the latter may be the factor that weakens the former. This suggests that when entering or operating in China's high-tech industry, MNCs should pay close attention to the role of the Chinese government as an influencer or gatekeeper and make sure that they compete at a level playing field. When large projects are involved, it is often necessary and effective for politicians in MNCs' home countries to support their business development in China.

Further research may examine the impact of other institutional factors, such as normative and cultural-cognitive elements, and different task environmental constructs on strategy-performance associations in

China's high-tech industry. In terms of the limitation of this study, a relatively small sample size may cause heterogeneity problems and restrict the choice of methodologies.

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