Configurations of Competitive Strategies and Resources: A Set-theoretic Approach

by

Na Ni

A Thesis submitted to the Faculty of Graduate Studies of

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ABSTRACT

A plethora of research across various fields of management has proposed a variety of reasons to explain the success many firms enjoy. The competitive positioning school (Porter, 1980, 1985) recognizes the value of business-level strategies associated with high performance; however, it focuses on external orientation while ignoring the role of internal attributes, such as resources. By integrating the competitive positioning school and the resource-based view of the firm (Barney, 1991), this study aims to address the following substantive question using a configurational perspective: what configurations of competitive strategies and resources are likely to lead to a high level of firm performance?

In this thesis, I propose several configurations of strategies and resources that are expected to lead to high firm performance in terms of perceptual and financial measures. The research was carried out at the business-level using two archival sources of data from 332 top executives of a random sample of motor carriers in the U. S. with a set-theoretic approach (Ragin, 1986, 2000).

Results of the study are as follows:

(1) All configurations that are associated with high firm performance involve customer responsiveness strategies.

(2) The following configurations enable firms to achieve high performance with respect to the five *perceptual* measures (i.e., quality, timeliness, flexibility, efficiency, and resource acquisition): customer responsiveness

strategies by themselves or when combined with operations & logistics resources; or with innovation strategies coupled with both resources (i.e., management & human resources, and operations & logistics resources).

(3) Customer responsiveness strategies, together with management & human resources, contribute to both *perceptual* and *financial* measures of firm performance.

(4) Hybrid strategies (i.e., the combined strategies of low cost, innovation, and customer responsiveness) are used to achieve high efficiency as well as financial performance with both resources as necessary conditions.

(5) Firms may find it useful to emphasize the co-alignment of resources with competitive strategies. Configurations combining strategies with resources appear to be more dominant than those that include either strategies or resources by themselves.

(6) A set-theoretic approach appears to have excellent promise for integrating qualitative and quantitative methods to develop and examine a configurational approach to organizations in the future.

Key words: configuration, firm performance, set-theoretic approach.

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CHAPTER 1: THE PROBLEM

1.1 INTRODUCTION

Why do some organizations succeed and others fail? This question in strategic management has generated plenty of research across various fields and has yielded tremendous insights into the functioning of organizations. As a result, several major schools of thought have emerged (Mintzberg, 1990; Mintzberg, Ahlstrand, & Lampel, 1998; Mintzberg & Lampel, 1999). For example, Porter (1980, 1985) proposed that firms with clear competitive positioning strategies (e.g., low cost or differentiation) are likely to achieve high performance as compared to their rivals. Empirical studies in strategic management have found support for these propositions. For example, numerous studies have provided evidence for the use of pure strategies such as low cost, innovation, and customer L1982; Thornhill & White, 2007). Further research (Hill, 1998; Kim, Nam, & Stimpert, 2004; Miller & Friesen, 1986; Yeung, Selen, Sum, & Huo, 2006) on the role of competitive strategies has conceptualized and supported the value of hybrid strategies as well (e.g., Toyota's use of low cost plus differentiation strategies, in Adler, Goldoftas, & Levine, 1999; Dyer, 1994). For example, Spanos, Zaralis, and Lioukas (2004) found that Greek firms' profitability was positively related to the number of generic strategic dimensions; and hybrid strategies were more successful than a pure strategy, provided that low cost strategy was necessary. Sum and Teo (1999), in their research sample, also found that high-performing logistics providers pursued a hybrid strategy of low cost and differentiation.

In contrast to the external orientation of positioning strategies, a second stream of research, the resource-based view (RBV) of the firm (Barney, 1986, 1991, 2001; Wernerfelt, 1984), has contended that bundles of resources and capabilities (e.g., human resource management, logistics) are likely to help firms gain and sustain competitive advantage. The developing conceptual and empirical stream of research in this area (Dutta, Narasimhan, & Rajiv, 2005; Newbert, 2007) has found support for the RBV of the firm. For example, Song, Droge, Hanvanich, and Calantone (2005) documented the positive impact of marketing and technology-related resources on firm performance. Others (Delery & Doty, 1996; Valle, Martin, Romero, & Dolan, 2000) found that human resource management practices were positively related to firm performance. Logistics resources have also been found to be valuable because they enable firms to efficiently cut costs, foster innovation, and integrate different business processes (Elmuti, 2002).

Since positioning strategies and resources concern external and internal orientations respectively, organizations may combine them together in the process of decision-making. Further, resources may enable firms to adapt to changes in the environment by adopting suitable strategies (Kraatz & Zajac, 2001). Realizing the importance of fit (Venkatraman, 1989) between strategies and resources, some researchers have used the contingency approach to examine how strategies and resources work together in organizations. The notion of co-alignment (Drazin & Van de Ven, 1985; Venkatraman & Prescott, 1990) between strategies and resources has received general support in extant empirical research with a contingency perspective. For example, Lynch, Keller, and Ozment (2000) demonstrated the fit between process capabilities and cost leadership strategy, as well as between value-added service capabilities and

differentiation strategy: both enable high firm performance in the retail grocery industry. Spanos and Lioukas (2001) found that resources (i.e., technical, marketing, and managerial resources) are associated with market performance via competitive strategies (low cost, innovative differentiation, and marketing differentiation). Nickerson, Hamilton, and Wada (2001) found that co-alignment between a differentiation strategy and idiosyncratic resources leads to high performance in the international courier and small package services in Japan. Likewise, product-focused resources may benefit the use of a differentiation strategy, whereas process-focused practices are useful for the adoption of a low cost strategy (Aragon-Correa & Sharma, 2003).

In the area of entrepreneurship, Chandler and Hanks (1994) found that quality-oriented strategies need to match with firms' capabilities in customer service training and managerial expertise, whereas cost leadership strategies need to pair with the capabilities of securing low-cost facilities. Additionally, Edelman et al. (2005) found that quality/customer service and innovation strategies work as mediators between resource profiles (i.e., human and organizational resources) and firm performance.

Most recently, several studies have also supported the role of strategies and resources in leading to high firm performance (e.g., Aral & Weill, 2007; Megnuc, Auh, & Shih, 2007; Ruiz-Ortega & Garcia-Villaverde, 2008). Despite these research efforts, most of them take a contingency perspective and treat the fit as mediation or moderation and thus examine the relationships in a pairwise or piecemeal manner (Venkatraman & Prescott, 1990). In sharp contrast to the contingency approach, some scholars have recommended a configurational approach (Miles & Snow, 1978; Miller & Friesen, 1984; Mintzberg, 1979). A configurational approach goes beyond a limited number of

contingent factors, and proposes relationships of multiple dimensions in a holistic manner giving rise to gestalts or archetypes. Thus, strategies and resources usually combine in different patterns and their relationship with firm performance is more synergistic rather than reductionistic (Meyer, Tsui, & Hinings, 1993).

Empirical research on configurational approaches has found support for the proposed relationships of strategies and resources on firm performance (Doty, Glick, & Huber, 1993; Ketchen, Thomas, & Snow, 1993). For example, Doty et al. (1993) found evidence of Miles and Snow's four typical gestalts of strategic competitors (*Prospectors*, *Defenders*, *Analyzers*, and *Reactors*), whereas Hughes and Morgan (2008) provided support for *Defenders* and *Analyzers*, but not for *Prospectors* when examining the relationship between fit and firm performance (i.e., financial and customer-market performance) in U.K. high technology firms. Delery and Doty (1996) examined the effectiveness of various human resource management practices across the four strategy groups and found selected configurational employment systems (e.g., market-type system) resulting in higher organizational performance than internal systems and middle-of-the-road systems. Other researchers were engaged in proposing a more comprehensive research agenda which examined the congruence of strategies, environment, and organizational structure (e.g., Milgrom & Roberts, 1995; Miller & Friesen, 1984; Reeves, Duncan, & Ginter, 2003; Ward, Bickford, & Leong, 1996).

Among the few configurational studies (e.g., Doty et al., 1993; Ketchen et al., 1993), they dealt with configurations of firm strategies, structure, or other organizational factors; however, none of these studies have explicitly put strategies and resources into one integrative framework. As a result, it is not clear which competitive strategies

explicitly pair with which resources, and this remains a gap in the literature. Further, whether the selection of certain testing techniques of fit is appropriate also depends on how fit is conceptualized (Venkatraman, 1989).

In the past, researchers interested in testing configurational relationships among major variables have used traditional regression analysis with interaction terms (Dess, Lumpkin, & Covin, 1997; Hambrick, 1983; Kim & Lim, 1988), clustering methods (Ebben & Johnson, 2005; Ketchen et al., 1993), or ideal-type profile deviation techniques (Doty et al., 1993; Hughes & Morgan, 2008). Among these methodologies, regression analysis is useful to explain interactions of variables (e.g., Miller & Shamsie, 1996), but it is essentially reductionistic because of its focus on a few major explanatory variables in the equation while treating others as residual terms that explain variance in the dependent variable. Furthermore, when there are multiple explanatory factors, the regression analysis becomes cumbersome for explanations of more than three-way interactions, because it is necessary to enter all lower-order interactions. By contrast, cluster analysis has the advantage of including more variables and clustering the research sample; however, it is not uncommon for researchers to use the selection criteria that include irrelevant characteristics and put similar cases into different clusters. Consequently, the reliability and validity of clustering techniques is doubtful (Ketchen & Shook, 1996).

Different from regression analysis and clustering techniques, the profile deviation method emphasizes the concept of fit among different factors in a holistic pattern. For example, Venkatraman and Prescott (1990) examined the positive impact of the match between strategy and environment on firm performance, whereas Doty et al. (1993) found empirical support for Miles and Snow's typology. However, the common practice of

picking firms in the top third (Olson, Slater, & Hunt, 2005) or top 10 or 15 per cent from the sample as the empirically constructed ideal type profile (Drazin & Van de Ven, 1985; Venkatraman, 1990; Venkatraman & Prescott, 1990) seems to be a weakness because the criteria are sample-dependent. Further, the fit/misfit among these multiple profile factors associated with the final outcome is examined in a collective manner, but it is hard to explain what the composition of individual factors is within the profile and how they are inter-related and lead to fit/misfit (da Silveira, 2005; Doty et al., 1993).

Scholars have proposed theories of complementarities (Milgrom & Roberts, 1990, 1995) to suggest that the outcome is determined not only by the multitude of factors, their collections, and sub-collections but by the synchronization of these factors. Consequently, there are multifaceted theories that are waiting to be tested because the pace of development of research methods has not kept up with the theoretical developments in organizational studies. This lack of theory testing has stunted the development of rigorous theoretical and practical frameworks in the field leading to theory proliferation in management research on the one hand, and witch doctors and guru solutions in management practice, on the other (Micklethwaite & Woolridge, 1997).

1.2 RESEARCH QUESTION

The objective of this study is to propose and test relationships of business-level strategies and resources with firm performance using the configurational perspective. More specifically, this study aims to address the following question: what configurations of competitive strategies (e.g., low cost, differentiation, hybrid) and resources (e.g., human resources, logistics) are likely to lead to a high level of performance for firms?

Based on extant theory in organization and management studies, I propose a model of competitive strategies and resources and hypothesize several combinations that are sufficient to lead to high firm performance. These combinations may range from simple to complex. For example, the simplest possible combination may be when a single competitive positioning strategy is sufficient to make an organization successful. I begin with the simplest form, a pure competitive strategy, and then propose combinations that are varying pairings of strategies (low cost, innovation, and customer responsiveness) and resources (management & human resources and operations & logistics resources). In this way, the study may make a theoretical contribution regarding the use of pure, multiple and hybrid strategies, the relative relevance of competitive positioning school and the RBV of the firm, and the concept of fit among competitive strategies and resources.

Specifically, I focus on the relationship of strategies and resources with firm performance in the setting of the U.S. trucking industry. Although there have been studies examining the use of competitive strategies in trucking firms (e.g., Corsi, Grimm, Smith, & Smith, 1991; Stephenson & Stank, 1994; Sum & Teo, 1999; Wang, Zantow, Lai, & Wang, 2006; Yeung et al., 2006) or major resources in the trucking industry (Lynch, Keller, & Ozment , 2000; Marchington, Carroll, & Boxall, 2003; Novack, Langley, & Rinehart, 1995; Pettus, 2001; Pettus & Munoz, 2007; Stank, Davis, & Fugate, 2005; Stank & Stephenson, 1995; Zhao, Dröge, & Stank, 2001), a configurational study that links strategies and resources with firm performance in the trucking industry is lacking. This study aims at filling this conceptual gap in the literature.

To address the drawback of traditional empirical techniques, a few scholars have proposed a new methodology that appears to have immense potential in theory testing for

configurational form of fit (Venkatraman, 1989). The set-theoretic approach (Ragin, 1986, 2000) has been widely used in political science and sociology (Hodson & Roscigno, 2004; Kvist, 2006; Roscigno & Hodson, 2004). Recently, some researchers have applied this approach in the area of management (Fiss, 2007; Kogut, MacDuffie, & Ragin, 2004; Kogut & Ragin, 2006). The set-theoretic approach emphasizes the concept of set membership that reflects the relationships among different variables. It represents a synthesis of qualitative and quantitative methods and is designed to study complex combinations and configurations of constructs that are difficult to examine as multi-way interactions in regression model and profile deviation analysis.

A set-theoretic approach emphasizes the notion of configurations and thus distinguishes itself from traditional methods by emphasizing holisticity, causal complexity, nonlinearity, and asymmetry (Ragin, 1986, 2000). It also examines the co-alignment between multiple factors in a systematic way as in the profile deviation method, but it is more specific by indicating how these multiple factors are combined in gestalts (Venkatraman, 1989). For example, it is not uncommon to find the presence of multiple combinations of antecedents that lead to the final outcome (e.g., Kogut et al., 2004). Consequently, the set-theoretic approach is useful not only in explaining how different combinations of causal factors lead to the same outcome but also in assessing the contribution of each combination to the outcome in question, which will be explained in the following chapters.

To test the proposed configurational model, this study uses archival data collected from a random sample of 332 top executives in the U.S. trucking industry to examine how competitive strategies, resources, and firm performance are interrelated. It applies

the set-theoretic approach in investigating different combinations and configurations of strategies and resources that lead to high firm performance.

1.3 RELEVANCE

Management theorists as well as practitioners have attempted to integrate various insights to get a holistic perspective of managing complex organizations. For example, practitioners use the concept of business models to convey the configurations of strategies and resources that influence the performance of organizations. Specifically, what competitive strategies are useful for service firms to achieve high performance? Can these strategies be combined together? Do firms require complementary resources to support strategies? A rigorous examination of strategies, resources, and firm performance is not only likely to help in a better theoretical understanding of these relationships, but it is also expected to provide executives with insights on which strategies and resources are likely to lead to the gaining and sustaining of competitive advantage. For example, executives who want to improve the quality of their services and create value for their customers may use customer responsiveness strategy as well as innovation strategy. They may use their management skills to develop human resources to support both strategies. Similarly, executives who are also keen on enhancing efficiency may adopt low cost strategy in addition to customer responsiveness and innovation strategies. Logistics resources may be helpful to streamline the value chain of the firm in order to achieve high efficiency.

1.4 CONCLUSION

The thesis unfolds as follows. First, I review the relevant literature on competitive strategies, resources, and configurations (Barney, 1986, 1991, 2001; Meyer et al., 1993; Miles & Snow, 1978; Miller & Friesen, 1984; Porter, 1980, 1985; Segev, 1989) in Chapter 2. Next, I propose the research model and develop hypotheses regarding the relationships of competitive strategies and resources with firm performance in Chapter 3. In Chapter 4, the setting of the study is introduced, namely the U.S. trucking industry; and the research methods used in the study, including the set-theoretic approach and its use for data analysis. Further analysis and results are discussed in Chapter 5, followed by discussion and conclusions of the study in Chapter 6.

CHAPTER 2: LITERATURE REVIEW

In this chapter, I review extant literature on competitive strategies and resources and their co-alignment. Porter's (1980, 1985) positioning school proposes the role of competitive strategies in enabling firms to achieve high performance, whereas the RBV of the firm concerns the contribution of firm resources. I argue that strategies and resources alone are not necessarily associated with high performance. Instead, we should integrate these two key constructs and examine the co-alignment between strategies and resources that enable firms to be successful.

Prior research has addressed the role of relationships between competitive strategies and resources in explaining differences in firm performance; however, for the most part, the research has taken a contingency perspective. I argue that the contingency approach is not able to fully capture the match among multiple strategies and resources. By contrast, the configurational approach may be more useful in understanding concepts such as competitive strategies and resources as part of a holistic pattern. Accordingly, this study is aimed at filling in the gap in research on co-alignment among multiple strategies and resources by integrating these key concepts into the organizational analysis and then developing corresponding methodologies to test the resulting hypotheses.

I will start by reviewing literature on competitive strategies and then introduce firm resources as the major contingency of the strategies. After that, I will discuss the configurational perspective and its role of integrating the two major constructs – strategies and resources.

2.1 COMPETITIVE STRATEGIES

The origin of research on competitive strategies can be traced back to Industrial Organization (IO) economics. The structure-conduct-performance (SCP) model (Bain, 1956; Mason, 1957) was the dominant paradigm from the 1950s till the early 1970s. In this model, structure refers to industry characteristics such as market concentration, barriers to entry, and composition of competitors. Industry structure affects firms' strategies of pricing, product development, research and development (R&D) and advertising, among others, which in turn influence firm performance.

Building on the traditional IO economics, Porter (1980, 1985) proposed the generic business strategy typology in which he emphasized that firms could choose different positions within industries. The competitive position is the unique identity that a firm seeks to establish in the industry. Porter classified competitive strategies based on the two dimensions of content and scope. First, at the most basic level, firms create value through the position of either low cost or differentiation. Low cost strategy emphasizes decreasing costs and prices related to firm activities and products, whereas differentiation strategy can be based upon product/service, quality, brand name, or innovation (Miller, 1986). Second, firms can serve the general market or choose to stick with specific customer groups or a particular geographic area (i.e., the use of focus strategy). For example, businesses may choose to serve customers characterized by different demographics: age, ethnicity, gender, geographic location, profession, and income, among others. Porter's basic hypothesis is that firms taking any one of these three strategies (low cost, differentiation, or focus) will outperform competitors who do not belong to any explicit typology (i.e., "stuck in the middle").

Porter's model is focused on the content of strategy, so it is different from those typologies which include other constructs relevant to strategy. For example, the model developed by Miller (1987) emphasizes structural and environmental factors in addition to a firm's strategic position. Miles and Snow's (1978) model, in which any organization falls into one of four basic groups, namely, *Prospectors, Defenders, Analyzers*, and *Reactors*, integrates strategic orientation, organizational features (e.g., structure), and management processes (Ghoshal, 2003; Ketchen, 2003). In this model, *Prospectors* are characterized by being proactive, creating new markets, and having organic structures in dynamic environments. By contrast, *Reactors* are usually reactive and may survive only in benign environments because they follow trends rather than creating them.

Nevertheless, there are similarities among these typologies. For example, *Prospectors* are similar to Porter's differentiators through product innovation (Hambrick, 1983; Miller, 1986) and Miller and Friesen's (1978) adaptive firms. *Defenders* are indeed interested in creating a low cost position. Miller and Friesen's niche innovators mostly adopt a focus strategy. *Reactors* are similar to firms that are "stuck in the middle" (Hambrick, 1983). In comparing models proposed by Porter, and Miles and Snow, Segev (1989) argued that Porter's original typology stressed the content of strategy making while overlooking both the component of the strategy-making process and environment included in Miles and Snow's model; however, he asserted that there was general congruence between the two typologies. By synthesizing the two typologies, Segev (1989) generated a new classification system of strategies along two dimensions: internal consistency and degree of proactiveness.

In sum, these typologies are generally consistent with each other. In this research, I use the most cited typology by Porter (1980, 1985) to examine two generic competitive strategies: low cost and differentiation (by innovation or by customer responsiveness). Two key questions have arisen from this framework. First, what strategies will lead to high firm performance? For example, are pure or hybrid strategies useful for firms? Second, is the effectiveness of pure and hybrid strategies universalistic or contingent on different factors (e.g., resources)?

2.1.1 Pure vs. Hybrid Types of Competitive Strategies

Porter (1980, 1985) advocated that a firm should follow a pure strategy to gain competitive advantage. For example, some firms are able to take advantage of the economies of scale. Tight cost control systems and comparatively low operating costs are key elements of their low cost strategy (Govindarajan, 1986). Other firms pursue differentiation strategies that focus on how to develop innovative products or cater to specific customer requirements (Spanos & Lioukas, 2001). Cost leaders may follow an economizing strategy (Williamson, 1994) and value efficiency, as well as low cost, by cutting down expenditures; whereas differentiators may be interested in distinguishing themselves from competitors with unique products/services. Because the emphases of the two strategic choices are different, firms that try to combine low cost and differentiation strategies will not be successful (Porter, 1985). The perspective of pure strategies has received empirical support in previous research (e.g., Campbell-Hunt, 2000; Dess & Davis, 1984; Hambrick, 1981, 1982; Thornhill & White, 2007). For example, by developing the concept of "strategic purity" (i.e., the ratio of low cost tactics to product leadership tactics), Thornhill and White (2007) found support for the positive impact of

pure strategy on firm performance in 2,351 Canadian firms across four industry sectors (i.e., manufacturing, construction, retail, and business services).

However, several studies have documented the use of hybrid competitive strategies. For example, conceptually, Karnani (1984) used the game-theoretical model to argue that low cost and differentiation are not mutually exclusive but two dimensions of any competitive strategy. Hill (1988) posited that although unit costs of differentiation strategy are high, the overall costs may decrease over time because of significant learning effects, economies of scale, and economies of scope associated with the use of a differentiation strategy. As a result, firms are able to use low cost and differentiation strategies simultaneously.

Further empirical research results have provided substantial evidence and corroborated the viability of hybrid strategies. Miller and Dess (1993), for example, disassembled Porter's strategies into a three-dimensional cube and analyzed the most plausible seven combinations, which included two hybrids (differentiation + low cost + broad strategies, and differentiation + low cost + narrow strategies), four multiple models (broad differentiation, broad low cost, narrow differentiation, and narrow low cost strategies), and "stuck in the middle" (i.e., no emphasis on any particular strategy). They suggested that the combination of a broad differentiation and low cost strategy was the most profitable in terms of return on investment (ROI) and cash flow in their sample companies.

Furthermore, some researchers found the existence of hybrid strategies by examining companies using the Profit Impact of Marketing Strategy (PIMS) database (e.g., Miller & Friesen, 1986). Others found these hybrids from different countries such

as Korea (Kim & Lim, 1988), Greece (Spanos et al., 2004) and Sub-Saharan Africa (Acquaah & Yasai-Ardekani, 2008). Still others discovered them in different industries such as the screw machine product industry (Wright, Kroll, Tu, & Helms, 1991) and contexts such as the business-to-consumer (B2C) interface (Kim et al., 2004). Studies of logistics providers and operations management have also evidenced that the best performers used hybrid strategies (e.g., Sum & Teo, 1999; Wang et al., 2006; Yeung et al., 2006).

In addition to the positioning school, the literature on strategic groups (Hunt, 1972) has provided additional theoretical and empirical support for the use of hybrid strategies from a different perspective. Firms in the same strategic group are found to have similar strategic emphases and identities (Peteraf & Shanley, 1997; Reger & Huff, 1993); however, the extent to which these businesses pursue single or mixed strategic recipes is different (McNamara, Deephouse, & Luce, 2003; Reger & Huff, 1993). Some firms may deviate from a pure strategic group by blending competitive recipes in order to escape from intense rivalries. Thus, both pure and hybrid strategic groups may exist. For example, DeSarbo and Grewal (2008) found that there are 25 strategic group configurations in the 131 public banks. Only 15 firms follow the single competitive recipe, whereas the others blend either two or three strategy recipes.

In this study, I will first address the research question of the use of pure and hybrid strategies by firms that lead to high firm performance. Additionally, I will investigate another question which has been raised by numerous researchers: assume managers' perceptions of strategic emphases are the same for two firms from the same industry - Why are there still huge differences in firm performance? Porter's model pales

when we focus on this question. This is due to the fact that Porter's model is based on two fundamental assumptions (Barney, 1991: 100): first, strategic resources of firms within the industry or an industry group are identical; second, resources are highly mobile so that the temporal advantages of firms are inherently unsustainable. Researchers have realized that these were overstated and idealized assumptions based on neo-classical economics. The reality is that inter-firm resource endowments are not equivalent; therefore, if the firm does not possess the needed resources and capabilities to implement strategies, the positive relationship between strategy and firm performance may be doubtful. Put differently, the adoption of a competitive strategy may demand strategy-specific resources.

The second question challenges Porter's view that competitive strategies are equally viable, that is, universalistic, in different circumstances. Advocates of this perspective assert that a contingency view of competitive strategies is more plausible. Building on previous literature, I consider the role of resources as one specific type of contingency of competitive strategies in this research.

2.1.2 Contingent View of Competitive Strategies: Resources as Contingency

Looking internally, researchers holding the resource based view (RBV) of the firm and dynamic capabilities (Barney, 1986, 1991, 2001; Carroll, 1993; Eisenhardt & Martin, 2000; Penrose, 1959; Wernerfelt, 1984) have questioned the validity of the two assumptions in Porter's model. They argue that if a firm's resources cannot be matched or substituted by competitors, or if its rivals are unable to perfectly imitate these resources in the market, firms are capable of seeking sustainable competitive advantage by utilizing particular resources and capabilities. In the next two sections, I will focus on

the role of the RBV of the firm in explaining differences in firm performance and argue for the integration of the RBV of the firm and the competitive strategy framework.

Extant literature in the RBV of the firm and dynamic capabilities has differentiated between resources and capabilities (e.g., Amit & Schoemaker, 1993; Teece, Pisano, & Schuen, 1997). Basically, resources emphasize possession of factors or assets, whereas capabilities imply a firm's ability to create and use factors. Thus, resources are what firms "have" and capabilities refer to what firms "do" (Hall, 1993). This study is not intended to differentiate the two concepts; therefore, I focus on firm resources by following the definition of resources as "assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Barney, 1991: 101).

In contrast to the competitive strategy framework, the RBV of the firm assumes heterogeneity and imperfect mobility of resources between firms (Barney, 1986, 2001; Carroll, 1993). The RBV of the firm holds that resources that are valuable, rare, inimitable and non-substitutable create sustainable firm-specific advantages leading to superior firm performance (e.g., Helfat, 1997; Henderson & Cockburn, 1994; Maijoor & Van Witteloostuijn, 1996; Miller & Shamsie, 1996). For example, firms with bundles of marketing resources are good at promotions, bonding with suppliers and distributors, and offering superior services to customers. If a firm has more information-focused resources, it is capable of utilizing real-time information to integrate activities and knowledge at different stages of the value chain. Because the formation and development of resources are historically dependent or causally complex most of the time (Barney, 1986),

advocates of the RBV of the firm believe that resources are key elements of high performance. Recent empirical results support the validity of this assertion (e.g., Dutta, Narasimhan, & Rajiv, 2005; Newbert, 2007). In the trucking industry literature, for example, studies have supported the positive role of resources (e.g., human resources, logistics resources) in enabling firms to achieve high performance (e.g., Lynch et al., 2000; Marchington et al., 2003; Novack et al., 1995; Pettus, 2001; Stank et al., 2005; Stank & Stephenson, 1995; Zhao et al., 2001).

There are different types of firm resources which may be either equivalent or complementary. Any single resource is the configuration of resource factors (Black and Boal, 1994). Different types of resources are nested or interconnected by local or structural networks. For example, it is hard for its competitors to copy practices such as bonus schemes, ownership structure, flexible work rules and piece rates that are within "a system of mutually enhancing elements" in *Lincoln Electric Company* (Milgrom & Roberts, 1995: 204). Additionally, resources can be tangible or intangible and unique combinations of resources are more likely to provide leverage effect (Galunic & Rodan, 1998; Rhyne & Teagarden, 1997). For example, trucking firms may transform into total transportation carriers if they are able to grow existing and new resources and thus create the synergy over time (Pettus, 2001; Pettus & Munoz, 2007).

While some researchers have focused on the immediate effects of resources on firm performance, others have argued that resources need to be acquired or renewed through the formulation and implementation of strategies (Day, 2004); therefore, resources need to fit strategies as a critical contingency for firms to achieve high performance. Extant research on strategic human resource management has verified the

fit between resources and strategy. For example, Hitt, Bierman, Shimizu, and Kochhar (2001) found that there is a positive relationship between human resources and diversification strategy and firm performance. Richard (2000) concluded that high cultural diversity is positively associated with firm performance when firms pursue growth strategy, but it is negatively related to the performance of firms pursuing downsizing strategies. Others (e.g., Delery & Doty, 1996; Valle et al., 2000) examined the effectiveness of various human resource management practices across the strategy groups identified by Miles and Snow (1978).

Along a different line, Aragon-Correa and Sharma (2003) proposed the relationship between proactive environment strategies and resources. They posited that product-focused practices such as relating products and services to environmental attributes are useful for differentiation strategy, while process-focused practices are linked to low cost strategy and thus lead to increased efficiency. Yeoh and Roth (1999) found that the R&D allocation strategies have indirect influence on the sustained competitive advantage of the U.S. pharmaceutical companies through component and integrative capabilities.

2.1.3 Integration of Competitive Strategies and Resources

Eventually, the answer to the problem of different levels of firm performance may require that we consider strategies and resources together. As Black and Boal (1994) put it, firm value is the fit of multiple resource factors to strategy. Performance therefore could be the joint effect of strategy and resources (also in Collis & Montgomery, 1998; Powell, 1992; Spanos & Lioukas, 2001). Porter's competitive strategy framework focuses on market emphasis and market scope, whereas the RBV of the firm emphasizes

resources and capabilities residing in the firm. However, neither the competitive strategy framework nor the RBV of the firm is necessarily by itself sufficient to explain differences in firm performance because resources are interrelated with strategies as evidenced in previous research results. Firms with co-alignment of strategy and resources are likely to outperform their rivals in the marketplace. Accordingly, we need to develop an integrative framework which covers competitive strategies and resources simultaneously (Parnell, 2006; Powell, 1992).

Spanos and Lioukas (2001) have supported the complementarities between Porter's competitive strategy typology and the RBV of the firm. According to them, Porter emphasizes that activities are logically prior to resources. Resources are attached to activities and therefore "not valuable in and of themselves" (Spanos & Lioukas, 2001: 910). The RBV of the firm, in contrast, posits that resources "are valuable in and of themselves" (Spanos & Lioukas, 2001: 910) and therefore are able to define the scope and content of strategies. Spanos and Lioukas (2001) argued that an integrative framework incorporating these two research streams is necessary because resources and strategies should be synthesized rather than separated. On the one hand, coherent resources and capabilities enable the firm to formulate and implement its strategic choices, thus forming the basis of competitive advantage (Barney, 1986, 1991). When market conditions change, adapting business strategies to existing resources is the "least disruptive and most economical for firms" (Miller & Friesen, 1986). On the other hand, resources are only meaningful in the process of pursuing strategies and gaining competitive edges. For example, many firms possess marketing resources, but they use them differently. A firm implementing a differentiation strategy would use marketing

resources to cater to customers' needs by utilizing its distribution channels, promotion tactics, brand names, and after-sales service. By contrast, low-cost players may see the value of marketing resources in retaining customers and economizing by saving on advertising for new customers.

In sum, firms may own different types of resources; but only those resources matching a firm's particular competitive strategies can be attributed as elements contributing to its competitive advantage. Further, it is possible that resources will become extinct if they are not useful for the adoption of any particular strategies when market conditions change over time.

Some researchers have tried to link Porter's positioning theory with the RBV using a contingency perspective. For example, Cool & Schendel (1988) in their study of entrepreneurial software firms argued that firms need to fit their strategic investments with accumulated assets in order to reduce risk exposure. Chandler and Hanks (1994) studied 155 small manufacturing firms and found that firms pursuing quality-oriented strategies need to develop capabilities associated with customer service training and managerial expertise in order to achieve higher levels of business growth in cash flow, market share, and sales. They also found that cost leadership strategy leads to high business volume (i.e., earnings, net worth, and sales) when it is supported by firms' capabilities in securing low-cost distribution, manufacturing facilities, capital, employees, and labour. In contrast, Lynch et al. (2000) investigated the match between logistics capabilities (process capabilities and value-added capabilities) and competitive strategies. They found that the match either between process capabilities and low cost strategy or between value-added capabilities and differentiation strategy enables firms in the retail

grocery industry to achieve high performance.

Using an international setting, Nickerson et al. (2001) emphasized co-alignment of market position (i.e., document specialists, package specialists, and full-line generalists), resource profiles (e.g., idiosyncratic IT), and governance structure (e.g., vertical integration) in a sample of international courier and small package (IC & SP) services in Japan by linking the strategic positioning framework and transaction cost economics (TCE). Their results demonstrated that document specialists use idiosyncratic resources in IT and vertical integration in order to provide fast and differentiated services, whereas package specialists and full-line shippers do not rely on idiosyncratic IT or vertical integration to provide low cost services. These findings have provided support for the match between competitive strategies and resources.

Spanos and Lioukas (2001) found that competitive strategies mediate the relationship between resources and market performance and via the latter enhance a firm's profitability. Similarly, in their sample of 192 small firms, Edelman et al. (2005) also found that the quality/customer service strategy is a mediating mechanism between human and organizational resources and performance. They believed that "neither resources nor strategies alone explain firm performance" (Edelman et al., 2005: 359).

From a different perspective, Aral and Weill (2007) investigated the match between four types of investment allocations (i.e., transactional, informational, IT infrastructure-oriented, and strategic investments) and IT capabilities that include human resource capability, internal IT use intensity, supplier facing IT use intensity, and internet capability. The transactional, informational, and infrastructure-oriented investments are part of the low cost strategy, whereas strategic investments are associated with a firm's

innovation strategies. Their results showed that the IT capabilities are complementary to investment allocations for sample companies to achieve a combination of performance dimensions (i.e., profitability represented by return on assets and net margin, market valuation presented by Tobin's q, costs of goods sold, and product innovation).

Menguc, Auh, and Shih (2007) included two types of resources, that is, transformational leadership and market orientation, and three competitive strategies of low cost, marketing differentiation, and innovation differentiation (also in Spanos & Likouas, 2001) in their analysis of firm efficiency and effectiveness. They found that marketing differentiation is the only strategy that is significantly related to both transformational leadership and market orientation. Further, it is also the only strategy contributing to both efficiency and effectiveness. However, they did not examine the possible joint effects of strategies and resources on firm performance.

Similarly, Ruiz-Ortega and Garcia-Villaverde (2008) examined the influence of capabilities and competitive tactics on business performance in their study of the moment of market entry. Using regression analysis of a sample of 253 firms from the information and communications technology industry in Spain, they found the individual positive relationships of marketing capabilities, technical capabilities, and low cost orientation with firm performance; Again, this study did not examine the joint influence of capabilities and competitive tactics on firm performance.[1]

Despite these research efforts, there has been scant research that is clearly dedicated to an integration of the competitive strategy framework and the RBV of the firm. The lack of an integrative framework is constrained by significant conceptual and

[2] For a review of major studies integrating the two major constructs of competitive strategies and resources, see Appendix 1.

methodological difficulties related to examining the relationship between competitive strategies and resources. For example, one critical question concerns the integration of these multiple interrelated variables in one conceptual model. After all, the contingency approach is reductionistic and emphasizes "*pairwise coalignment among the individual dimensions*" (Venkatraman & Prescott 1990, emphasis added). When the research agenda involves examining the simultaneous effects of multiple variables such as various strategies and resources, the contingency approach at best is able to examine up to three variables. Thus, researchers using the contingency perspective are apt to emphasize some major explanatory variables while ignoring other factors. This may explain the reason why the link between firm resources and strategies has been neglected (Grant, 1991) and it has not changed significantly so far.

For example, as Venkatraman (1989) put it, fit may be conceptualized into six forms: as moderation, mediation, matching, gestalts, profile deviation, or covariation. Most studies examining the concept of fit with the contingency perspective by examining moderation or mediation (e.g., Chandler & Hanks, 1994; Edelman et al., 2005), which is unable to cover the relationships among multiple strategies and resources.

To address the gap associated with the integration of competitive strategies and resources using a contingency approach, I propose that the configurational approach may be helpful to go beyond the limitations of the contingency framework in explaining firm performance. It therefore may reflect an immense potential to advance our understanding of the sources of differences in firm performance. Nevertheless, this research is not intended to compare the application of configurational perspective to a contingency one; instead, the focus on the fit as gestalt (Venkatraman, 1989) to examine the relationships

of competitive strategies and resources with firm performance. I may also note that other conceptualizations of fit such as mediation (whether strategies mediate resources or resources mediate strategies) are interesting but outside the scope of current research.

2.2 CONFIGURATIONS

Miller and Friesen (1984: 12) posited that configurations are "commonly occurring clusters of attributes or relationships...that are internally cohesive". Likewise, configuration is also defined as "any multidimensional constellation of conceptually distinct characteristics that commonly occur together" (Meyer et al., 1993: 1175). Focused on organizational configurations, Miles, Snow, Meyer, and Coleman (1978) argued that each firm has a unique configuration of technology, process, structure, and the market strategy. Whereas some researchers view configurations as congruent patterns (Whittington & Pettigrew, 2003) or dominant patterns (Ward et al., 1996) in the organization, others use the configurational approach to understand the organizational form. For example, Rindova and Kotha (2001) defined organizational form as the configuration of different elements such as products/services, resources and structures.

The concept of configurations, gestalts (Miller, 1981), or archetypes (Greenwood & Hinings, 1993), has increasingly gained popularity in academia. For example, it is used in the area of entrepreneurship (Dess, Lumpkin, & Covin, 1997; Tan, 2007), IT outsourcing strategies (Colbert, 2004; Lee, Miranda, & Kim, 2004), human resource management (Delery & Doty, 1996; Kang, Morris, & Snell, 2007; Lepak & Snell, 2002; Sheppeck & Militello, 2000), joint venture (Child, 2002), operations management (Devaraj, Hollingworth, & Schroeder, 2001), workgroup context (Jehn & Bezrukova,

2004), and work system (Sinha & Van de Ven, 2005), among others. Another application of the configurational approach exists in the research of family business management by Miller and Le Breton-Miller (2005). Building on the analysis of the 40 most successful family firms, they found five configurations of business families: operators (using low cost strategy), brand builders (using differentiation strategy by branding), innovators (using innovation strategy), craftsmen (using customer responsiveness strategy), and deal makers (using instinct in transactions).

Doty et al. (1993) tested Mintzberg's typology of organizational structure (1979) and Miles and Snow's model (1978). The results did not back up Mintzberg's model but provided significant support for Miles and Snow (1978). Likewise, Hughes and Morgan (2008) used Miles and Snow's framework to test the effects of the co-alignment between strategic resources and product-market strategy on financial and customer-market performance (e.g., market share, customer satisfaction, and customer retention) in a sample of U.K. high technology firms. They used the profile deviation method to test how firms with different strategic orientations perceive the value of different resources (e.g., learning, information distribution, strategy support and commitment, and implementation capabilities) associated with high firm performance. They found that the fit is significantly related to firm performance for *Defenders* and *Analyzers*, but not for *Prospectors*.

The configurational approach is different from the contingency approach in that the former stresses holisticity, nonlinearity and equifinality (Bagozzi & Lynn, 1982; Gresov & Drazin, 1997; Hambrick, 1984; Meyer et al., 1993). The configurational approach focuses on the whole system, whereas the latter focuses on interactions of some

factors (Gerdin & Greve, 2004). It considers a holistic analysis of multiple elements and complementarities by looking beyond the traditional bivariate relationships associated with different elements (Milgrom & Roberts, 1990; Miller, 1988, 1996; Miller & Friesen, 1986; Porter & Siggelkow, 2004). Thus, it stresses interrelations among multiple but overlapping variables in the organization. When there is change in exogenous factors (e.g. technical or institutional environment) and endogenous factors (e.g., cognitive processes, social forces, self-organizing or self-selection, and spontaneous or deliberate processes), configurations may evolve over time (Miller, 1996; Siggelkow, 2001). For example, values are critical to the emergence of different archetypes (Hinings & Greenwood, 1988).

In this study, the two major pillars in our configurations include strategies and resources. To include these two elements rather than others (i.e., value, structure, and leadership among others) is the result of the following consideration: first, strategies and resources have been the dominant research subjects in the area of strategic management. Second, integration of strategies and resources in one coherent concept will contribute to the theoretic advancement on the basis of the competitive strategy framework and the RBV of the firm. Third, variations in the different degrees of pure/hybrid strategies and resources by managers who cognitively map their competitive space indicate that organizations could be differentiated by these two major elements. Further, since this study considers multiple strategies and resources, it would be too complicated to add more variables. Once we have integrated strategies and resources, this can be extended to other factors in future studies.

2.3 CONCLUSION

The traditional positioning school of management emphasizes utility of competitive strategies in explaining differences in firm performance, whereas the RBV of the firm values the role of firm resources in helping firms to be successful. Although there have been some attempts that integrate these two constructs in one conceptual model in previous studies, most of them take the contingency perspective. I argue that the contingency perspective is not sufficient to capture the interrelationships between multiple strategies and resources because it treats the relationship as pairwise and therefore is reductionistic by nature.

Building on the literature on competitive strategies, resources, and their co-alignment, this study aims at using the concept of configurations to link strategies and resources in a coherent and holistic way. It will then examine the associated relationships between different configurations of strategies and resources with firm performance. It therefore is one of the relatively few attempts in the area of strategic management that brings the positioning school and the RBV together using a configurational perspective in order to better understand the sources of a firm's success.

CHAPTER 3: MODEL AND HYPOTHESES

3.1 THE RESEARCH MODEL

In this study, I use a configurational approach to examining organizations in which strategies and resources are the major construct of research interest (see Figure 3.1). This study seeks to understand which configurations of competitive strategies and resources are likely to lead to a high level of firm performance.

Firms may develop a host of configurations of pure and/or multiple strategies with or without resources. I propose hypotheses for certain configurations derived from extant theory, previous empirical findings, and consultation with industry experts concerning the relationship of different configurations of strategies and/or resources to firm performance. The intent is not to provide an exhaustive list of all the possible configurations because of the complexity associated with an examination of multiple factors in the study. Even if we can give all the logically possible configurations, "limited diversity" (i.e., absence of specific configurations in reality) may occur (Miller & Friesen, 1984; Ragin, 2000). Instead of specifying all possible configurations, I therefore highlight a selection of plausible hypotheses in this chapter (see Table 3.1 and Figure 3.2). In other words, I propose only those configurations in the form of hypotheses that have strong theoretical rationale. Within each hypothesis, the intent is to test whether or not the proposed configuration will be sufficient for firms to succeed.

Additionally, I draw a variety of examples of firms. I use these illustrations for two purposes: First, it is in line with the perspective of building theory using inductive methods (Eisenhardt, 1989; Locke, 2007; Mintzberg & McHugh, 1985; Mintzberg & Waters, 1985; Siggelkow, 2001) and therefore aims to bring the qualitative and

quantitative methods together, which is consistent with a set-theoretic approach. Second, the goal is to provide clarity to readers regarding the proposed hypothesis. These examples are not used to provide evidence for theory testing. I agree that counter examples may exist. The key point of theory testing is to check whether the theory and its illustrative examples provide the rule or the exception. Support for hypothesis will imply that the examples are the rule, not the exception, and vice versa.

To better understand the configurational model proposed in this study, I begin by examining strategies without considering resources. Accordingly, I develop two sets of hypotheses that consider how single and multiple strategies are related to firm performance. Resources are then added into the model in the later sections. Because Porter's (1980) notion of focus strategy mainly addresses geographic scope rather than content, this study concentrates on examining low cost and differentiation strategies. Specifically, drawing on the recent literature (e.g., Menguc et al., 2007; Spanos & Lioukas, 2001) and consultation with industry experts (Kleysen, 2007; Streuber, 2007), I investigate three types of competitive strategies: low cost strategy, differentiation strategy by innovation (designated hereafter as innovation strategy), and differentiation strategy by customer responsiveness (designated hereafter as customer responsiveness strategy).

Depending on the number of strategies, I advance hypotheses related to both pure and multiple strategies[2] in the discussion that follows.

[3] In this study, the terms "pure" and "single" strategies are interchangeable and refer to any singular competitive strategy: low cost, innovation, or customer responsiveness. The terms "multiple" and "combined" strategies refer to the simultaneous use of more than one strategy. Specifically "multiple" includes the two differentiation strategies (of innovation and customer responsiveness), while "hybrid" strategies include low cost with innovation, or low cost with customer responsiveness, or low cost with both strategies of innovation and customer responsiveness.

FIGURE 3.1
A MODEL OF BUSINESS STRATEGIES, RESOURCES, AND FIRM PERFORMANCE

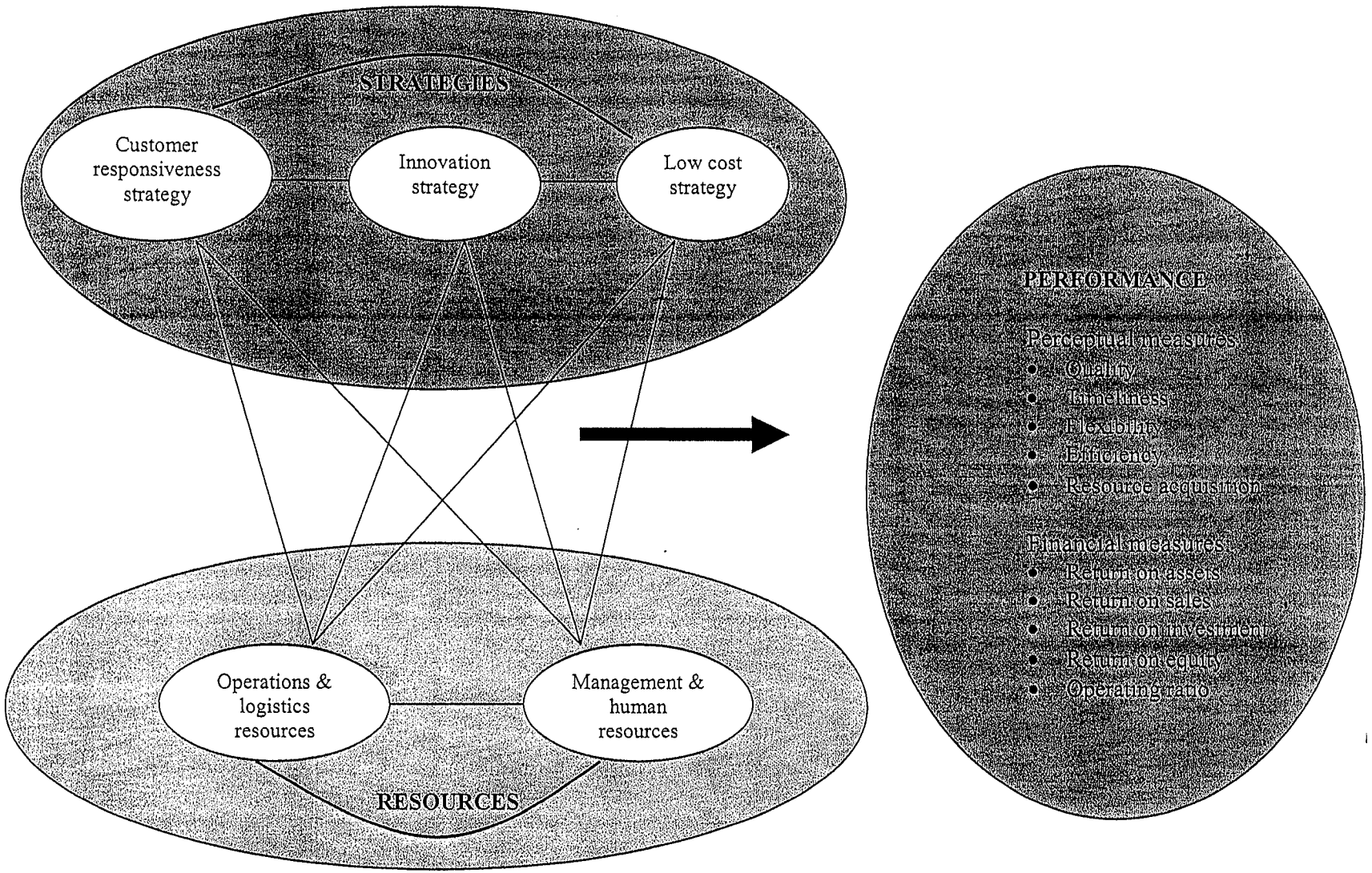
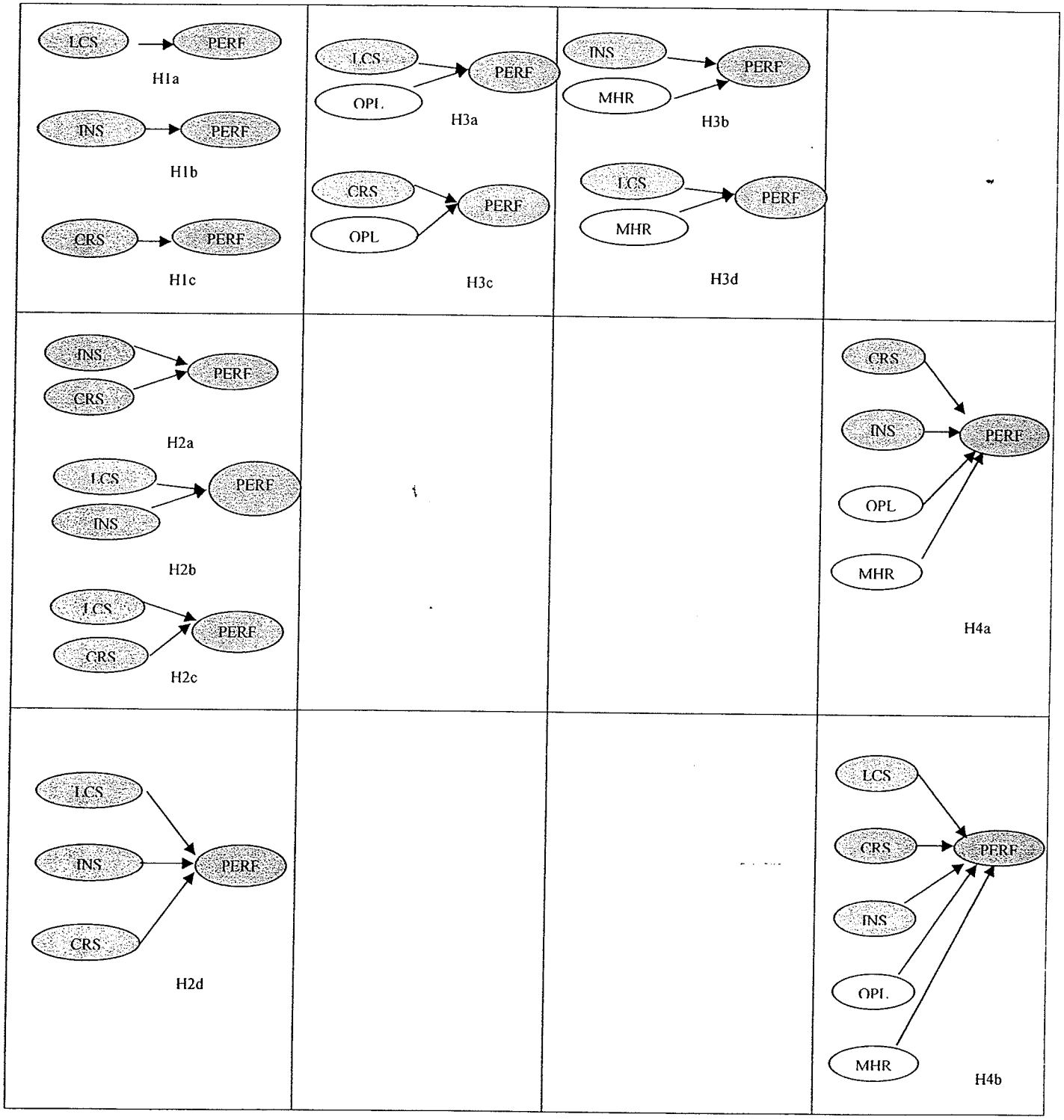


TABLE 3.1
HYPOTHESES TO BE TESTED IN THE STUDY

STRATEGIES	Absence of resources	Presence of OPL resources *	Presence of MHR resources **	Presence of both OPL and MHR resources
Single	<u>Cell A</u> ***Hypothesis 1a:*** Low cost strategy will lead to high firm performance. ***Hypothesis 1b:*** Innovation strategy will lead to high firm performance. ***Hypothesis 1c:*** Customer responsiveness strategy will lead to high firm performance.	<u>Cell D</u> ***Hypothesis 3a***: The pairing of low cost strategy and operations & logistics resources will lead to high firm performance. ***Hypothesis 3c:*** The pairing of customer responsiveness strategy and operations & logistics resources will lead to high firm performance.	<u>Cell E</u> ***Hypothesis 3b:*** The pairing of innovation strategy and management & human resources will lead to high firm performance. ***Hypothesis 3d:*** The pairing of customer responsiveness strategy and management & human resources will lead to high firm performance.	
Two	<u>Cell B</u> ***Hypothesis 2a:*** Innovation strategy combined with customer responsiveness strategy will lead to high firm performance. ***Hypothesis 2b:*** Low cost strategy combined with innovation strategy will lead to high firm performance. ***Hypothesis 2c:*** Low cost strategy combined with customer responsiveness strategy will lead to high firm performance.			<u>Cell F</u> ***Hypothesis 4a:*** The pairing of customer responsiveness and innovation strategies with both resources (i.e., operations & logistics and management & human resources) will lead to high firm performance.
Three	<u>Cell C</u> ***Hypothesis 2d:*** The simultaneous choice of low cost strategy, innovation strategy, and customer responsiveness strategy will lead to high firm performance.			<u>Cell G</u> ***Hypothesis 4b:*** The pairing of all three strategies (i.e., low cost, customer responsiveness, and innovation) with both resources (i.e., operations & logistics and management & human resources) will lead to high firm performance.

* OPL – Operations & logistics resources
** MHR – Management & human resources

FIGURE 3.2
FIGURES OF HYPOTHESES TO BE TESTED IN THE STUDY *



* LCS – Low cost strategy; CRS – Customer responsiveness strategy; INS – Innovation strategy; OPL – Operations & logistics resources; MHR – Management & human resources; PERF – Performance.

3.1.1 Competitive Strategies and Firm Performance

i. Pure competitive strategy

According to Porter (1980, 1985), organizations will secure high performance using any pure competitive strategies (e.g., low cost and differentiation). Low cost strategy involves a firm's continuous search for cost reductions by providing high volumes of standardized products or services at or below average industry prices. It could also be achieved by realizing economies of scale in the companies themselves. By contrast, differentiation strategy calls for creating products with unique features or benefits that distinguish and insulate a firm from its competitors. Whereas low cost strategy focuses predominantly on superior efficiency, differentiation could be achieved in several different ways, e.g., customer responsiveness, innovation, or quality. Porter argued that a firm's efforts to combine generic strategies often caused it to get 'stuck in the middle': this is the basis of his recommendation concerning the logic of pure strategies. Several studies (e.g., Dess & Davis, 1984; Govindarajan, 1986; Hambrick, 1981, 1982) have supported the pure strategy hypothesis. More recently, Thornhill and White (2007) studied 2,351 businesses across four major industry sectors (i.e., manufacturing, construction, retail, and business services) and found that pure strategies "never did less well, and often did better than hybrid strategies" (Thornhill & White, 2007: 553).

Firms may be able to manufacture their products or provide services with high efficiency because the use of a cost leadership strategy enables them to decrease overhead cost and thereby provide products/services at low prices for customers. Executives in private general hospitals, for example, have emphasized the value of

efficient operations (Hambrick, 1981, 1982). Another example is from the trucking industry which has endured pressures from escalating prices (Belzer, 2002). Firms that are able to control costs (i.e., costs associated with recruiting drivers, transporting goods with increased fuel prices, and maintaining equipment) will be able to achieve high performance (e.g., Stank & Stephenson, 1995; Stephenson & Stank, 1994).

Alternatively, other firms focus on a customer responsiveness strategy for achieving high performance because they understand that it is important to know customer needs, to bond with customers, and to maintain relationships with suppliers and retailers (Dess & Davis, 1984). They also need to improve the quality of their products and/or services and be attentive to their customers. In addition, they strive to build the brand loyalty of their current and potential customers. For example, customers are able to mix and match their apparel when they shop at *Liz Claiborne* (Siggelkow, 2001). This flexibility has helped the firm attract and retain its customers.

Still other firms may emphasize product or process innovation. These firms may focus on providing creative products/services and leading with the competitive processes, compared to their rivals (Dess & Davis, 1984). For example, Hambrick (1981, 1982) argued that customers of life insurance companies are not price sensitive; thus, these firms rely primarily on developing innovative insurance products with new features. Although costs associated with innovation strategies are substantial, differentiation strategy makes it possible for firms to charge customers premium prices because it enhances customers' perceived value of the products/services.

Therefore, as long as a firm uses a strategy that falls into any of these three types (see Cell A in Table 3.1), it can achieve high performance. Thus, the first set of hypotheses is:

Hypothesis 1a: Low cost strategy will lead to high firm performance.

Hypothesis 1b: Innovation strategy will lead to high firm performance.

Hypothesis 1c: Customer responsiveness strategy will lead to high firm performance.

ii. Multiple competitive strategies

Although competitive strategies were proposed as "pure" choices (Dess & David, 1984; Porter, 1980, 1985), recent studies have challenged this perspective. Hill (1988), for example, argued that differentiation is the firm's means to achieve a low cost position, whereas others (e.g., Parnell, 2006) advocated that low cost strategy focuses on value-oriented customers and therefore is another form of differentiation. Even Porter himself recognized that "differentiation may not be incompatible with relatively low costs and comparable prices to those of competitors" (1980: 38).

Several researchers have further revised Porter's competitive strategy framework. For example, Mintzberg (1988) simplified all generic strategies to different means of achieving differentiation. He composed a six-factor model of differentiation based on quality, image, design, price, support, and a final catch-all category that he termed "undifferentiated". His model was supported in a study of manufacturing firm executives (Kotha & Vadlamani, 1995). Likewise, Campbell-Hunt's (2000) meta-analysis of competitive strategies also developed a six-dimension model of strategies. In her model,

the meta-dimensions include quality reputation, product innovation, marketing, sales, operations, and market scope.

Therefore, competitive strategies such as low cost and differentiation may not necessarily be mutually exclusive or inherently incompatible. Numerous empirical studies have also supported the hybrid hypotheses (e.g., Miller & Friesen, 1986; White, 1986). For example, Miller and Dess (1993) posited that low cost, differentiation, and focus are the three dimensions of strategic positioning. They proposed seven plausible combinations of differentiation, low cost, and focus strategies and examined their relationships with firm performance in terms of return on investment (ROI) and cash flows. They found that "combinations are not only possible, but also profitable." (Miller & Dess, 1993: 577).

Specifically, this study will also examine the use of multiple competitive strategies in addition to pure strategies, with "multiple competitive strategies" referring to the simultaneous use of more than one competitive strategy (e.g., innovation & customer responsiveness, low cost & innovation, low cost & customer responsiveness, and low cost, customer responsiveness, & innovation). I propose that it is different from Porter's concept of "stuck in the middle", which implicitly assumes the lack of emphasis on any particular strategy.

a. Combining innovation & customer responsiveness strategies

Innovation and customer responsiveness are both based on differentiation (Dess & Davis, 1984; Miller & Dess, 1993; Spanos & Lioukas, 2001). A firm may be innovative and proactive to defeat the threats or capitalize on the opportunities in the external environment. An innovation strategy helps the firm to compete with rivals and attract

customers because of the uniqueness of its products/services (Miles & Snow, 1978; Miller, 1986). Customers thus may be keen on the brand and establish high loyalty towards the firm. In this way, the firm is able to adopt a customer responsiveness strategy in addition to an innovation strategy. Firms applying a customer responsiveness strategy, by contrast, are more likely to be proactive in innovations to cater to their customers' preferences (Hill, 1988).

A useful example could be found in *Starbucks* (Sarasvathy, Dew, Read, & Wiltbank, 2008). It introduced green tea Frappuccino to adapt to consumer taste in Asia (e.g., Taiwan and Japan) and iced Frappuccino which was extremely popular in the U.S. Its belief in creating value for customers has enabled *Starbucks* to develop innovative products in different markets. In this way, innovation and customer responsiveness strategies synergistically enhance each other.

Both innovation and customer responsiveness strategies belong to the category of differentiation strategy which is in sharp contrast to low cost strategies (Miller & Friesen, 1978). They aim at differentiating a firm from its competitors because of unique or creative product features provided for its customers (Miller & Dess, 1993). Hence, a firm capable of adopting superior customer responsiveness and innovation strategies is able to gain sustainable competitive advantage in the long run. For example, *3M* (Leavy, 2005) has successfully evolved into a conglomerate that leads in a variety of markets including consumer and office products, electronics and communications, industrial and transportation, display and graphics, and health care, among others. Thus, I propose that:

Hypothesis 2a: Innovation strategy combined with customer responsiveness strategy will lead to high firm performance.

b. Combining low cost & innovation strategies

Strategies of low cost and innovation can be complementary depending on conditions of supply and demand in the industry. On the one hand, a firm using an innovation strategy is more likely to develop novel products with unique features and functions more often. It may shape an embryonic industry by revolutionary breakthroughs or conversely renew a mature one through incremental changes (Anderson & Tushman, 1990). Either way, the firm may capture the market share quickly and make profits by meeting customers' growing demand. As long as the benefits from charging a premium price are higher than the costs of innovation for the firm, an innovation strategy is beneficial. At the same time, the firm also accumulates knowledge about products, markets, and customers (Miller & Friensen, 1978). It can then apply the information derived from new product development to improve current or related products/services. It is also helpful for the firm to use the same customer base and implement its marketing strategies on other products/services. As a result, the costs of commercializing and marketing products could be reduced greatly because of the effects of learning, economies of scale, and economies of scope through this process (Hill, 1988).

For example, Anderson and Tushman (1990) examined the three major technological breakthroughs in the U.S. flat-glass industry since 1903: the Lubbers machine, the Colburn machine, and the float-glass machine. They found that, because of these machines, manufacturing capacity has dramatically increased from 700 to 17,600 square feet per hour over time. The flat-glass firms have benefited greatly from these technical innovations and achieved economies of scale simultaneously.

On the other hand, simultaneous development of a low cost strategy may enhance the firm's choice of an innovation strategy (Ghoshal, 2003; Ketchen, 2003; Miles & Snow, 1978). Through the implementation of a low cost strategy, a firm may be engaged in minimizing the associated cost structure. Accordingly, it may be proactive in terms of developing creative operation systems or innovative products/services. For example, the introduction of the Celeron processor by *Intel* enabled it to compete in the low end of the microprocessor industry in order to defeat threats from its competitors (Anthony, Johnson, & Sinfield, 2008). *Intel* deliberately adopts an innovation strategy although its "dominant logic" (Prahalad & Bettis, 1986; Bettis & Prahalad, 1995) may still be low cost oriented.

The second hypothesis related to multiple strategies thus is as follows:

Hypothesis 2b: Low cost strategy combined with innovation strategy will lead to high firm performance.

c. Combining low cost & customer responsiveness strategies

Similarly, firms can also combine low cost and customer responsiveness strategies. A customer responsiveness strategy may help firms to improve customer satisfaction because they offer products/services with greater customer perceived utility (Miller & Friensen, 1978; Segev, 1989). They can also customize goods and services to fit the demands of different customers. The focus on customers also helps these firms to respond to changes related to customers' needs in different industries or industry segments in a timely manner. For example, the positive or negative feedback on particular goods of a firm from its customers will be communicated within the firm

quickly. Therefore, it saves time and money for the firm to achieve coordination at different stages of the value chain, which, in turn, helps the firm to maintain a lower cost structure (Govindarajan, 1986; Hambrick, 1981, 1982). In this way, a customer responsiveness strategy is the foundation upon which rests the goal to implement low cost strategies (Hill, 1998; Kim & Lim, 1988).

On the other hand, firms that successfully adopt a low cost strategy may have developed tactics to serve their customers in a better way, as exemplified by *Southwest Airlines* (Rhoades, 2006; Sirkin & Stalk, 1995). In order to attract the lower-end market in the airline industry, *Southwest Airlines* developed point-to-point travel instead of hub-and-spoke route structure. The short-haul air travels provided customers with high efficiency and flexibility. Additionally, the effects of learning by doing are helpful for firms to understand and find one or more ways to meet their customers' needs more quickly. For example, *Southwest* purchased the same type of airplane for the purpose of low maintenance. As a result, customers were able to enjoy greater flexibility because it took employees at *Southwest* only 15 minutes for the unloading in the plane turnaround process compared to the industry average of 45 minutes (Rhoades, 2006; Sirkin & Stalk, 1995). These experiences associated with the formulation and implementation of a low cost strategy will enable firms to pursue customer responsiveness strategies. Therefore, the third hypothesis regarding the use of multiple strategies proposes that:

Hypothesis 2c: Low cost strategy combined with customer responsiveness strategy will lead to high firm performance.

d. Combining low cost, innovation, & customer responsiveness strategies

As reflected in the above three hypotheses, firms are able to combine two different strategies, such as innovation and customer responsiveness, low cost and innovation, and low cost plus customer responsiveness (see Cell B as of Table 3.1). It may, however, be possible for firms to combine all three strategies together (see Cell C in Table 3.1) in order to compete with their rivals.

Mixing these strategies may be difficult to implement because of possibilities of getting stuck-in-the middle due to conflicting requirements (Porter, 1980, 1985). However, if executives can craft a hybrid strategy they may be able to achieve economies of scale by catering to the common needs of several segments of customers. Such value innovations may help firms develop their own market space, and move from a red-ocean to a blue-ocean strategy (Kim & Mauborgne, 2005). Considerations that firms are able to combine these three competitive strategies (i.e., customer responsiveness, innovation, and low cost) come from these aspects: first, Innovation strategy is valuable for the use of low cost and customer responsiveness strategies. On the one hand, process innovation will enhance the productivity of facilities and employees, thus enabling firms to keep costs to a minimum (Anderson & Tushman, 1990). On the other, product innovation will give products more unique characteristics and attract customers (Ghoshal, 2003; Ketchen, 2003; Miller & Le-Breton Miller, 2005, 2006).

Secondly, the successful implementation of a customer responsiveness strategy may be positively associated with the extent to which firms are proactive in the process of designing and creating innovative products/services. At the same time, the adoption of

low cost strategy may provide leverage for firms to use customer responsiveness strategy at the same time (Kim & Lim, 1988; Miller & Dess, 1993).

Similarly, a low cost strategy is also attainable with the combined use of innovation and customer responsiveness strategies. Firms use low cost strategy in order to pursue high efficiency (Porter, 1980, 1985). Although the unit costs associated with innovation and customer responsiveness strategies are high, firms are still able to decrease overall costs when their products are innovative and tailored to customer needs (Hill, 1988).

As the technology leader in the cellular phone industry, *Nokia* (Anthony et al., 2008), takes initiative to integrate the most advanced techniques (e.g., nanotechnology) into its products. In the process of establishing foreign markets, *Nokia* has been active in integrating global innovation activities. It is aiming to become a "metanational innovator" (Santos, Doz, & Williamson, 2004). For example, the set-up of research and development centres in China and India helps *Nokia* to reduce costs related to new product development and therefore proves the underlying basis of combining low cost and innovation strategies. Further, *Nokia* provides a whole range of products in order to attract local customers in emerging economies. It not only sells cheap and simple mobile phones for price-sensitive buyers but also provides cellular phones made of cutting-edge technology with unique features to meet the needs of trendy Chinese customers (Ni & Wan, forthcoming).

Therefore, it is proposed that:

Hypothesis 2d: The simultaneous choice of low cost strategy, innovation strategy, and customer responsiveness strategy will lead to high firm performance.

3.1.2 Linking Strategies and Resources to Firm Performance

i. Two types of resources: Management & human resources, operations & management resources

In this section, I will focus on the match of competitive strategies and firm resources that lead to high performance in the trucking industry. As extant research suggests, there have been a variety of different categorization systems to classify resources and capabilities (e.g., Barney, 1991; Grant, 1991; Hall, 1993; Hofer and Schendel, 1978); however, no single classification framework has, to date, achieved dominant acceptance (Miller & Shamsie, 1996; Ray, Barney, & Muhanna, 2004; Snow, Miles, & Miles, 2004). This may be due, in part, to the industry-specific nature of in the relationship between resources and performance.

As Wernerfelt (1984) noted, resources may be tangible or intangible. Examples of tangible resources include land, machines, and other manufacturing facilities, whereas intangible resources include brand name, employee know-how, technology, organizational culture, and leadership, among others (Delios & Beamish, 2001). Intangible resources enable firms to establish sustainable competitive advantage because of causal ambiguity or historical path-dependent conditions (Barney, 1986, 1991). Firms generally continue to combine or reconfigure their resource profiles to attain competitive advantage.

Theories of complementarities (Milgrom & Roberts, 1990, 1995) provide the rationale for the way combinations of resources contribute to a firm's competitive advantage. Rhyne and Teagarden (1997), for example, found that intangible resources, such as human assets, combined with tangible resources (e.g., financial resources) and

provided competitive advantage. Likewise, Song et al. (2005) found complementary effects between marketing and technology resources. Other studies found a complementary relationship between information technology and human resources (e.g., Powell & Dent-Micallef, 1997).

To understand the co-alignment between strategies and resources, I add resource factors into our previous model of strategies. Specifically, drawing on previous literature on the trucking industry (e.g., Lynch et al., 2000; Marchington et al., 2003; Novack et al., 2001; Pettus, 2001; Stank et al., 2005; Stank & Stephenson, 1995; Zhao et al., 2001) and insights provided by industry experts (e.g., Kleysen, 2007; Streuber, 2007), I focus on the role of two key resources: management & human resources and operations & logistics resources. Over the past two decades, increased global competition has provided many opportunities for trucking firms to offer logistical support functions to their customers. Customers are keen on carriers who possess core competencies of improving information flows, coordinating inventory and materials, and processing and tracking orders with greater flexibility and timeliness. Logistics resources and management resources can also help trucking firms to offer services, bond with customers, and coordinate people and other resources across different internal departments in an efficient and timely manner.

Another reason for focusing on these two resources relates to the critical questions faced by those in the trucking industry. For example, many trucking firms have been forced out of business because of problems associated with driver shortage, high turnover, and safety issues, whereas others capable of addressing the challenges of managing critical human resources have been able to lead the competition (Shaw, Gupta, & Delery, 2005; Stephenson & Stank, 1994). Further, some successful trucking firms have grown

their resources of logistics services and effectively transformed their organizations into third-party logistics companies (Novack et al., 1995; Pettus, 2001). Based on the knowledge further derived through our discussions with industry executives, I assert that these two resources, that is, management & human resources and operations & logistics resources, are the most critical assets for U.S. trucking firms to survive and prosper. They are valuable and rare. Most of all, it is hard for competitors to copy or imitate these two resources because their growth and development are not only time consuming but also causally complex.

The coupling of pure and multiple competitive strategies with these resources leads to our configurations being further categorized into one of two types: pure strategies coupled with single resources (see Cell D and E in Table 3.1) and multiple strategies coupled with both resources (see Cell F and G in Table 3.1), which will be addressed in the next two subsections.

ii. Pure strategies coupled with single resources

In this subsection, configurations refer to those that include one resource (i.e., either operations & logistics or management & human resources) as a key element together with a pure competitive strategy (i.e., low cost, innovation, or customer responsiveness strategy). When formulating strategies, decision makers may believe that competition is based on lower cost because the growth rate and profit potential of the market are low. In contrast, other managers may perceive that it will be more valuable for them to strive to provide high quality services, maintain an excellent image, or create better customer loyalty to a customer responsiveness strategy. Finally, there may still be other managers who believe that competition should be based on the firm's capacity to be

innovative. However, whatever strategies a firm chooses, decision makers are likely to deploy appropriate resources to support their strategy.

Building on literature on firms' resources and competitive strategies (Miles & Snow, 1978; Miller, 1986, 1988; Miller & Le-Breton Miller, 2005, 2006; Porter, 1980, 1985; Segev, 1989), this section will examine selected parings of the three pure strategies with the aforementioned two resources. I will consider the configurations of a pure competitive strategy (i.e., low cost, innovation, or customer responsiveness) with a single resource (management & human resources, or operations & logistics resources), leading to a set of four hypotheses.

a. Configuration of low cost strategy and operations & logistics resources

When customers are price sensitive and are inclined to choose products and services with the lowest price, managers may view economies of scale to be the basis for competition (Govindarajan, 1986; Hill, 1988); thus it is vital for the firm to bring down prices through superior efficiency. Hence, firms may provide standardized products or services in order to realize low prices and costs. The critical challenge for a firm, therefore, is to maximize operations or manufacturing capacities, shorten inventory turnover time, and control costs to a minimum (e.g., *Ryanair,* in Creaton, 2004).

Compared to its rivals, the firm may attribute its competitive advantage to the use of operations & logistics resources, which enhances its efficiency in equipment utilization and invested capital (Lynch et al., 2000; Novack et al., 1995; Pettus, 2001; Zhao et al., 2001). First, operations & logistics resources are especially helpful in several value chain activities. For example, some trucking firms may use uniform fleet equipment to maximize utilization and minimize operating costs. Other firms may use centralized

dispatch systems for freight, which enable them to purchase fuel locally at favourable bulk rates. Further, maintenance of the terminal facilities is also more efficient in centralized dispatch systems. Still others set standards in their business processes in order to efficiently plan, implement, or streamline their activities by dropping inefficient or obsolete ones (Kleysen, 2007; Stank & Stephenson, 1995; Streuber, 2007).

Secondly, when the firm is able to keep tight control of its operating costs and set up strict targets, it may possibly achieve greater efficiency and earn a higher return on investment (Hambrick, 1983; Miller & Dess, 1993; Wright et al., 1991). For example, operations & logistics resources help firms to determine how many miles are required to break even for the day. By consolidating the freight appropriately, trucking firms are able to control the linehaul cost (i.e., cost by distance rather by weight) effectively even if before running the truck down the road. These resources, therefore, are valuable in terms of enhancing a firm's usage of budget and cost control, coordination of various activities, and maintenance of internal efficiency. Firms are then able to implement low cost strategies and provide services at a significant cost advantage over their competitors (e.g., Creaton, 2004; Lynch et al., 2000; *Schneider National,* in Winston, 1998). By contrast, other resources (e.g., marketing, sales) are often used as cost-cutting measures or discretionary expenditures (also in Porter, 1980). Thus, I propose that:

Hypothesis 3a: The pairing of low cost strategy and operations & logistics resources will lead to high firm performance.

b. Configuration of innovation strategy and management & human resources

When customers are willing to pay premium prices to get added-on values derived from attributes of innovative products/services that are difficult for other firms to replicate, executives may pursue an innovation strategy to differentiate their firms from its competitors (Anand, Gardner, & Morris, 2007; Belzer, 2002). They may recognize the relationship of firm resources to innovation strategy (Galunic & Rodan, 1998; Yeoh & Roth, 1999). Specifically, for firms to pursue an innovation strategy, they may require management & human resources (Hughes & Morgan, 2008).

Internally, management & human resources are valuable because these firms need to grow and configure their distinctive competencies in research, product development, and service delivery. For example, some trucking firms are more creative in designing delivery schedules, tracking freight, and communicating with drivers (Marchington et al., 2003; Kleysen, 2007; Stank & Stephenson, 1995; Streuber, 2007). The flexibility of these innovative services will make them distinct from their competitors. Further, the less constrained by standardized rules and procedures in internal relationships and management, the more likely for firm employees to be motivated. Firms with informal communication channels and decentralized structures have a much greater capacity to communicate information, enhance employee satisfaction, and develop their innovative potential.

Externally, management & human resources are helpful to the firm in scanning environments, tracking information related to products/services provided by its rivals, and communicating with customers in a timely fashion (Chandler & Hanks, 1994;

Edelman et al, 2005). Only if firms are able to continuously design innovative high-quality products that satisfy customer's changing needs, are they able to establish an unbeatable innovation advantage. Thus, I hypothesize:

Hypothesis 3b: The pairing of innovation strategy and management & human resources will lead to high firm performance.

c. Configuration of customer responsiveness strategy and operations & logistics resources

For firms that intend to build their brand name, customer responsiveness strategy is ranked as the key component of gaining competitive advantage (e.g., *FedEx*'s next-day delivery service). Customer responsiveness strategy makes the most sense when customers have varied needs that cannot be met with an average product or service (Siggelkow, 2001). To respond to the needs of its customers, a firm may undertake product differentiation and invest heavily in operations & logistics resources.

For example, executives may believe that operations & logistics resources enable their firms to streamline and optimize their value chain (Lynch et al., 2000; Novack et al., 1995; Stank et al., 2005; Zhao et al., 2001). With operations & logistics resources, it may be easier for firms to find out which stages or procedures provide high-quality services to customers. Subsequently they will improve the operational process/routines and provide high-quality products indefinitely by offering more reliable services to their customers (Pettus, 2001; Pettus & Munoz, 2007; Sum & Teo, 1999). For example, some executives believe that customers prefer consistent and reliable service associated with regular truck routing. Additionally, a centralized dispatch system is more likely to guarantee the

dispatch of freight on a regular schedule. Thus, some trucking firms may strategically locate their headquarters and dispatches to provide greater convenience for customers, e.g., locations that are close to highways, railways, or waterways and thus able to easily connect to other cities (Kleysen, 2007; Novack et al., 1995; Streuber, 2007).

Operations & logistics resources are also valuable because they are helpful for integrating the firm's operational process and therefore enable it to respond to customers' needs more quickly (Stank & Stephenson, 1995). Firms may become aware of some aspects of organizational process used successfully by other businesses. As a result, operations & logistics resources improve the firm's capacity to attract customers. Thus, I hypothesize that:

Hypothesis 3c: The pairing of customer responsiveness strategy and operations & logistics resources will lead to high firm performance.

d. Configuration of customer responsiveness strategy and management & human resources

Firm executives may believe that management & human resources help them to understand what the trends will be in the future marketplace, what new market segments they can go into, what kind of product diversity they can pursue, how the firms are able to generate more sales, or how they should differentiate their firms' products from those of their rivals (Delery & Doty, 1996; Kang, Morris, & Snell, 2007; Powell & Dent-Micallef, 1997; Sheppeck & Militello, 2000). For example, *Crown Cork & Seal, Inc.* (Barney, 2001) uses its managerial skills in designing reward systems to compensate managers who are responsive to meet customer needs. It has significantly helped the firm

to pursue a customer responsiveness strategy. Likewise, *Procter & Gamble* was one of the first organizations that introduced brand management, an internal structure that allowed firms to decide on resources and profits at the brand level, in order to establish good customer relations (Dawar, 2004).

In the trucking industry, it is extremely valuable for firms to be active in the process of hiring and training drivers in order to meet or exceed customer expectations for on-time deliveries. However, such investments are rare as revealed by the shortage of experienced drivers across motor carriers in North America, since several trucking firms shut down due to high employee turnover (Shaw et al., 2005). In order to hire and retain qualified drivers, some trucking firms may design a more routine and humane schedule (e.g., schedule with more frequent stops at home) (Kleysen, 2007; Streuber, 2007). For example, Marchington et al. (2003) argued for the use of at least a minimum set of human resources investment.

Further, it is also valuable for trucking firms to establish well-developed internal communication systems in order to facilitate the distribution of information about the market and customers (Chandler & Hanks, 1994; Edelman et al, 2005). Imitation of these routines by other trucking firms will be costly because firms need continuous improvements in their structure, processes, and routines to keep ahead of the competition. Thus, the related hypothesis will be:

Hypothesis 3d: The pairing of customer responsiveness strategy and management & human resources will lead to high firm performance.

iii. Multiple strategies coupled with both resources

Different from the previous pairing of pure types of strategies and single resources, multiple types consider the simultaneous use of more than one strategy and both resources. Obviously, firms possessing a variety of resources (rather than resource-constrained ones) are more likely to be able to use multiple strategies coupled with resources either nested in each other or complementary (Black & Boal, 1994; Milgrom & Roberts, 1990, 1995; Miller, 1988, 1996; Porter & Siggelkow, 2004). In addition to individual resources, complementarities can further contribute to organizational success (Galunic & Rodan, 1998; Miller & Friesen, 1986; Rhyne & Teagarden, 1997). For example, bringing together research and development, organic structure, and supportive organizational culture is positively related to product innovation (Capon, Farley, Lehmann, & Hulbert, 1992). Research on acquisitions and alliances also shows that complementary resources contribute to high performance (Harrison, Hitt, Hoskisson, & Ireland, 1991). Another example (Meyer & Tran, 2006) is from global firms that acquire local firms in emerging economies to remedy the lack of market knowledge in a new environment. Therefore, when firms possess multiple resources, it may be easier for them to combine various strategies.

The first multiple type involves the combination of innovation and customer responsiveness strategies with the two resources. After all, both strategies are based on differentiation and their ultimate goals are attracting and retaining customers. Take the example of *Apple* (Moore, 1993). It competes in the personal computer industry but has been one of the pioneers of the consumer electronics industry. It has all the required R&D resources, high-tech sector knowledge, and creative scientists and employees. These

resources and capabilities enable *Apple* to pursue innovation and customer responsiveness strategies to answer people's needs, as reflected in its innovative products such as iPod and iPhone. At the same time, its substantial knowledge of logistics helps it to establish close links with suppliers, customers, and distributors. As a result, it is much easier for *Apple* to introduce new products to current customers and respond to their needs much faster and more efficiently.

In the trucking industry, there will be some firms that may be able to purse a customer responsiveness strategy in addition to an innovation strategy because they are resourceful in the aspects of logistics and management. For example, Pettus (2001) argued that trucking firms may expand to other regions, industries (e.g., ocean, small package, airfreight service), or international service in order to establish a more solid market position. Additionally, they may reconfigure their resources and diversify into different areas. Some of the firms may eventually transform into total transportation carriers. Thus, I hypothesize:

Hypothesis 4a: The pairing of customer responsiveness and innovation strategies with both resources (i.e., operations & logistics and management & human resources) will lead to high firm performance.

Firms may also pursue a low cost strategy in addition to innovation and customer responsiveness strategies with the use of both resources. As the learning process accelerates, the firm can reduce its fixed costs over time (Hill, 1988). Economies of scale and scope will be fully utilized if a firm is good at knowing how to hold down its operating costs and enhance its efficiency in each step of the value chain. Accordingly,

the firm may be able to pursue a low cost strategy combined with innovation and customer responsiveness strategies (Miller & Dess, 1993; Kim & Lim, 1988; Spanos et al., 2004). Executives with strategic intent for value innovation may undertake capability audits to strengthen current core competencies or develop new ones (Hamel & Prahalad, 1994) to make their strategic moves successful in order to look for "blue oceans" (Kim & Mauborgne, 2005). Consequently, complementarities of these resources and capabilities (e.g., Song et al., 2005) enable the firm to meet with the increased demands of firm products/services and expand its profit space through combination strategies. The fit among these strategies and resources is the major reason that firms are able to achieve high performance.

There are different examples of firms that successfully combine these three strategies (i.e., low cost, innovation, and customer responsiveness) coupled with both operations & logistics resources and management & human resources. For example, *Toyota* (Adler et al., 1999; Dyer, 1994) provides an excellent example of a firm that has combined the three strategies (i.e., innovation, low cost, customer responsiveness) with the two resources (logistics and management). With the innovative use of lean production systems, *Toyota* has been able to make small production runs economical since the 1960s. Its superior skills in managing logistics (e.g., the implementation of a parallel sourcing policy, that is, a long-term contract with two suppliers for the same component part) also help it to realize economies of scale at the stages of purchasing and manufacturing. Therefore, *Toyota* is able to combine low cost and innovation strategies with the use of operations & logistics resources.

On the other hand, *Toyota* is also a learning organization composed of experienced managers, engineers, and sales people. These human resources help *Toyota* to easily enter emerging market segments (e.g., SUV) and international markets with localized design and production facilities that help it cater to various customer segments. Compared to its rivals in North America (e.g., *GM*), *Toyota* is not constrained by a bureaucratic or inward-looking corporate culture, so it is able to creatively enact such combinations of strategies with resources.

Based on the above analysis and facts, it is therefore proposed that:

Hypothesis 4b: The pairing of all three strategies (i.e., low cost, customer responsiveness, and innovation) with both resources (i.e., operations & logistics and management & human resources) will lead to high firm performance.

iv. Performance differences across configurations

In the above sections, I have proposed four sets of hypotheses regarding what different configurations of strategies and/or resources are associated with firm performance. A related issue is whether these different configurations will lead to similar levels of firm performance. In other words, does equifinality exist?

Rather than relying on the assumption that a best path exists for a system to reach the final state, equifinality acknowledges the possibility that multiple paths may be equally effective for a system under certain circumstances (Gresov & Drazin, 1997; Katz & Kahn, 1966). Despite the relatively scarce attention in previous studies to the equifinal possibility (Fiss, 2007; Miller, 1981), equifinality has gradually received researchers' attention and has been empirically tested with different research designs. For example, in

their qualitative study of the emergence and embedding of new practice creation in management consulting firms, Anand et al. (2007) noted that the four generative elements of socialized agency, differentiated expertise, defensible turf, and organizational support combined in three equifinal pathways: expertise-based pathways, turf-based pathways, and support-based pathways. Likewise, using the agent-based simulation, Siggelkow and Rivkin (2005) proposed different formal designs for firms to cope with turbulent and/or complex environments.

In the area of competitive strategies, the notion of equifinality is implicit in major research frameworks; for example, the models developed by Porter (1980, 1985) and Miles and Snow (1978). Further, with the profile deviation method, Doty et al. (1993) tested Miles and Snow's model and found that firms belonging to *Defender*, *Prospector*, or *Analyzer* achieved similar performance. Recently, Jennings, Rajaratnam, and Lawrence (2003) found similar results in their research of the strategy-performance relationship in service firms by conducting an analysis of variance (ANOVA). Nevertheless, there is still ongoing debate on whether firm performance is similar or different across various strategic groups (e.g., Barney & Hoskisson, 1990; Fiegenbaum & Thomas, 1990; Ketchen et al., 1997; Ketchen et al., 2004).

Firms may have different expertise because of their historical path or their resource set's causal ambiguity. Their strengths and weaknesses may differ because of a firm's possession of different types of resources. Further, top managers may have different "dominant logics" (Bettis & Prahald, 1995) which also explain the existence of heterogeneous configurations. Accordingly, firms within each configuration may choose what the best strategy or the best combination of strategies should work for them, what

the most suitable resources are to utilize, and which of the most similar firms they need to compete with. If firm performance differs significantly across configurations, firms may follow new strategic recipes (Spender, 1980) and transfer to another configuration in order to seek the fit (Siggelkow, 2002). As a result, I may explore performance differences across configurations proposed in the hypotheses.

3.2 CONCLUSION

This study seeks to provide insights concerning the relationship among competitive strategies (low cost, innovation, and customer responsiveness), resources (operations & logistics and management & human resources), and firm performance. Although academia and practitioners have made progress over time, a comprehensive framework that integrates all these major constructs to explain differences in firm performance is still needed. This chapter proposes four sets of hypotheses in order to answer the following question: what configurations of competitive strategies and resources are likely to lead to a high level of firm performance?

Examining the configurational co-alignment among various variables (i.e., strategies and resources) and revealing their causal relationships with firm performance requires an effective methodology. Following the suggestion of enhancing internal validity in the study proposed by Ketchen et al. (1993), I chose the setting of a single industry to examine configurations of strategies and resources, that is, the U.S. motor carrier industry.

It is also hard to examine and explore configurations by using traditional approaches (e.g., regression models, clustering techniques, ideal-type profile deviation techniques, etc.) because of methodological limitations associated with them. In the next

chapter, I therefore introduce and discuss the application of the set-theoretic approach (Ragin, 1986, 2000) in a test of different configurations. Before discussing the application of the set-theoretic approach, I first introduce the research context for this study, the U.S. motor carrier industry.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 RESEARCH CONTEXT

4.1.1 The U.S. Motor Carrier Industry

In this research, I chose the U.S. motor carrier industry to test the relationship of configurations of strategies and resources with firm performance. In the context of globalization, firms have realized the significance of providing high quality products, developing innovative services and responding to customers' needs. The motor carrier industry provides logistics facilitation through activities such as purchasing, transportation, warehousing, packaging and scheduling. Compared to other industries such as air, rail, and water transportation, trucking covered over 84.3 per cent of freight costs in the United States in 2005. The freight volume transported by the trucking industry accounted for 68.9 percent of the total in the U.S. in 2005 (American Trucking Associations, 2006).

Industry deregulation always redraws industry boundaries, in addition to shifting the scope of activities and strategies for incumbents and entrants (Bonardi, 2004; Delmas & Tokat, 2005; Smith & Grimm, 1987). For example, deregulation in the telecommunications industry has evidenced the separation of firms targeting specific customer segments from those competing aggressively by using low price strategies (Bonardi, 1999). In the trucking industry, the Interstate Commerce Commission (ICC) loosened its controls through interstate deregulation (1980) and intrastate deregulation (1995) after almost 50 years of high regulation. After deregulation, the trucking industry became more fragmented. There were more than 524,000 carriers on file with the U.S.

Department of Transportation by 2004, compared with fewer than 20,000 interstate motor carriers before 1980 (American Transportation Research Institute, 2006). The trucking industry has become a major employer with more than 8.6 million people employed in the U.S. in 2003.

Deregulation in the trucking industry has also changed relationships between the motor carriers and their customers (shippers). Shippers can reduce the number of their carriers, while carriers are able to negotiate long-term contracts and develop close relationships with their shippers (Glaskowsky, 1986). But, trucking firms are faced with new opportunities and threats; for instance, the increased use of the national hub-and-spoke system, labour shortages and the increasingly turbulent environment. In addition, there is a proliferation of information technology such as Electronic Data Interchange (EDI) and on-board computer systems (Rakowski et al., 1993; Snyman, 2006). Trucking firms need to make strategic changes to compete; as a result, companies may choose their strategies by focusing on high quality services, or innovative products, or low prices, as in other deregulated industries.

The trucking industry is composed of for-hire carriers (less-than-truckload trucking and truckload trucking), private carriers, and owner-operators. In this research, my focus is on for-hire carriers. It is fragmented with numerous small businesses in the industry segment. Over 87 percent of trucking firms operate six or fewer trucks (American Trucking Associations, 2006). At the same time, large carriers are turning into asset-based transportation management firms (Pettus, 2001). These carriers use a variety of resources, including network design, intermodal operations and computer systems, experienced drivers, and networking with customers (Winston, 1998).

4.1.2 Competing Strategies and Resources in the Trucking Industry

Various executives in the trucking industry have different beliefs concerning what constitutes the essential elements of competitive advantage. Some may perceive that the environment is composed of numerous dynamic and unpredictable competitors. Customers require fast, timely, and precise services that are upgraded with the newest information technology (Klaysen, 2007; Stank & Stephenson, 1995; Streuber, 2007). Their firms may provide innovative and customized services in order to meet customer needs. The extensive distribution network and advanced techniques (e.g., Benchmarking, EDI, TQM, Re-engineering, and satellite tracking systems) are useful for them to monitor their products/services. For example, firms can utilize information on truck speeds, fuel usage, engine temperature and other data in order to ensure high quality services provided for their customers. They may also attempt to establish a brand name, advertise services, build relationships with customers, train experienced drivers and engineers, and improve customer satisfaction. Thus, the key to success is the application of innovation and customer responsiveness strategies by exploiting and developing certain types of firm resources and capabilities (Lynch et al., 2000; Marchington, et al., 2003; Novack et al., 2001; Pettus, 2001; Stank, et al., 2005; Zhao et al., 2001).

By contrast, other executives may think that the trucking industry is cost-driven with high pricing pressures (Belzer, 2002; Stank & Stephenson, 1995; Stephenson & Stank, 1994). Costs include recruiting their own drivers or contracting with owner-operators, transporting shipments between terminals, and sorting freight. The costs are high partly due to dramatic increases in fuel prices, taxes, and insurance rates (Stank & Stephenson, 1995). Typically, expenses related to the operation of equipment and

transportation are major costs for trucking firms. For example, fuel expenditures account for 20 percent to 25 percent of total operating costs. The common optimal operating ratios (operating costs / operating revenues) of trucking firms are 95 to 98 per cent, which shows that operational profits in the trucking industry are vastly constrained (American Trucking Associations, 2006). On the other hand, driver shortage and rapid turnover also explain trucking firms' high cost structure. In addition, the industry is fragmented and the shippers are price sensitive. The switching costs are low so that shippers can easily turn to other carriers. All these factors lead these firms to lower operating ratios by tightening cost controls. Accordingly, they are likely to adopt a low cost strategy and price their services in a competitive manner. For example, *Schneider National* (long distance trucking) responded to deregulation with a low cost strategy by obtaining substantial operating efficiencies based on heavy investment in logistics and communication infrastructure (Winston, 1998).

Smith, Corsi, and Grimm (1990) identified four strategic groups among less-than-truckload freight carriers after deregulation and found strategies were a major determinant of financial performance. In another study, Corsi et al. (1991) used squared Euclidian distance measures to classify their samples of motor carriers into six clusters: differentiation based on quality, product focus, regional focus, contingency, broad product/geographic focus, and low cost. They found differentiation strategy was positively associated with the highest performance. Further, Sum and Teo (1999) found four strategic types of logistics providers in Singapore: pure low cost, pure differentiation, hybrid of low cost and differentiation, and no strategy. They found almost half of the respondents used pure differentiation, and pure cost leaders and hybrids each

accounted for 25.5 per cent of all respondents. Hybrids performed the best along all dimensions of firm performance (e.g., growth in return on assets, return on sales, and market share). Similar patterns appeared in another study of Hong Kong third-party logistics providers (Yeung et al., 2006). Interesting as the studies are, however, operationalization of the four typologies was relatively rough. Basically, the typologies were classified by measuring relative price and cost (e.g., low cost was measured by low cost/low price, and hybrid was measured by low cost/high price).

Although previous research on competitive strategies and resources in the trucking industry had its merits, it did not examine the co-alignment between resources and strategies. As argued in previous sections, competitive strategies or resources are not the sole element that determines success for the firm. The fit between strategies and resources may be the key to success. By examining the motor carrier industry in the U.S., this study is aimed at exploring the match between competitive strategies and resources and its associated impact on firm performance.

4.1.3 Research Design

In this study, I used two sources of archival data to test my conceptual model of strategies, resources, and firm performance (see Figure 3.1). First, I used secondary data based on the survey of a random sample of 332 motor carriers. These data were from the research project # MBTC-1058: Strategy, Structure, and Performance of the Rural Transportation Companies (Principal Investigator: Parshotam Dass; Investigator: John Ozment; Research Associate: Ken Zantow) sponsored by the *Mack-Blackwell National Rural Transportation Study Centre, University of Arkansas*, established by the *U.S.*

Department of Transportation. Second, the financial data were collected from the *TTS Blue Book of Trucking Companies.*

The survey used a random sample of 1,100 U.S. trucking firms that reported information to the Interstate Commerce Commission (ICC) and were included in the *TTS Blue Book of Trucking Companies* (henceforth, the TTS Blue Book). The criterion for inclusion in the survey was that the firm had at least 30 employees or five million U.S. dollars in gross revenues. During the survey, researchers made phone calls to all the 1,100 firms in order to identify the Chief Executive Officer (CEO) of the company. Thirty-one firms could not be contacted by the researchers, had gone out of business, or refused to participate in the study during the initial contact period. Thus, the final number of potential respondents was 1,069.

To develop the questionnaire, first, potential questions and issues were raised based on researchers' extensive literature review on strategic management and the trucking industry. Next, they sent a letter introducing the research team and a brief description of the study to each of the participants identified through telephone contacts. Following an initial mailing and telephone contacts, the questionnaire was mailed to the CEO of each company in the final sample. Each person who had not yet responded after three to four weeks was contacted again by telephone, and approximately four to five weeks beyond that, a follow-up card was sent to non-respondents. A total of 332 companies returned completed questionnaires, yielding a response rate of 31 per cent. These 332 responses formed the sample for the survey data.

The completed questionnaire included responses from top executives in the U.S. motor carrier industry. Ninety-one per cent of the respondents were CEO, President,

Chairman, Owner of the company, Vice President, Executive Vice president, and Corporate Officers. The rest nine per cent were Departmental Directors or General Managers. Among them, 67 per cent were truckload firms, 16 per cent were less-than-truckload firms, and the rest were special commodity carriers. The average number of employees in these firms was 2,188. Most executives were males (95%) and their average age was 49 years. Over half of the executives had at least a college degree. Management was the most indicated primary area of experience (65 per cent) and the average time for them to be in their present position was 13 years. There were no significant differences in responses by group on major study variables.

Survey data of the executives reflects top managers' perception of the firm's strategies, resources and performance. These items are based on their mental models and the elements to construct competitive space. Objective data cannot offer the same insights as those based on managers' actual responses. As a result, I chose self-reported measures based on the survey of top executives in the industry, where the executives were asked to rate each measure separately indicating the extent to which resources contributed to firm success, or the frequency of use of specific competitive strategies, or firm performance relative to competitors. In summary, the data obtained through the questionnaires covered strategies, resources, performance, safety issues, and information about the structural characteristics of the company (e.g., size, fleet, etc.), among others.

I also collected performance data of these trucking firms from different sources. Specifically, financial performance information from the TTS database was reported for these companies, thus the supplementary analyses in this study were based on these companies. I calculated five financial measures: return on assets (ROA, e.g., in Dess &

Davis, 1984; Kim & Lim, 1988; Nickerson & Silverman, 2003), return on sales (ROS, e.g., in Nickerson & Silverman, 2003; Robinson & Pearce, 1988), return on investment (ROI, e.g., in Hambrick, 1983; Miller & Dess, 1993; Wright et al., 1991), return on equity (ROE, e.g., in Kim & Lim, 1988), and operating ratio (OPT). In addition to the other four common financial measures, Operating ratio (OPT) is widely used in trucking firms to measure profitability (e.g. Corsi & Fanara, 1988), which is equal to the ratio of total operating expenses to operating income. In order to smooth out the concurrent effects of the data, I calculated these five measures based on the data available in the subsequent financial year. Accordingly, the supplementary analysis using objective financial measures of firm performance in addition to perceptual performance constructs will correct the potential problem of common method bias in this study.

4.2 DATA ANALYSIS: A SET-THEORETIC APPROACH

In this study, I used a set-theoretic approach to examine configurations of business strategies and resources associated with high firm performance in the U.S. trucking industry. The set-theoretic approach has been widely used in political science and sociology (Hodson & Roscigno, 2004; Kvist, 2006; Roscigno & Hodson, 2004). Recently, a group of researchers have applied this approach in the area of management (Fiss, 2007; Kogut et al., 2004; Kogut & Ragin, 2006).

In a set-theoretic approach, set membership is a critical construct as it reflects the relationships among different variables (Fiss, 2007; Ragin, 1986, 2000). For example, let us think of two sets of firms that have high performance (set 1) and low performance (set 2). One possible reason why some firms can achieve high performance is because they

use innovation strategies, as evidenced in the literature of competitive strategies (e.g., Porter, 1980, 1985). Accordingly, a proposed hypothesis that innovation strategy leads to high performance means that firms using innovation strategies constitutes a *subset* of the first set (i.e., high-performing firms). As a result, a set-theoretic approach is useful to reveal the relationship between causal factors and the outcome in the research sample.

There are two major reasons why I chose to use the set-theoretic approach in this study. First, a set-theoretic approach acknowledges the notion of equifinality (Gresov & Drazin, 1997; Ragin, 2000), which indicates alternative ways to achieve the same final state. The subset relationships of causal conditions and the outcome are useful to find out different sufficient antecedents; however, they do not mean that these antecedents are necessary. For example, innovation strategy is sufficient but may not be necessary for high performance. In other words, other strategies (e.g., low cost or customer responsiveness strategy) may lead to high performance, in addition to innovation strategy. By using the set-theoretic approach, it is possible to find the simultaneous existence of these different causal factors leading to the same level of firm performance. Therefore, a set-theoretic approach incorporates equifinality.

Second, a set-theoretic approach emphasizes the notion of configurations and causal complexity (Ragin, 2000), which is difficult to examine by traditional methods. For example, we may propose that the configuration of innovation strategy and management & human resources is sufficient to explain high firm performance, thereby the set of firms using innovation strategies and management & human resources constitute a subset of high performing firms (as indicated in Hypothesis *H3b)*. Alternatively, we may propose that the combined low cost strategy with operations &

logistics resources also lead to high firm performance (as indicated in Hypothesis *H3a)*. As a result, firms that pursue low cost strategies with operations & logistics resources constitute another subset of high performing firms. Further, there may be other configurations that lead to high performance but we do not have the theoretical basis to propose (e.g., the phenomenon of strategy absence, in Inkpen & Chowdhury, 1995). In addition, not all configurations may be viable due to "limited variety" (Ragin, 1986, 2000). A set-theoretic approach may help to examine the relationships between various configurations composed of multiple strategies and resources and firm performance.

There have been a variety of methodologies developed to examine the concept of configurations, e.g., regression analysis, cluster analysis, ideal-type profile deviation, and the qualitative method, among others (for a detailed review of the methodologies, see Fiss, 2007). Regression analysis (Dess et al., 1997; Hambrick, 1983; Kim & Lim, 1988) is useful to explain interactions of variables, but it is essentially reductionistic because of its focus on major independent variables while treating others as error terms in the equation. It is also difficult to work with interactions of multiple categorical variables. Furthermore, when there are multiple factors, the regression analysis becomes cumbersome for explanations of more than three-way interactions, especially when it is necessary to enter all lower-order interactions.

Cluster analysis (Ebben & Johnson, 2005; Ketchen et al., 1993) has the advantage of including more variables and clustering the research sample; however, picking selection criteria that include irrelevant characteristics may put similar cases into different clusters. Consequently, some researchers are sceptical of the reliability and validity of clustering techniques (e.g., Ketchen & Shook, 1996).

The profile deviation method (Doty et al., 1993; Hughes & Morgan, 2008) emphasizes the concept of fit among different factors in a holistic pattern, but most researchers select the ideal type based on the sample data used in the empirical studies. They usually pick the top 10 or 15 per cent (e.g., Van de Ven & Drazin, 1985; Venkatraman, 1990; Venkatraman & Prescott, 1990) or the top third (Olson et al., 2005) of sample firms to empirically construct ideal type profiles. Further, the fit or misfit among these multiple profile factors associated with the final outcome may be examined in a collective manner, but it is hard to explain what the composition of individual factors is within the profile and how they are inter-related and lead to fit or misfit (da Silveira, 2005; Doty et al., 1993).

By contrast, the qualitative method (e.g., Anand et al., 2007; Brown & Eisenhardt, 1997) is able to provide rich information on the complex relationships among variables; however, it loses its ability to provide a delicate and thorough analysis by researchers when the sample size is too large. In other words, researchers often have difficulty handling parsimony and complexity (Eisenhardt, 1989; Locke 2007).

Along a different line, the set-theoretic approach (Ragin, 1986, 2000) distinguishes itself from those traditional methods by emphasizing holisticity, causal complexity, nonlinearity, and asymmetry. It is used not only to explain how different combinations of causal factors lead to the same outcome but also to assess the contribution of each path to the outcome in question. It differs from other traditional methodologies because it brings together the qualitative and quantitative methods. Its quantitative aspects are associated with defining research question(s), validating constructs, and providing statistical measures supporting or rejecting hypotheses, whereas

its qualitative attributes are highlighted in the process of "within-case analysis" (Eisenhardt, 1998) or comparative analysis across cases (Ragin, 1986, 2000).

To better explain the difference between set-theoretic approaches and traditional regression/correlation methods, I provide an example explaining the mechanics and the formulae in Appendix 2.

4.2.1 Fuzzy Sets

The traditional way of applying a set-theoretic approach is to classify variables by using crisp sets so that they will fall into dichotomous sets such as high/low, or presence/absence, or black/white. As a result of this classification system, their membership is defined as either "in" the set or "out of" the set. By using binary values, membership scores of these variables could be either 0 or 1. In essence, crisp sets reflect the qualitative attributes of variables (i.e., two states in strict contrast).

However, these dichotomous values are not that precise in terms of revealing quantitative attributes of variables. For example, how do we measure the "grey zone" along the continuum of black and white? This question requires more fine-grained measures. In contrast to crisp sets, fuzzy sets (Zadeh, 1965) which incorporate information of varying levels or degrees of membership provide a useful tool for researchers to calibrate measures into values in the interval between 0 and 1. Accordingly, the membership values can be expanded to reflect different degrees of subset relationship. In this way, fuzzy sets are essentially qualitative and quantitative.

In practice, fuzzy sets take either discrete or continuous schemata of values (Ragin, 2000). First, they may include only a limited number of values. For example, there are 3-value fuzzy sets (0, .50, and 1), 5-value fuzzy sets (0, .25, .50, .75, and 1), and

7-value fuzzy sets (0, .17, .33, .50, .67, .83, and 1), among others. A score of 1 means being fully in the set, whereas a score of 0 represents being fully out of the set. The 0.5-point is called the crossover point, which implies being neither in nor out of the set and hence represents the point of maximum ambiguity of set membership.[3]

Alternatively, fuzzy sets could take continuous values in the interval between 0 and 1. With .50 as the crossover point, this scheme may have infinite number of set membership scores, where partitioning could be "more fine-grained up to continuous sets" (Fiss, 2007: 1186).

4.2.2 Calibration of Measurement into Fuzzy Sets

The first step in the set-theoretic analysis is to calibrate original measures into fuzzy sets. In this study, I recoded the measures into fuzzy sets by using a continuous scheme. Compared to fuzzy sets with schemes of discrete values, the membership scores of continuous fuzzy sets, as noted above, vary in the interval between 0 and 1. There are two methods to calibrate continuous fuzzy sets: direct method and indirect method (Ragin, forthcoming b).[4] In the indirect method, qualitative coding (i.e., log odds of full memberships) is used as an instrumental scheme of variables that connect original measurement (e.g., indices derived from items on a Likert scale) and the fuzzy sets. Qualitative coding usually uses a 6-value scheme (Ragin, forthcoming b): (a) out of the set, (b) probably out of the set, (c) more out than in the set, (d) more in than out of the set,

[3] This scheme seems equivalent to ordinal scales; however, ordinal scales only reflect the ranking order of a case relative to others on particular attributes. Fuzzy sets, instead, emphasize the information of set membership with reference to external criteria (Ragin, 2000). The calibration of ordinal ranks to fuzzy membership scores requires substantive and theoretical knowledge (Ragin, forthcoming b).

[4] The direct method emphasizes the three qualitative anchors: full membership (1), full nonmembership (0), and crossover point (0.5). Therefore, each qualitative anchor is assigned with a precise numerical value. In the indirect method, cases are categorized into different qualitative groups with presumed set membership scores.

(e) probably in the set, and (f) in the set. There is correspondence between the verbal label, log odds of full membership, and degree of membership, as given in Table 4.1.

Therefore, the key is to select the threshold value of original measures in correspondence with the values of qualitative coding and then to establish six qualitative groupings (Ragin, forthcoming b). The threshold value for each qualitative group is based on external standards that require researchers' substantive and theoretical knowledge of strategic management and the particular industry as well. For example, in the illustration provided in Table 4.2, firms with innovation strategy greater than 4.6 on the 5-point scale have been coded as fully in the target set of innovation strategy (i.e., log odds of full membership is 5.0); firms with innovation strategy less than or equal to 2.2 have been coded as fully out of the target set of innovation strategy (i.e., log odds of full membership is -5.0); and so on. These recoded data are called qualitative coding (Ragin, forthcoming b). The original values and qualitative coding for the innovation strategy of the sample firms are indicated in Columns 2 and 3 in Table 4.2. I only present 20 cases here for illustration.

A problem with the recoding is that the original continuous measures are turned into qualitative coding with discrete values (as shown in Table 4.2). To get a more precise measure that reflects the set relationship, I used cubic regression to estimate the predicted qualitative coding of each case. In the regression, innovation strategy was the independent variable, and the qualitative coding was the dependent variable. The predicted qualitative coding of each case (reported in Column 4 in Table 4.2) reflects its odds or chances of membership in the target set.

TABLE 4.1
TRANSLATIONS BETWEEN DIFFERENT SCHEMES *

Verbal label	Log odds of full membership (Qualitative coding)	Degree of membership
Full membership	5.0	.993
Probably in	2.0	.881
More in than out	0.5	.622
More out than in	-0.5	.378
Probably out	-2.0	.119
Full non-membership	-5.0	.007

* Adapted from Ragin (forthcoming b)

TABLE 4.2
CALIBRATING DEGREE OF MEMBERSHIP IN THE SET OF INNOVATION STRATEGY

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Firms	Innovation strategy	Qualitative coding (Log odds of full membership)	Predicted qualitative coding [1]	Exponential of predicted qualitative coding [2]	Degree of membership [3]
A	1.2	-5.0	-7.145	0.001	0.001
B	1.6	-5.0	-5.397	0.005	0.005
C	2	-5.0	-3.937	0.020	0.019
D	2.2	-5.0	-3.294	0.037	0.036
E	2.8	-2.0	-1.614	0.199	0.166
F	3	-0.5	-1.109	0.330	0.248
G	3	-0.5	-1.109	0.330	0.248
H	3.2	-0.5	-0.618	0.539	0.350
I	3.4	-0.5	-0.131	0.877	0.467
J	3.6	0.5	0.358	1.431	0.589
K	3.6	0.5	0.358	1.431	0.589
L	4	2.0	1.380	3.975	0.799
M	4	2.0	1.380	3.975	0.799
N	4	2.0	1.380	3.975	0.799
O	4.2	2.0	1.929	6.883	0.873
P	4.4	2.0	2.515	12.362	0.925
Q	4.6	2.0	3.145	23.227	0.959
R	4.8	5.0	3.829	46.029	0.979
S	5	5.0	4.575	97.020	0.990
T	5	5.0	4.575	97.020	0.990

[1] Predicted coding is obtained by running the cubic regression of the qualitative coding (in Column 3) on innovation strategy (in Column 2). It is equal to the predicted value of qualitative coding after cubic regression.
[2] Exponential of predicted qualitative coding = exp (predicted qualitative coding)
[3] Degree of membership = exponential of predicted qualitative coding / (1 + exponential of predicted qualitative coding)

The next step is to transform the predicted qualitative coding (i.e., predicted coding, which represents odds of membership in the target set) into membership scores. The relationship between odds of membership and degree of membership (Ragin, forthcoming b) is as follows:

$$\text{Odds of membership} = \frac{\text{degree of membership}}{1 - \text{degree of membership}} \quad (1)$$

Therefore,

$$\text{Degree of membership} = \frac{\text{odds of membership}}{1 + \text{odds of membership}} \quad (2)$$

Because

$$\text{Odds of full membership} = \exp(\text{log odds of full membership}) \quad (3)$$

Where exp denotes exponentiation of log odds to simple odds.

Therefore, formula (2) becomes:

$$\text{Degree of membership} = \frac{\exp(\text{log odds of full membership})}{1 + \exp(\text{log odds of full membership})} \quad (4)$$

Finally, the original values are transformed into the degree of membership in terms of fuzzy sets as in column 6 in Table 4.2.

4.2.3 Evaluation of Calibrated Measures

i. Application of the basic rules of set operation

The next step is to use calibrated fuzzy-set measures to evaluate causal set relations in the model. In the set-theoretic approach, it is crucial to examine whether one particular causal factor (X) or combination of causal factors (e.g., X_1, X_2) is sufficient to explain occurrence of the outcome (Y). On the other hand, we also need to know whether

there are other causal factors or combinations of causal factors for the outcome to occur. Therefore, X may be only a subset of Y.

Before determining the set-relationships between causal factors and the outcome, I needed to get the set membership scores of configurational antecedent conditions. In the set-theoretic approach, three basic rules of set operation are needed to assess membership scores of configurational factors in the study:

(1) Examining the existence of different configurational antecedents is logically similar to performing an 'and' operation; therefore, the calculation of membership scores of combinational causal factors follows the *intersection rule*, which takes the minimum of the membership degree of X in each set:

$$\mathbf{M}_{A \wedge B}\ (\mathbf{X}) = \mathbf{M_A}(\mathbf{X}) \wedge \mathbf{M_B}(\mathbf{X}) = \mathbf{min}\ (\mathbf{M_A}(\mathbf{X}), \mathbf{M_B}(\mathbf{X})) \quad (5)$$

Where M (X) represents the membership score of X.

For example, if membership score of case X in set *innovation strategy* is 0.2 and 0.8 in set *customer responsiveness strategy*, X then has a membership score of 0.2 in the set of firms that use *combined innovation and customer responsiveness strategies*. The *intersection rule* is still valid for anything more than three sets. In the example provided in Table 4.3, we need to examine set *innovation strategy,* set *customer responsiveness strategy,* and set *low cost strategy* to determine the final set membership scores of the three causal conditions (as in Column 5).

(2) The second operation in the set-theoretic method is the 'or' operation. It follows the logic of the *union rule*, which takes the maximum of the membership degree of X in each set:

$$\mathbf{M}_{A \vee B}\ (\mathbf{X}) = \mathbf{M_A}(\mathbf{X}) \vee \mathbf{M_B}(\mathbf{X}) = \mathbf{max}\ (\mathbf{M_A}(\mathbf{X}), \mathbf{M_B}(\mathbf{X})) \quad (6)$$

TABLE 4.3 ILLUSTRATION OF FUZZY SET OPERATION: AND ($\wedge$), OR ($\vee$), AND NEGATION ($\sim$)

Firms	Membership in causal conditions			Membership			
	Column 1	Column 2	Column 3	Column 4 [a]	Column 5 [b]	Column 6 [c]	Column 7 [d]
	Innovation (I)	Customer responsiveness (C)	Low cost (L)	~L	I $\wedge$ C $\wedge$ L	I $\vee$ C $\vee$ L	I $\wedge$ C $\wedge$ (~L)
1	0.96	0.92	0.09	0.91	0.09	0.96	0.91
2	0.93	0.33	0.45	0.55	0.33	0.93	0.33
3	0.87	0.64	0.09	0.91	0.09	0.87	0.64
4	0.99	0.75	0.45	0.55	0.45	0.99	0.55
5	0.99	0.20	0.27	0.73	0.20	0.99	0.20
6	0.59	0.05	0.42	0.58	0.05	0.59	0.55
7	0.59	0.76	0.40	0.60	0.40	0.76	0.59
8	0.87	0.99	0.32	0.68	0.32	0.99	0.68
9	0.70	0.43	0.59	0.41	0.43	0.70	0.43
10	0.93	0.67	0.70	0.30	0.67	0.93	0.30

[a] Column 4 represents the membership scores of each firm in the set of firms that do not use low cost strategies.
[b] Column 5 represents the membership scores of each firm in the set of firms that use innovation, customer responsiveness and low cost strategies simultaneously.
[c] Column 6 represents the membership scores of each firm in the set of firms that use any of the three strategies: innovation, customer responsiveness and low cost.
[d] Column 7 represents the membership scores of each firm in the set of firms that use innovation and customer responsiveness strategies but do not use low cost strategies.

In the case of membership scores of 0.2 and 0.8 in set *innovation strategy* and set *customer responsiveness strategy* respectively, X has a membership value of 0.8 in the set of firms that use *either innovation or customer responsiveness strategy.*

(3) The third operation, 'negation', is calculated by subtracting the membership score from 1, as follows:

$$\sim M_A(X) = 1 - M_A(X) \quad (7)$$

For example, Column 4 in Table 4.3 indicates the membership score of each firm in the set of firms that do not pursue low cost strategies in each of the 10 illustrated firms.

In the system, the operations of 'and', 'or', and 'negation' are denoted by the symbols '$\wedge$', '$\vee$', and '~', respectively. Table 4.3 provides an illustration of these three operations of fuzzy sets. Three variables are addressed for the purpose of illustration: innovation strategy (I), customer responsiveness strategy (C), and low cost strategy (L). Column 5 labelled by $I \wedge C \wedge L$ signifies the membership scores of the three configurational factors after applying the intersection rule. Since each row corresponds to each firm, each firm has a different membership score of configurational antecedents depending on the value of each variable. For example, firm #10 has the greatest membership score (0.67) because the minimum membership of I, C, and L is 0.67. By contrast, firm #6 has the lowest membership score (0.05). Similarly, the union rule is used to calculate the membership scores of $I \vee C \vee L$, and the combined intersection and negation rule is used for $I \wedge C \wedge (\sim L)$.

ii. Calculation of consistency scores

Applying the basic rules of set operation helps to obtain set membership scores of configurational antecedents for each case. The following step is to evaluate subset

relationships between antecedents and the outcome using two measures: *consistency* and *coverage*.[5]

Consistency measures "the degree to which the empirical evidence is consistent with the set theoretic relation in question" (Ragin, 2006). For example, it measures the extent to which firms following innovation strategies have high performance when compared to all the firms that pursue innovation strategies. The original method to calculate consistency score (Ragin, 2000) was to count the proportion of cases in which the membership score of the outcome is greater than or equal to that of causal factors, that is, $Xi \leq Yi$. For example, if this is true for 9 out of 10 cases in our example, the consistency score is 0.90 (9/10). The higher the value of the consistency scores, the higher is the consistency of set theoretic relationships.

A limitation of this counting method is that it does not consider the fact that cases with different membership in fact contribute to consistency differently. For example, we have two cases that both are consistent with the criterion $Xi \leq Yi$. However, membership scores of Xi and Yi are 0.2 and 0.3 in the first case, and 0.9 and 0.95 in the second case. Do these two cases explain consistencies of Xi and Yi equally? Probably the answer is no. The second case is more powerful to explain subset membership because it mostly falls in the set of Xi, whereas the first case mostly falls out of the set. Therefore, the value of membership scores of Xi has impact on the power of consistency scores to interpret subset membership.

To remedy the shortcomings of the counting method, Ragin (2006) introduced a new way to calculate a consistency score by using the following formula:

[5] Appendix 2 also provides a crisp set example that helps to understand the two measures: consistency and coverage.

$$\textbf{Consistency } (\mathbf{Xi} \leq \mathbf{Yi}) = \sum(\min(Xi, Yi)) / \sum(Xi) \quad (8)$$

Where "min" indicates the lower value of Xi and Yi, Xi represents membership value in a combination of antecedent factors, and Yi is the membership value in the outcome. $\sum$ means all the cases are included. The closer the consistency score to 1, the more Xi values are less than or equal to their corresponding Yi values, which means the greater chance that X is empirically sufficient to explain the outcome Y.

iii. Calculation of coverage scores

Coverage assesses the degree of empirical relevance of certain causes or causal combinations to explain the outcome in question (Ragin, 2006). Different from the consistency score in the previous example, it measures the proportion of variance in high performance firms (Y) that is explained by innovation strategy (X) rather than other strategies. The formula to calculate coverage score (Ragin, 2006) is:

$$\textbf{Coverage } (\mathbf{Xi} \leq \mathbf{Yi}) = \sum(\min(Xi, Yi)) / \sum(Yi) \quad (9)$$

There are two types of coverage scores: *overall coverage* and *unique coverage*. Because it is not uncommon to find multiple paths that lead to the outcome by researchers using set-theoretic approaches, *overall coverage* assesses the extent to which all the sufficient paths explain the outcome; consequently, overall coverage is similar to the R^2 in regression models. By contrast, *unique coverage* measures the degree of empirical relevance of a certain cause or causal combination to explain the outcome. It is useful to understand the relative weight of each path in leading to the outcome in one model.

In sum, the value of consistency scores and coverage scores provides the tool to evaluate the importance or relevance of different configurational antecedents as well as

the overall model (Ragin, 2006). The higher the value of consistency and coverage scores, the more powerful is the model.

4.2.4 Using the Fuzzy-set-truth-table Method

Currently, the software Fuzzy-set/Qualitative Comparative Analysis (fs/QCA) uses crisp truth tables to calculate the membership scores of variables as well as the consistency and coverage scores (Ragin, forthcoming a). As seen from Table 4.4, each truth table row represents a unique logically possible combination of different antecedent conditions derived from a related causal argument. With the fuzzy-set-truth-table method, in each row, the presence of a particular causal factor is represented by one, and zero signifies its absence. As the result of this crisp value system (i.e., zero or one), the vector space of causal factors has 2^k components in total, where k is the number of antecedent conditions. These corners have direct correspondence with the rows of a crisp truth table (Ragin, 2000).

In the example of five antecedent factors, there are 32 (2^5=32) combinations for further analysis (see Table 4.4, where I depict 10 out of the 32 combinations for illustrative purposes. For a full list of the 32 combinations and the corresponding hypotheses, see Appendix 3). Each case in the research sample is to be distributed to the corresponding row depending on its collective membership scores of all the antecedent conditions.

The calculation of the collective membership scores of different combination antecedent conditions follows the *intersectional rule*. If a case's collective membership score in one set of combined antecedents is greater than .50 (i.e., crossover point), this

TABLE 4.4
ILLUSTRATED DISTRIBUTION OF CASES ACROSS CAUSAL COMBINATIONS AND CONSISTENCY OF CAUSAL COMBINATIONS AS SUBSETS OF QUALITY USING FS/QCA

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
	Strategy			Resources			
# of rows	Low cost	Innovation	Customer responsiveness	Operations & Logistics resources	Management & human resources	N of cases with > .5 membership	Consistency as a subset of QUALITY
1	1	1	1	1	1	19	0.96
2	0	1	0	1	0	5	0.44
3	0	1	0	0	1	6	0.37
4	1	0	1	0	1	8	0.92
5	1	0	0	1	0	10	0.99
6	0	0	1	1	0	3	0.60
7	0	1	1	1	0	1	0.76
8	0	0	1	0	0	1	0.83
9	1	1	0	0	1	12	0.95
10	1	0	1	1	0	14	0.87

case is more "in" than "out" of the set of conditions. In Table 4.4, column 7 shows the number of cases with collective membership scores greater than .50 in each corner.

For example, in the case of three competitive strategies and two firm resources (see Table 4.4), different combinational factors may exist and explain high performance in terms of quality. Low cost strategy and operations & logistics resources may be sufficient for high performance as in row #5. Nevertheless, the combined use of three strategies (low cost, innovation, and customer responsiveness) and two resources (operations & logistics and management & human resources) may also lead to high performance (in row #1). Firms with their membership scores of two causal factors (low cost strategy and operations & logistics resources) greater than .50 will be put in row #5, whereas firms with membership scores of all five causal factors greater than .50 will be put in row #1.

The proportion of cases in each configuration is different (e.g., the numbers of valid cases are 19 and 10 for row #1 and row #5, respectively. See column 7 in Table 4.4). Therefore, contributions of the two different configurations to high quality also differ in terms of consistency and coverage.

The following step is to establish a frequency threshold for determining how many cases are needed to further assess fuzzy subset relations. There is no fixed rule for choosing the frequency threshold. Mostly, it is based on the number of cases included in the analysis, the knowledge of cases by researchers, and the calibration precision of fuzzy sets, among other factors (Ragin, forthcoming a). Since each case is treated as unique, a frequency threshold of 1 is acceptable (Ragin, 2000). One can use a higher frequency threshold for conducting the analysis of subset relations if the research sample is large to

improve one's confidence in the findings of a study. In this study, 10 cases were chosen as the frequency threshold because sample size was relatively big (n=332). The remaining cases with frequency less than 10 were treated as "remainders" in the further logical simplification of the truth table.

When constructing the truth table, a cut-off value for the consistency score is needed. Column 8 in Table 4.4 gives the consistency scores of possible combinations of causal factors at each row using the calculation formula (8). If the consistency score of a causal combination is above the consistency threshold, the subset relationship between causal factors and the outcome will be verified and coded as 1 (true). If the consistency score is below the consistency threshold, the proposed subset relation will not be supported. In this case, it will be coded as 0 (false). In this study, I chose .80 as the consistency threshold value following Ragin (forthcoming a). The remainders were coded as 0 (false) to ensure that these cases were considered as counterfactual cases, that is, conditions that lead to lower performance (for details, see Ragin & Sonnett, 2005).

The final step involves the logic reduction of the truth table and calculation of major statistics (i.e., coverage and consistency scores). Similar to coverage scores, the consistency scores also include statistics such as overall consistency and unique consistency. Consistency scores measure the credibility of a statement regarding the relationship between a particular solution and the outcome (e.g., to what extent that firms using innovation strategy have high performance), whereas coverage scores measure the contribution of the solution to the final outcome (e.g., how much of the variance in high performance is explained by innovation strategy). For more information, please refer to Appendix 2.

4.3 OPERATIONALIZATION OF VARIABLES AND DATA SOURCE

To heighten their confidence in the content validity of the questionnaire, three researchers developed items for the measures when designing the questionnaire. The measures were derived from the existing literature whenever possible (e.g., Barr, Stimpert, & Huff, 1992; Dess & Davis, 1984; Doty et al., 1993; Miller, 1988; Porter, 1980, 1985; Quinn & Rohrbaugh, 1983).Two other researchers who had expertise in the construction of surveys in the trucking industry provided feedback. Before the survey was finalized, the researchers reviewed and modified the survey items with input from top executives at three trucking companies in semi-structured interviews so that all the items were representative of the constructs. I will discuss the content and construct validity of all the research instruments that are included in this secondary database in detail in Chapter 5.

4.3.1 Independent Variables

i. Measurement of competitive strategies

Top executives are assumed to have knowledge of the strategy of their firm. Hence, their perceptions of which strategic dimensions are particularly valuable or important provide the basic information on their choice of strategies. For example, low cost strategy is associated with competitive pricing, being low cost provider and enhancing operating efficiency, whereas differentiation strategies by innovation and customer responsiveness require offering innovative services, adapting services to customer needs, etc (Dess & Davis, 1984; Miller, 1988; Porter, 1980, 1985).

Based on items used in the survey, I included three major types of strategies (for specific items of each scale, see Table 4.5) in the study: (a) low cost strategies (e.g., offer

competitive prices, be the lowest cost provider); (b) innovation strategies (e.g., offer innovative services, offer services with distinctly different features from those of competing services); and (c) customer responsiveness strategies (e.g., match varied customer needs, improve customer satisfaction). All these items were measured on a 5-point Likert scale.

ii. Measurement of resources

Two resources that have critical importance in the trucking industry were used. First, management & human resources (MHR) address the importance of organizational structure, management, and drivers. High-quality managers and drivers are essentially valuable and rare in the trucking industry. They are also difficult to copy by other trucking firms especially when they are organized well. Second, operations & logistics resources (OPL) in the trucking industry are composed of dispatch (city and road) and operations management, which allow firms to coordinate activities and control the flow of goods for motor carriers (Stank et al., 2005) (for specific items of each scale, see Table 4.5). All these items were measured on a 5-point Likert scale.

4.3.2 Dependent Variables: Measurement of Firm Performance

Firm performance can be examined using multiple measures. Subjective measures have the advantage of strong reliability and validity (Dess & Robinson, 1984) and objective measures are good indicators of firms' financial performance. Subjective measures may represent the interests and perspectives of various stakeholders, so they may not significantly correlate with each other (Cameron & Whetten, 1983; Doty et al., 1993). Thus, multi-dimensional measures of perceptual performance are needed in order

TABLE 4.5
ITEMS USED TO MEASURE MAJOR VARIABLES

Variables	Measures
To what extent do the following reflect the strategies used by your company to give a competitive advantage (1. Not at all; 2. A little; 3. To some extent; 4. To a large extent; and 5. To a very large extent)	
Cost leadership	Offer competitive prices
	Be the lowest cost provider in your industry
	Offer low prices
Innovation	Offer innovative services
	Offer services with distinctly different features from those of competing services
	Innovativeness
Customer responsiveness	Quick response
	Offer higher quality services than competitors
	Improve customer satisfaction
To what extent do you consider the following as your company's strengths as compared to your competitors (1. Not at all; 2. A little; 3. To some extent; 4. To a large extent; and 5. To a very large extent)	
Management & human resources	Drivers
	Management
	Structure
Operations & logistics resources	Dispatch city
	Dispatch road
	Operations
The following questions focus on your company's performance, as it compares to other companies in the trucking industry. Compared to other companies in the trucking industry, are your company's experiences in these areas better, worse, or about the same? (1. Significantly worse; 2. Worse; 3. Somewhat worse; 4. Neither worse nor better; 5. Somewhat better; 6. Better; and 7. Significantly better)	
Quality	Traffic safety rules compliance
	Accident rates
	"Logging" compliance
	Equipment breakdowns
	Loss/damage history
Timeliness	On-time deliveries
	On-time pick-ups
	Consistent transit times
Flexibility	Adherence to special shipping instructions
	Ease with which drivers can locate pick-up and delivery sites
	Company's willingness to accommodate special customers' needs
Efficiency	Cost of producing your organization's service
	Productivity per employee in your organization
Resource acquisition	Access to resources for regular operations
	Access to resources for growth and expansion

to capture the different aspects of evaluations from multiple stakeholders (Ariño, 2003; Doty et al., 1993; Venkatraman & Ramanujam, 1986).

Further, since perceptual measures of firm performance may not be significantly correlated with objective performance measures, it posits the needs of adding objective performance measures in the analysis, especially when all the scales used in the analysis are developed from the same respondents (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). For example, recent studies have highlighted perceived organizational effectiveness as a measure of firm performance in addition to overall financial performance (Noble, Sinha, & Kumar, 2002; Lunnan & Haugland, 2008; Ray et al., 2004). While subjective measures are associated with the operational effectiveness in this study, objective measures have provided insights into the profitability of the firm (Venkatraman & Ramanujam, 1986). This study employed both perceptual and financial measures of firm performance to address the common method bias in research using a single method as well as other concerns.

Perceptual performance in the study was based on survey respondents' cognitions of organizational effectiveness (Doty et al., 1993; Quinn & Rohrbaugh, 1983; Ray et al., 2004). Based on past research and feedback from managers from the trucking industry, I measured performance in terms of five dimensions in this study: (a) quality (traffic safety rules compliance, accident rates, "logging" compliance, equipment breakdowns, and loss/damage history); (b) timeliness (on-time deliveries, on-time pick-ups, and consistent transit times); (c) flexibility (ease with which drivers can locate pick-up and delivery sites, adherence to special shipping instructions, and the company's willingness to accommodate special customers' needs); (d) efficiency (miles per driver, fuel

consumption, and cost of producing your organization's services); and (e) resource acquisition for regulation operations and growth are also included as a measure of effectiveness (for specific items of each scale, see Table 4.5). All these items were measured on a 7-point Likert scale.

By contrast, the financial performance of trucking firms was represented by five measures: (a) return on assets (ROA), which is equal to operating income to assets (e.g., in Dess & Davis, 1984; Kim & Lim, 1988; Nickerson & Silverman, 2003); (b) return on sales (ROS), which is equal to operating income to sales (e.g., in Robinson & Pearce, 1988); (c) return on investment (ROI) (e.g., in Hambrick, 1983; Miller & Dess, 1993; Wright et al., 1991); and (d) return on equity (ROE) (e.g., in Kim & Lim, 1988). Operating ratio (OPT) was also used because it is one of the most often used scales to measure a firm's operating efficiency (e.g., Corsi & Fanara, 1988).

I used the set-theoretic approach to transform the measures into fuzzy sets data and processed them using the fs/QCA software as described earlier.

4.4 CONCLUSION

This chapter outlined the methodology used in testing the model and hypotheses advanced in Chapter 3. Operationalization of major variables was presented for three types of competitive strategies (low cost, innovation, and customer responsiveness), two types of firm resources (management & human resources, operations & logistics resources), and five dimensions of firm perceptual performance (efficiency, flexibility, quality, timeliness, and resource acquisition). Additionally, five measures of financial performance (i.e., ROA, ROE, ROS, ROI, and OPT) were also included for further analysis.

CHAPTER 5: ANALYSIS AND RESULTS

5.1 INTRODUCTION

This research investigates the relationship of competitive strategies and resources with firm performance. While researchers have considered these issues separately or used a contingency perspective, their work has suffered from related theoretical and methodological limitations as addressed in previous chapters. This study therefore considers these issues using the configurational framework by answering the related question:

What configurations of competitive strategies (e.g., low cost, innovation, customer responsiveness) and resources (e.g., management & human resources, operations & logistics resources) are likely to lead to a high level of firm performance?

This chapter outlines the data analysis and results using the methodology discussed in Chapter 4 in the following sections: first, the analysis focuses on assessing the validity and reliability of the major constructs using confirmatory factor analysis (CFA). Second, it addresses the procedures and results related to the fs/QCA using a set-theoretic approach (Ragin, forthcoming b). Specifically, several combinations and configurations of strategies and resources are identified that enable firms to achieve high performance in terms of quality, timeliness, flexibility, efficiency, and resource acquisition as well as financial measures. The final section summarizes the study's findings.

5.2 CONFIRMATORY FACTOR ANALYSIS

In this study, the strategies, resources, and perceptual performance dimensions are represented by scales composed of multiple items (see Table 4.5 to 4.7). It is important to establish the psychometric properties of the instruments for measuring the constructs. I used confirmatory factor analysis (CFA) to assess the validities of the constructs because of its advantage over exploratory factor analysis (EFA) in terms of the power to test validities by providing inferential statistics (Anderson & Gerbing, 1988). In the analysis, the measurement model provides accurate estimation of which scale items are indicators of the unobservable constructs (i.e., latent variables) and the individual contribution of each item. Additionally, it considers measurement errors of the constructs in the survey research. As a result, it has been widely used to check construct validation (e.g., Spanos & Lioukas, 2001).

I conducted CFA using the maximum likelihood estimation (MLE) in AMOS 7.0 in order to validate the main dimensions of the constructs of our research interest. In this research, some of the items in the survey came from previously validated instruments (e.g., effectiveness of firm performance was adapted from Quinn & Rohrbaugh, 1983); however, further assessment of the measurement models is needed because of changes in wording of the items and our specific research context.

5.2.1 Content Validity

Content validity measures the extent to which empirical measurement indicates a domain of content (Venkatraman & Grant, 1986). In the original data collection procedure, three researchers developed items for all the measures by reviewing the existing literature whenever possible (e.g., Barr et al., 1992; Doty et al., 1993; Miller,

1988; Porter, 1980, 1985; Quinn & Rohrbaugh, 1983). Two other researchers who had expertise in the trucking industry were also involved in construction of questionnaires and provided feedback. The researchers also reviewed all the survey items with top executives at three trucking companies before finalizing the questionnaires in order to make sure that the items were representative of the constructs. Consultation with additional industry experts at interviews in the trucking industry (Klaysen, 2007; Streuber, 2007) further built our confidence in the content validity of the measures.

Further, four measurement properties (unidimensionality, reliability, convergent validity, and discriminant validity) were conducted to test the construct validity in addition to content validity, as I will discuss in the next four subsections.

5.2.2 Unidimensionality

The unidimensionality of a construct refers to the extent to which all its indicators are related to the underlying construct rather than any others. Two sets of statistics were calculated to test unidimensionality: the overall model fit and the significance of the factor loadings (Spanos & Lioukas, 2001). The most often used measures of fit in previous studies include the likelihood ratio chi-square (X^2), the ratio of X^2 to degree of freedom (X^2/df), the comparative fit index (CFI), the normed fit index (NFI), the root mean square error of approximation (RMSEA), and the Tucker-Lewis index (TLI).

Although a non-significant X^2 ($p>0.05$) indicates good fit, a significant X^2 does not necessarily identify a poor model because it is dependent on sample size (Joreskog & Sorbom, 1993). Instead, X^2/df is recommended as a more useful measure and indicates a good fit model if the value of it is smaller than 3:1 (Joreskog & Sorbom, 1993). As stated in Table 5.1, the perceptual performance and resource measurement models reflected the

TABLE 5.1
CONSTRUCTS AND TESTS OF UNIDIMENSIONALITY OF PERCEPTUAL MEASURES

Firm Performance:
The following questions focus on your company's performance, as it compares to other companies in the trucking industry. Compared to other companies in the trucking industry, (1: significantly worse…7: significantly better)

Perceptual performance	Items	Measures	First order loadings
Quality	P1	Traffic safety rules compliance	.76
	P2	Accident rates	.76
	P3	"Logging" compliance	.75
	P4	Equipment breakdowns	.64
	P5	Loss/damage history	.56
Timeliness	P6	On-time deliveries	.95
	P7	On-time pick-ups	.73
	P8	Consistent transit times	.71
Flexibility	P9	Adherence to special shipping instructions	.86
	P10	Ease with which drivers can locate pick-up and delivery sites	.67
	P11	Company's willingness to accommodate special customers' needs	.58
Efficiency	P12	Cost of producing your organization's service	.52
	P13	Productivity per employee in your organization	.99
Resource acquisition	P14	Access to resources for regular operations	.84
	P15	Access to resources for growth and expansion	.72

Model summary statistics: $X^2(80)=170.324$; $p<.001$; $X^2/df=2.13$; NFI=.99; CFI=.99; TLI=.99; RMSEA=.06; (lower bound: .05, upper bound: .07); all first order loadings significant at $p<.001$

TABLE 5.1 (Cont'd)

Competitive strategies:
To what extent do the following reflect the strategies used by your company to give a competitive advantage (1: Not at all…7: To a very large extent)

Strategy	Items	Measures	First order loadings
Low cost	S1	Offer competitive prices	.42
	S2	Be the lowest cost provider in your industry	.69
	S3	Offer low prices	.97
Innovation	S4	Offer Innovative services	.88
	S5	Offer services with distinctly different features from those of competing services	.65
	S6	Innovativeness	.65
Customer responsiveness	S7	Quick response	.58
	S8	Offer higher quality services than competitors	.68
	S9	Improve customer satisfaction	.74

Model summary statistics: $X^2(24)=78.334$; $p<.001$; $X^2/df=3.26$; NFI=.99; CFI=.99; TLI=.99; RMSEA=.08 (lower bound: .06, upper bound: .10); all first order loadings significant at p<.001

Firm resources:
To what extent do you consider the following as our company's strengths as compared to your competitors (1: Not at all…7: To a very large extent)

Resource	Items	Measures	First order loadings
Management & human resources	R1	Drivers	.60
	R2	Management	.79
	R3	Structure	.62
Operation & logistics resources	R4	Dispatch city	.65
	R5	Dispatch road	.67
	R6	Operations	.71

Model summary statistics: $X^2(8)=23.825$; $p<.001$; $X^2/df=2.98$; NFI=.95; CFI=.96; TLI=.91; RMSEA=.08 (lower bound: .04, upper bound: .11); all first order loadings significant at p<.001

goodness-of-fit with X^2/df values of 2.13 and 2.98, respectively, whereas the value of X^2/df for the strategy model was 3.26 which indicated a moderately acceptable measurement model (see Table 5.1).

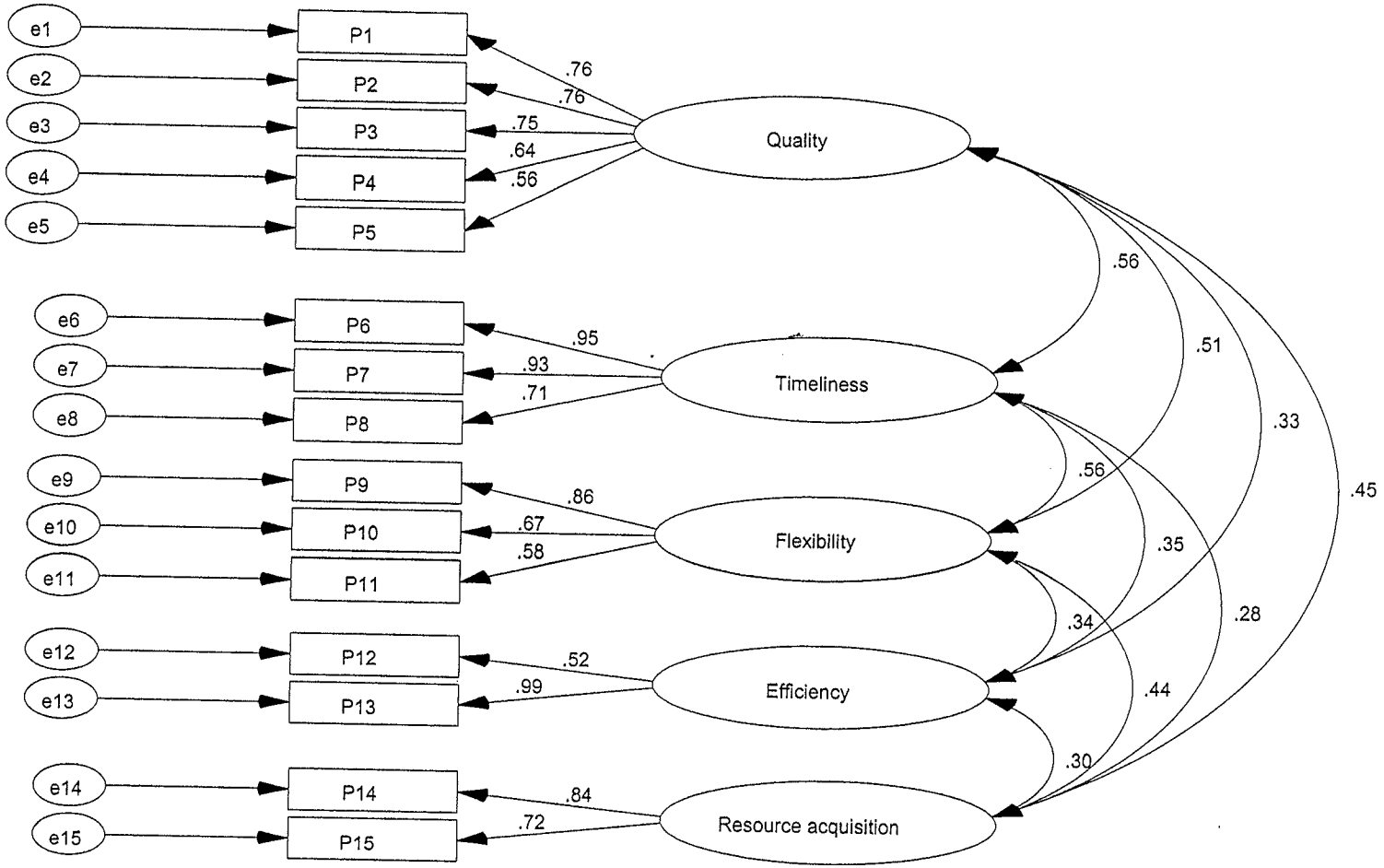
The NFI and CFI are based on the comparison of the hypothesized model with the independence model. Any value greater than .95 for both indexes is perceived to represent a well-fitting model (Hu & Bentler, 1999). In this study, all the values of NFI and CFI ranged from .95 to .99 (see Table 5.1), which signified good fitness of the measurement models.

The RMSEA measures the mean discrepancy between population and sample data. Values between .05 and .08 are acceptable (Hair, Anderson, Tatham, & Black, 1998). The three measurement models of perceptual performance, resources, and strategies had acceptable values of RMSEA in this study that ranged from .06 to .08 (see Table 5.1).

Different from the above statistics that measure absolute fit of the model, the TLI compares the proposed model to the null model and is therefore an incremental fit measure. The minimum threshold value of TCL is .90 (Hair et al., 1998). Again, the TCL values of the three models were greater than the threshold value of .90 ranging from .91 to .99 (see Table 5.1).

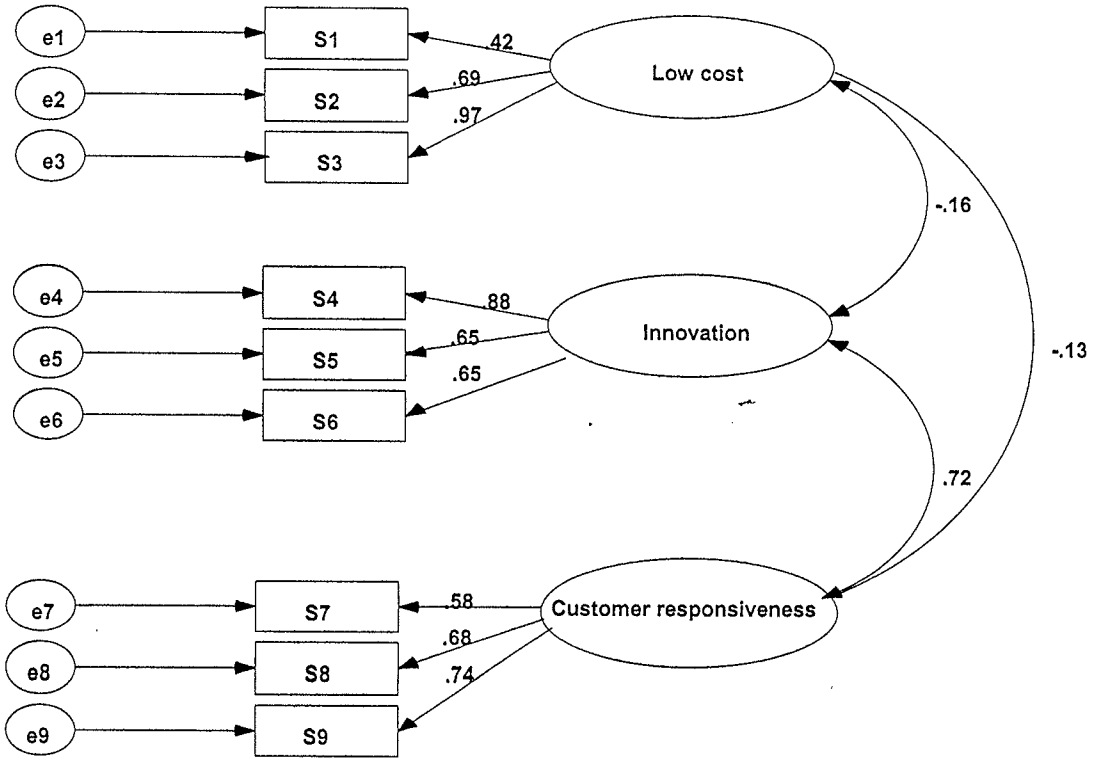
The significance of the factor loadings was also examined to determine the probability that items were related to the corresponding construct (see Figure 5.1 to 5.3). All factor loadings of performance, strategies and resources are significant at the $p < .01$ level. There were a few items that had marginal factor loadings (e.g., S1, P5, P11, P12). I decided to keep these items because their presence enhanced the overall model fit.

FIGURE 5.1
FIVE-FACTOR CFA MODEL OF PERCEPTUAL PERFORMANCE: MEASUREMENT MODEL*



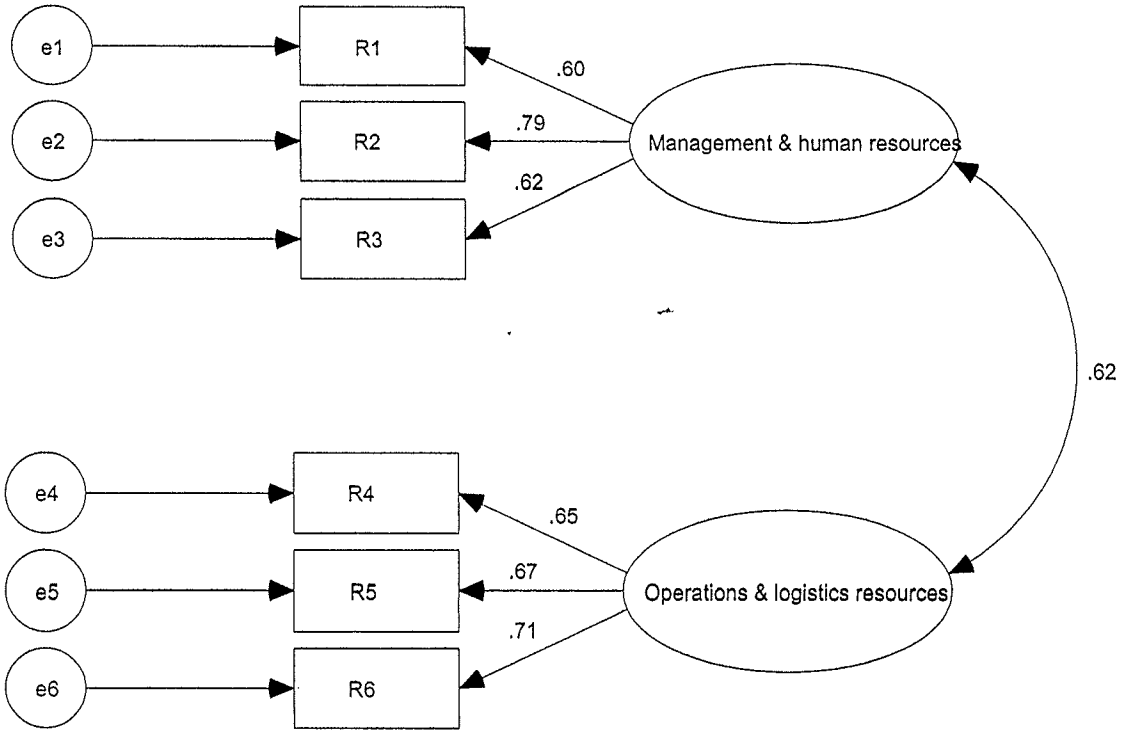
* **All factor loadings are significant at the p<.01 level.**

FIGURE 5.2
THREE-FACTOR CFA MODEL OF STRATEGIES: MEASUREMENT MODEL*



* All factor loadings are significant at the p<.01 level.

FIGURE 5.3
TWO-FACTOR CFA MODEL OF RESOURCES: MEASUREMENT MODEL*



* All factor loadings are significant at the p<.01 level.

In sum, these two sets of statistics measuring the overall model fit and significance of the factor loadings showed acceptable unidimensionality of our constructs.

5.2.3 Reliability

Reliability measures the internal consistency and the degree of absence of measurement error related to a particular construct (Venkatraman & Grant, 1986). Two estimates of reliability were calculated for each latent variable: Cronbach's alpha coefficient and composite reliability. The oft-used Cronbach's alpha tests internal consistency and the acceptable minimum threshold value is .70 (Nunnally, 1978). All measures in this study had reliability coefficients of .70 or higher, except efficiency (which was .68, see Table 5.2).

The Cronbach's alpha assumes that all items of the construct are weighted equally. In contrast, the composite reliability is more general and considers the item loadings estimated within the model (see Fornell & Larcker, 1981 for calculation formula). The recommended minimum value for composite reliability is .70 (Hair et al., 1998). As shown in Table 5.2, all coefficients exceeded the recommended value for composite reliability, except the measure of efficiency, which received marginal support with its value of composite reliability as .68.

5.2.4 Convergent Validity

Convergent validity shows the degree to which the operationalization of a construct is similar to other operationalizations that attempt to measure the same concept. One common index to test convergent validity is the average variance extracted (AVE) that measures the overall amount of variance in the indicators relative to measurement

TABLE 5.2
RELIABILITY AND CONVERGENT VALIDITY TESTS OF MAJOR CONSTRUCTS

Variable names	Cronbach's alpha	Composite reliability	AVE
Perceptual performance			
Quality	.82	.80	.45
Timeliness	.90	.91	.78
Flexibility	.74	.76	.53
Efficiency	.68	.68	.54
Resource acquisition	.75	.71	.55
Strategy			
Low cost (LCS)	.73	.76	.54
Innovation (INS)	.77	.75	.50
Customer responsiveness (CRS)	.70	.79	.69
Resources			
Management & human resources (MHR)	.70	.71	.45
Operations & logistics resources (OPL)	.71	.72	.46

error (Fornell & Larcker, 1981). The commonly used minimum value for convergent validity is .50 (Fornell & Larcker, 1981; Hair et al., 1998) but some lower values of AVE are also acceptable (e.g., Spanos & Lioukas, 2001). In this study, most constructs (i.e., timeliness, flexibility, efficiency, resource acquisition, low cost, innovation, and customer responsiveness strategies) exceeded the recommended value except in the case of management & human resources, operations & logistics resources, and the dimension of quality. The AVE values of these three constructs ranged from 0.45 to 0.46 which were very close to the accepted threshold value (see Table 5.2).

5.2.5 Discriminant Validity

Discriminant validity measures the extent to which one construct is different from the others. To test discriminant validity, I compared two CFA models with one restricted model (i.e., in which all correlations among pairs of latent variables are one) and one less restricted model where the correlation is free to vary (Spanos & Lioukas, 2001; Venkatraman, 1989). Significant lower X^2 values for the three unconstrained models (i.e., base models) of strategy, resource, and perceptual performance provided strong support for discriminant validity of our major constructs (see Table 5.3).

In sum, these different statistics (i.e., X^2/df, CFI, NFI, RMSEA, TLI, Cronbach's alpha, composite reliability, AVE, discriminant validity), derived from CFA, indicated that our measures of strategies, resources, and perceptual performance had acceptable construct validity and reliability.

Since the variables of strategies, resources, and perceptual performance were collected from the survey of top executives in the trucking industry, the data might be suffering from the common method variance bias (Podsakoff et al., 2003). I used CFA

single-factor test to check if the problem existed in the data used in this study. Specifically, all items from the major constructs examined are modeled as the indicators of one general factor in CFA analysis. An overall good fit of the model would imply a high probably of the existence of common method variance.

For the tested CFA single-factor model, the results were as follows: $X^2/df = 5.81$, CFI = .49, NFI = .45, and RMSEA = .12. These results revealed a poor overall fit of the model. In other words, the examined measures of strategies (i.e., low cost, innovation, and customer responsiveness), resources (operations & logistics and management & human resources), and perceptual firm performance (quality, timeliness, flexibility, efficiency, and resource acquisition) were not likely to have common method bias because of the absence of a single factor that accounts for the variance among the items. I therefore now turn to data analysis using a set-theoretic approach.

5.3 FUZZY-SET/QUALITATIVE COMPARATIVE ANALYSIS RESULTS

5.3.1 Calibration of Measurement into Fuzzy Sets

I used the indirect method to calibrate the original constructs (i.e., strategies, resources, perceptual and financial performance) into the set membership of the target set (Ragin, forthcoming b). Unlike the direct method of measurement calibration, which uses three qualitative anchors to specify set membership, the indirect method first qualitatively groups cases into categories by the degree of set membership (from 0 to 1). Building on the method developed by Ragin (see section 4.2.2), I chose nine anchors to represent the membership of 0.007, 0.047, 0.119, 0.378, 0.50, 0.622, 0.881, 0.953, and 0.993 in the target set for each construct.

TABLE 5.3
DISCRIMINANT VALIDITY TEST OF MAJOR CONSTRUCTS *

Strategy	X^2(d.f. = 25)
Low cost vs. Innovation	281.7
Low cost vs. Customer responsiveness	286.9
Innovation vs. Customer responsiveness	182.1
Base Model (unconstrained)	$X^2(24) = 78.3$
Resources	X^2(d.f. = 9)
Management & human resources vs. Operations & logistics resources	102
Base Model (unconstrained)	$X^2(8) = 23.8$
Perceptual performance	X^2(d.f. = 81)
Quality vs. Timeliness	264.1
Quality vs. Flexibility	295.5
Quality vs. Efficiency	259.6
Quality vs. Resource acquisition	245.4
Timeliness vs. Flexibility	298
Timeliness vs. Efficiency	263.8
Timeliness vs. Resource acquisition	275.4
Flexibility vs. Efficiency	287.9
Flexibility vs. Resource acquisition	267.9
Efficiency vs. Resource acquisition	233.3
Base Model (unconstrained)	$X^2(80) = 170.3$

* The discriminant validity test is conducted by comparing two CFA models for all the construct: one in which the correlation of a pair of latent variables is constrained to equal 1.0, and the other in which the correlation is free to vary (Venkatraman, 1989). A significant lower X^2 value for the unconstrained model provides support for discriminant validity of the constructs.

Establishing the nine anchors for all the constructs requires the application of the existing theoretical and substantive knowledge of the trucking industry. In this study, because the survey items by themselves reflect executives' opinions of which set or category they belong to with regard to the importance/value of strategies, resources or perceptual performance, I chose the anchors primarily based on the scales of survey items. For example, items of management & human resources were measured on a 5-point Likert scale; therefore, firms with management & human resources values less than one were coded as out of the target set (i.e., the set membership of zero). If a firm's numerical value of management & human resources was equal to three, its membership value was coded as 0.5 indicating that the firm was neither in nor out of the target set. Firms with management & human resources values equal to five had the full membership of one in the target set. I used 0.5 point difference to differentiate all the other six anchors (for details, see column 2 in Table 5.4). Since all the items of resources (management & human resources and operations & logistics resources) and strategies (low cost, innovation, and customer responsiveness) were measured on 5-point scale, I used the same method to establish calibration anchors for these two sets of constructs (see Column 2 in Table 5.4).

TABLE 5.4
TRANSLATIONS BETWEEN DIFFERENT SCHEMES*

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10
Verbal label	Anchors for resources and strategies *	Anchors for perceptual performance *	Anchors for ROA**	Anchors for ROS**	Anchors for ROI**	Anchors for ROE**	Anchors for OPT**	Log odds of full membership	Degree of membership
Full membership	5.0	7.0	1.32	0.33	360.83	703.96	.00	5.0	.993
Threshold of full membership	4.5	6.375	.42	0.14	96.13	84.32	70.11	3.0	.953
Probably in	4.0	5.75	.25	0.09	44.03	45.63	89.61	2.0	.881
More in than out	3.5	5.125	.11	0.04	16.61	17.03	95.20	0.5	.622
Cross-over point	3.0	4.5	.08	0.03	12.32	11.40	96.64	0	.50
More out than in	2.5	3.875	.06	0.02	7.88	6.05	97.96	-0.5	.378
Probably out	2.0	3.25	-.03	-0.01	-4.41	-3.87	100.98	-2.0	.119
Threshold of full non-membership	1.5	2.625	-.18	-0.05	-34.82	-32.01	105.43	-3.0	.047
Full non-membership	1.0	2.0	-.94	-.24	-208.23	-194.99	124.25	-5.0	.007

* Resources and strategies (Column 2) are measured on a 5-point scale; perceptual firm performance (Column 3) is measured on a 7-point scale.

** Data for ROA, ROS, ROI, ROE, and OPT (Column 3 to 7) were calculated from the industry data in *the TTS Blue Book.*

By contrast, perceptual firm performance dimensions (quality, timeliness, flexibility, efficiency, and resource acquisition) were measured on 7-point scale. It is well-known that self-reported performance data are usually inflated by respondents for reasons of social desirability (Ganster, Hennessey, & Luthans, 1983). In this study, because no respondents rated performance items as 1 and the minimum value of these items was 2, I set the minimum threshold value of the target performance set to be 2 rather than 1, which means any firm's perceptual performance membership was zero if its original perceptual performance was less than or equal to 2 points out of 7 (for details, see column 3 in Table 5.4).

The common method bias has generated concern in cross-sectional survey because of the social desirability needs of respondents (Fiske, 1982). It is mostly likely to occur in surveys when data on antecedents and performance are collected from the same informants, so the variance may be attributable to the measurement method rather than to the constructs the measures represent (Doty & Glick, 1998; Podsakoff et al., 2003). In this study, the perceptual performance measures based on trucking firm managers' perceptions may have been biased due to the common method. To remedy this possible problem, I also collected performance data from objective sources. Specifically, I used data provided in *the TTS Blue Book* to calculate five financial measures that were often used in previous research (e.g., Nickerson & Silverman, 2003): return on assets (ROA), return on sales (ROS), return on investment (ROI), return on equity (ROE), and operating ratio (OPT). Operating ratio is widely used in trucking firms (e.g., Corsi & Fanara, 1988) to measure their profitability, which is equal to the ratio of total operating expenses to operating revenues.

In order to take out the confounding effects of time, I calculated these five financial measures based on the data available in the subsequent financial year which was about one year after measuring the variables of strategies, resources, and perceptual performance.

Similar to the procedure used to calibrate strategies, resources, and perceptual performance, the indirect method was used to transform the original measurement of financial performance into fuzzy set membership. I used the industry-level data that comprised 1,581 firms in the *TTS Blue Book* to establish the nine qualitative anchors (Ragin, forthcoming b) for further calibration. Using the industry level data helps avoid the sample-dependant bias often present in profile deviation research. Specifically, I calculated the five financial measures and grouped firms into different categories by following the rules proposed by Ragin (forthcoming b) as below: firms with values in the top 0.7 per cent trucking firms had a membership of .993 in the target set of high performing firms. By contrast, firms who fell in the bottom 0.7 per cent of all trucking firms had a set membership of .007 in the target set of high performing firms. Following similar procedures, I created the threshold values for firms with memberships of .047, .119, .378, .50, .622, .881, and .953 in the set of high performing firms at the interval of 0 and 1 (see Column 4 to 10 in Table 5.4). Different from the other four financial measures of firm performance, the operating ratio is equal to the value of total operating expenses divided by operating revenues; as a result, firms with the lowest operating ratios fell into the category of highest-performing firms whereas those with the highest operating ratios belonged to lowest-performing ones.

I then used the continuous indirect calibration procedure (described in section 4.2.2) to transform all the original measurements into fuzzy set memberships. The correlations between

the original and calibrated measures ranged from .78 to .99 (-.93 for operating ratio because of the reversed procedure), which suggested that the validity of the recoded set membership was not discounted by the calibration.

After calibrating the data, I analyzed them using fuzzy-set/qualitative comparative analysis (fs/QCA) software (Ragin, 2006). The fs/QCA software provides combinations of strategies and resources, and their consistency and coverage scores, which I present in the following section. I first discuss seven combinations and their comparisons (A1 to A7) that enable sample firms to achieve high perceptual performance in terms of quality, timeliness, flexibility, efficiency, and resource acquisition using the calibrated data as discussed in section 5.3.1. Next I address six configurations of firms (C1 to C6) based on how they use these different combinations separately or jointly. I then present the results with regard to the five financial performance measures collected from archival sources (i.e., ROA, ROS, ROI, ROE, and OPT). Interestingly, the results from perceptual and financial performance measures present similar patterns.

5.3.2 Results: Descriptives of Major Variables

A correlation matrix of the study variables given in Table 5.5 provides means, standard deviations, and Pearson correlation coefficients of strategies, resources, and performance variables.

TABLE 5.5
DESCRIPTIVE STATISTICS OF MAJOR VARIABLES

				Pearson's correlation													
		Mean[+]	Std. deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Perceptual performance	1. QUA	.68	.22														
	2. TIM	.74	.22	.51**													
	3. FLEX	.68	.21	.44**	.50**												
	4. EFF	.53	.24	.28**	.25**	.27**											
	5. RES	.62	.24	.33**	.24**	.35**	.230**										
Financial performance	6. ROA	.57	.25	.03	-.01	.05	.11	.09									
	7. ROS	.58	.27	.05	.00	.01	.13	.07	.90**								
	8. ROI	.59	.25	.00	-.02	.06	.06	.07	.95**	.82**							
	9. ROE	.58	.23	.03	-.00	-.01	.14*	.13	.67**	.63**	.64**						
	10. OPT	.56	.23	.04	.01	.00	.13	.06	.89**	.99**	.81**	.60**					
Strategy	11. LCS	.26	.25	-.07	-.05	-.07	.05	.02	-.03	-.03	-.06	.09	-.05				
	12. CRS	.84	.18	.27**	.40**	.35**	.22**	.26**	.06	.10	.07	.11	.09	.01			
	13. INS	.59	.28	.20**	.24**	.35**	.18**	.28**	.05	.06	.02	.06	.05	-.01	.49**		
Resource	14. OPL	.64	.28	.18**	.17**	.19**	.18**	.22**	-.03	.02	-.06	.02	.01	.02	.42**	.34**	
	15. MHR	.70	.24	.31**	.24**	.28**	.25**	.31**	.00	.02	-.03	-.03	.01	.02	.54**	.41**	.41**

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
[+] These are calibrated measures of set membership of each variable within the interval of [0, 1]. They are used for fs/QCA in the study.

QUA – Quality; TIM – Timeliness; FLEX – Flexibility; EFF – Efficiency; RES – Resource acquisition;
ROA= Return on assets (Operating income/total assets);
ROS= Return on sales (Operating income/total sales);
ROI= Return on investment;
ROE= Return on equity;
OPT= Operating ratio (Total operating expenses/Operating income);
LCS – Low cost strategy; CRS – Customer responsiveness strategy; INS – Innovation strategy;
OPL – Operations & logistics resources; MHR – Management & human resources.

Among the three strategies, customer responsiveness strategy had the highest mean value of .84 and low cost strategy appeared to have the lowest mean value of .26, which indicated that, on average, trucking executives might put higher emphasis on customer responsiveness strategy than low cost strategy. Customer responsiveness strategy had strong significant correlation coefficients (.22 to .40) with the five dimensions of firm perceptual performance, whereas innovation strategy had moderately significant correlation relationships with the five performance dimensions (.18 to .35). Interestingly, innovation and customer responsiveness strategies had a strong correlation coefficient (.49), which indicated that they might be used together in trucking firms. Management & human resources and operations & logistics resources also had moderately significant correlations with firm perceptual performance (.17 to .31), which implied the possible contribution of resources to firms' high performance achievement. The correlation of two strategies (customer responsiveness and innovation) with two resources (management & human resources and operations & logistics resources) was also significant (.34 to .54) which might point towards the possibility of a fit between strategies and resources (Doty et al., 1993). Low cost strategy, as shown in Table 5.5, appeared to have weak association with all the other study variables.

The statistics (correlations, scale means, and standard deviations) of financial performance measures are also given in Table 5.5. The mean values of the five financial measures (i.e., ROA, ROS, ROI, ROE, and OPT) ranged from .56 to .58. Although there were significant correlations among these financial measures (Pearson's correlation were from .60 to .99), there was no evidence of correlations among financial measures and perceptual performance measures. The only exception was the significant correlation

between ROE and the dimension of efficiency (the value was .14). It may be in accordance with the view that the most perceptual and financial measures are complementary, rather than substitute for one another.

5.3.3 Results: Testing the Hypotheses

I considered five antecedent factors in these analyses: (a) low cost strategy; (b) innovation strategy; (c) customer responsiveness strategy; (d) operations & logistics resources; and (e) management & human resources. I will first present the analysis of their relationships with the five dimensions of perceptual performance — quality, timeliness, flexibility, efficiency, and resource acquisition. I will then move to the analysis of the five financial performance measures.

Table 5.6 provides the hypotheses, names, composition, and various statistics for the overall solution and the specific combinations of strategies and resources associated with high performance on five perceptual dimensions.

In Table 5.6, the first column shows the outcome variables which represent the five dimensions of perceptual performance of our sample firms. The second column shows the hypotheses in Chapter 3. Columns 3 and 4 indicate the names and composition, respectively, of different combinations of strategies and/or resources that firms use to achieve high performance. For example, combination A1 (lcs*CRS*ins) associated with the dimension of quality provided one way that firms used for the attainment of high quality. Capital letters in the combinations represented the presence of a variable, whereas the absence of a variable was signified by small letters. Combination A1 (lcs*CRS*ins) refers to the use of pure customer responsiveness strategy without the use of low cost and innovation strategies.

TABLE 5.6
COMBINATIONS AND THEIR CONSISTENCY & COVERAGE USING PERCEPTUAL PERFORMANCE MEASURES

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
DV	Hypothesis	Combination#	Combinations*	Solution Consistency	Unique Consistency**	Solution coverage+	Unique coverage
Quality	H1c	A1	lcs*CRS*ins		.90		.02
	H3c	A2	lcs*CRS*OPL		.88		.02
	H3d	A3	lcs*CRS*MHR		.87		.05
	H4a	A4	CRS*INS*OPL*MHR		.91		.06
				.84		.85	
Timeliness	H1c	A1	lcs*CRS*ins		.93		.02
	H3c	A2	lcs*CRS*OPL		.92		.02
	H3d	A3	lcs*CRS*MHR		.92		.06
	H4a	A4	CRS*INS*OPL*MHR		.95		.06
				.89		.83	
Flexibility	H1c	A1	lcs*CRS*ins		.90		.02
	H3c	A2	lcs*CRS*OPL		.90		.02
	H3d	A3	lcs*CRS*MHR		.89		.06
	H4a	A4	CRS*INS*OPL*MHR		.93		.06
				.86		.86	
Efficiency	H1c	A1	lcs*CRS*ins		.81		.09
	H3c	A5	lcs*CRS*OPL*mhr		.89		.03
	H3d	A6	lcs*CRS*opl*MHR		.86		.05
	H4b	A7	LCS*CRS*INS*OPL*MHR		.91		.08
				.80		.73	
Resource acquisition	H1c	A1	lcs*CRS*ins		.85		.02
	H3c	A2	lcs*CRS*OPL		.84		.02
	H3d	A3	lcs*CRS*MHR		.83		.05
	H4a	A4	CRS*INS*OPL*MHR		.89		.07
				.79		.88	

*Capital letters represent the presence of a variable, whereas small letters represent the absence of a variable.
**A consistency score value of 0.80 or higher is acceptable (Ragin, forthcoming a).
+The interpretation of a coverage score is similar to R^2 in regression analysis.

i. Key statistics for set-theoretic analysis

Table 5.6 also provides a few major statistics used to measure the fit of the overall model and of the individual combinations in fs/QCA. For example, *solution consistency* (also called *overall consistency*) for each of the five outcome dimensions as represented in Column 5 examines the overall significance of the solution. The solution consistency for the dimension of quality was .84, which indicated that overall 84 per cent of firms using combinations A1, A2, A3, and A4 were able to achieve high performance in terms of quality. A consistency score of .80 or higher represents a significant solution/path (Ragin, 2000, forthcoming a).

Each solution is composed of multiple combinations. For example, the solution that included combinations A1, A2, A3, and A4 resulted in high performance for the dimensions of quality, timeliness, flexibility, and resource acquisition, whereas combinations A1, A5, A6, and A7 collectively provided the solution for efficiency. The fs/QCA software also provides another statistic, *unique consistency* (as in Column 6 of Table 5.6), to measure the extent to which firms following a particular combination are able to achieve the outcome. For example, the unique consistency of combination A1 (lcs*CRS*ins) associated with the dimension of quality was .90 (as in Column 6 of Table 5.6), which meant that 90 per cent of our sample firms using pure customer responsiveness strategies were able to achieve high quality. Likewise, a unique consistency score of .93 (as in Column 6 of Table 5.6) associated with timeliness meant 93 per cent of our sample firms adopting pure customer responsiveness strategies were able to achieve high value with the dimension of timeliness.

In addition to consistency scores, two coverage scores were also used to measure the contributions of each solution and combination. Specifically, *solution coverage* (in Column 7) measures the overall variance that could be explained by all the presented combinations with respect to each dimension of firm performance. (It is similar to R^2 used in multivariate regression analysis). For example, the four paths/combinations (A1, A2, A3, and A4) explained 85 per cent of the variance in quality, whereas the other four combinations (A1, A5, A6, and A7) accounted for 73 per cent of the variance in efficiency (as in Column 7 of Table 5.6). Similarly, *unique coverage* scores (in Column 8) of the combinations represent their individual contributions to firm performance. For instance, combination A1 (i.e., pure customer responsiveness strategy without low cost and innovation strategies) contributed two per cent to the overall variance in quality, whereas combination A4 (i.e., customer responsiveness and innovation strategy with operations & logistics and management & human resources) appeared to be the most potent combination for firms to achieve high levels of quality with a unique coverage score of .06 (as in Column 8 of Table 5.6).

I next move to the analysis of results with regard to testing the hypotheses proposed in Chapter 3. As illustrated in Table 5.6, the solution consistency (in Column 5) and coverage scores (in Column 7) provided general support for the proposed relationships between different configurations and firm performance. The overall consistency scores were above the minimum value of .80 (i.e., the proposed relationships were supported by over 80 per cent of sample firms) which represented good fitness of the proposed model. The dimension of resource acquisition received marginal support with the solution consistency score of .79. Additionally, solution coverage scores for the

five dimensions of firm performance ranged from .73 to .88, which also corroborated the relationships between configurations and firm performance.

ii. Results: Testing Hypotheses *H1a* to *H1c*

Our first set of hypotheses (*H1a* to *H1c*) that predicted pure competitive strategies would lead to high firm performance received partial support. Specifically, Hypothesis *H1c* indicating the positive relationship between the use of customer responsiveness strategy and firm performance was strongly supported across the five dimensions of quality, timeliness, flexibility, efficiency, and resource acquisition. Comparing the unique consistency scores of the combination A1 (i.e., lcs*CRS*ins), four out of the five scores over .85 were associated with the dimension of quality, timeliness, flexibility and resource acquisition (as in Column 6 of Table 5.6). The minimum value of unique consistency of combination A1 was .81 with the dimension of efficiency. As a result, 81 per cent of firms using pure customer responsiveness strategies achieved high performance in terms of efficiency.

As depicted in Table 5.6, unique coverage scores of the combination A1 (as in Column 8 of Table 5.6) representing their individual contributions to firm performance ranged from .02 to .09. The pure customer responsiveness strategy (i.e., represented by combination A1) appeared to be the most potent combination for firms to achieve high levels of efficiency (unique coverage was equal to .09). It also contributed to the other four dimensions of performance (i.e., quality, timeliness, flexibility, and resource acquisition) as well, where all unique coverage scores were .02. In other words, whereas the use of pure customer responsiveness strategy explained 9 per cent of the variance in

high efficiency, it contributed about 2 per cent with respect to high performance in quality, timeliness, flexibility, and resource acquisition.

As a result, our Hypothesis *H1c* regarding the positive relationship between the use of pure competitive strategy of customer responsiveness and firm performance received support in all the five dimensions of firm performance. However, I did not find support for either pure low cost strategy (as proposed in *H1a)* or the pure innovation strategy (as proposed in *H1b).*

iii. Results: Testing Hypotheses *H2a* to *H2d*

Hypotheses *H2a* to *H2d* proposed the positive relationships between the use of multiple strategies and firm performance (i.e., innovation and customer responsiveness strategies, low cost and innovation strategies, low cost and customer responsiveness strategies, and the simultaneous use of the three strategies of low cost, innovation, and customer responsiveness). As illustrated in Table 5.6., I found seven significant combinations (A1 to A7) that contributed to high performance of quality, timeliness, flexibility, efficiency, and resource acquisition; however, none of these combinations represented the use of multiple strategies without the presence of resources. In other words, I did not find any combination such as low cost and customer responsiveness strategies without any single or multiple resources (e.g., LCS*CRS*opl), low cost and innovation strategies without any resources (e.g., LCS*INS*mhr), customer responsiveness and innovation strategies without any resources (e.g., CRS*INS*mhr*opl), or combined low cost, customer responsiveness, and innovation strategies without any resources (e.g., LCS*CRS*INS*mhr*opl). Therefore, based on our analysis of the five perceptual performance measures, there was no empirical support for

the proposed relationships between multiple strategies and firm performance as stated in the second set of hypotheses.

iv. Results: Testing Hypotheses *H3a* to *H3d*

The existence of combinations A2, A3, A5, and A6 provided partial support for the third set of hypotheses (i.e., H3a to H3d) that proposed a positive relationship between firm performance and the pairing of pure strategies with resources. Specifically, Hypothesis *H3a* that predicted the pairing of low cost strategy and operations & logistics resources would lead to high performance did not receive any empirical support as results revealed in Table 5.6. Likewise, I did not find any support for Hypothesis *H3b* in which the match of innovation strategy and management & human resources was associated with high firm performance.

By contrast, Hypothesis *H3c* proposed that the pairing of customer responsiveness strategy and operations & logistics resources would lead to high firm performance. The results showed support for Hypothesis *H3c.* Combination A2 (i.e., lcs*CRS*OPL), the presence of operations & logistics resources paired with customer responsiveness strategy and the absence of low cost strategy was sufficient for firms to achieve high performance in terms of quality, timeliness, flexibility, and resource acquisition (see Table 5.6). All the unique consistency scores of combination A2 ranged from .84 to .92. By contrast, combination A5 (lcs*CRS*OPL*mhr, i.e., customer responsiveness strategy and operations & logistics resources without low cost strategy and management & human resources) also comprised one way that led to high firm performance in terms of efficiency with a unique consistency score of .89 . The unique coverage scores of combinations A2 and A5 ranged from .02 to .03. These two combinations (i.e., A2 and

A5) provided empirical support for Hypothesis *H3c,* which stated that the pairing of customer responsiveness strategy with operations & logistics resources would enable firms to achieve high performance.

Additionally, I also found support for Hypothesis *H3d* that predicted that the pairing of customer responsiveness strategy and management & human resources would lead to high performance. Specifically, combination A3 (i.e., lcs*CRS*MHR) and combination A6 (i.e., lcs*CRS*opl*MHR, which is similar to combination A3 but also emphasizes the exclusion of operations & logistics resources) represented another sufficient path - the pairing of customer responsiveness strategy with management & human resources - for firms to achieve high performance as predicted in Hypothesis *H3d.* Specifically, the use of combination A3 (i.e., lcs*CRS*MHR) was valuable in the four dimensions of firm performance: quality, timeliness, flexibility, and resource acquisition but not the dimension of efficiency. Their unique consistency scores surpassed the threshold value of .80 (they ranged from .83 to .92. See Column 6 in Table 5.6). In addition to combination A3, combination A6 (i.e., lcs*CRS*opl*MHR) was also composed of the use of pure customer responsiveness strategy with management & human resources; however, it was used only for the dimension of high efficiency. The unique consistency scores of combination A6 was .86, which provided support for Hypothesis *H3d.*

Comparing these four combinations of A2, A3, A5, and A6, combinations with high emphasis on customer responsiveness strategy and management & human resources (as in A3 and A6 that supported Hypothesis *H3d*) had higher unique coverage scores than combinations A2 and A5 (i.e., higher emphasis on customer responsiveness strategy and

operations & logistics resources) which supported Hypothesis *H3c*. Specifically, the unique coverage scores of combinations A3 and A6 ranged from .05 to .06, which were higher than those of combinations A2 and A5 ranging from .02 to .03.

Interestingly, firms following combination A5 (lcs*CRS*OPL*mhr) and combination A6 (lcs*CRS*opl*MHR) emphasized that high efficiency was associated with an exclusive use of either type of resource but not with both, whereas firms following combination A2 (lcs*CRS*OPL) and combination A3 (lcs*CRS*MHR) did not necessarily emphasize the exclusive use of one single type of resource with regard to the dimensions of quality, timeliness, flexibility, and resource acquisition. One possible explanation could be because firms believed that the pursuit of high efficiency excluded the use of both resources simultaneously.

In sum, although the pairing of customer responsiveness strategies and resources received general empirical support (as proposed in Hypotheses *H3c* and *H3d)*, I did not find support for the relationships with single resources for low cost strategies and innovation strategies as proposed in Hypotheses *H3a* and *H3b*.

v. Results: Testing Hypotheses *H4a* to *H4b*

Hypothesis *H4a* predicted the use of strategies of customer responsiveness and innovation with both types of resources. It received strong support as evidenced in combination A4 (CRS*INS*OPL*MHR). Similar to combinations A1, A2, and A3, combination A4 was supported for firms to achieve high performance in terms of the four dimensions of quality, timeliness, flexibility, and resource acquisition (all unique consistency scores over .89, in Column 5 of Table 5.6). Furthermore, its unique coverage scores ranged from .06 to .07 for the four dimensions of performance. It thus provided

significant support for Hypothesis *H4a* with the four dimensions of quality, timeliness, flexibility, and resource acquisition.

Hypothesis *H4b* predicted that the use of hybrid strategies (low cost, customer responsiveness, and innovation) associated with two resources (operations & logistics, and management & human resources) would lead to high firm performance. The last combination, A7, was the only combination that used three competitive strategies coupled with two resources and therefore signified the simultaneous use of hybrid strategies and both resources. The consistency score of combination A7 was .91 (as in Column 6 of Table 5.6), which indicated that 91 per cent of the firms using the hybrid strategies (low cost, customer responsiveness, and innovation) plus the two resources were able to achieve high efficiency. Additionally, its unique coverage score was .08 which represented the most significant contribution towards higher levels of efficiency. However, it did not contribute to any of the other four dimensions of firm performance. Thus, Hypothesis *H4b* received empirical support only with respect to the dimension of efficiency.

vi. Summary of the results

In sum, the solutions for each dimension of performance included four combinations of strategies and resources, which resulted in a total of 20 significant combinations of strategies and resources with five dimensions of firm performance. There were 17 out of 20 combinations with their unique consistencies over .85, while three other unique consistencies were between .80 and .85 (as in Column 6 of Table 5.6). Overall, there were seven significant combinations of strategies and resources in the sample (A1 to A7, as in Column 3 of Table 5.6). The four combinations for the

dimensions of quality, timeliness, flexibility, and resource acquisition were the same (A1, A2, A3, and A4). Only combination A1 appeared again with the dimension of efficiency, whereas the other three combinations leading to high efficiency (A5, A6, and A7) were unique as they appeared with no other dimension of performance. Since the use of low cost strategy was absent in any other combination associated with the dimensions of quality, timeliness, flexibility, and resource acquisition, firms might choose to pursue the low cost strategy in combination with other strategies and resources only if they were intent on seeking high efficiency.

Additionally, the four statistics (unique consistency, solution consistency, unique coverage, and solution coverage in Table 5.6) have provided significant support for the Hypothesis *H1c* (i.e., pure customer responsiveness strategy), *H3c* (i.e., customer responsiveness strategy and operations & logistics resources), *H3d* (i.e., customer responsiveness strategy and management & human resources), *H4a* (i.e., customer responsiveness and innovation strategies with operations & logistics and management & human resources) and *H4b* (i.e., low cost, customer responsiveness, and innovation strategies with operations & logistics and management & human resources). I did not find empirical support for the use of pure low cost strategy (*H1a*), pure innovation strategy (*H1b*), combination strategies without any single or multiple resources (*H2a* to *H2d*), low cost strategy with resources (*H3a*), and innovation strategy with resources (*H3b*).

5.3.4 Six Firm-level Configurations of Strategies and Resources

i. From combinations of constructs to configurations of firms

By adopting the notion of "hybrid strategic groups," DeSarbo & Grewal (2008) argued that firms may blend multiple competitive recipes and thus belong to multiple

strategic groups. In the previous section, I found seven different competitive combinations (A1 to A7) simultaneously exist in the sample firms with regard to achieving multiple dimensions of high performance (see Columns 3 and 4 in Table 5.6).

Depending on their perspectives and firm's mission, executives in different firms may develop varying dominant logics (Bettis & Prahalad, 1995; Prahalad & Bettis, 1986) to compete in their industry. As a result, some firms may follow simple recipes to accomplish their objectives. For example, combination A1 (lcs*CRS*ins) uses a pure customer responsiveness strategy without low cost and innovation strategies. The results presented in Table 5.6 reveal that this combination may be sufficient for at least some firms to achieve superior quality, timeliness, flexibility, efficiency, and resource acquisition. In this study, I found 16 firms that used this combination alone (see Table 5.7). Similarly, I found that nine firms used combination A3 (lcs*CRS*MHR, i.e., customer responsiveness strategy coupled with management & human resources in the absence of low cost strategy in Table 5.7).

However, other firms may use different dominant logics that involve other simple or more complex recipes. For example, a firm may use combination A2, A3, or A4 to achieve the four dimensions of superior quality, timeliness, flexibility, and resource acquisition. At the same time, it may choose to use combination A5, A6, or A7 to accomplish superior efficiency (see Columns 3 and 4 in Table 5.6). As a result, the firm is likely to use combinations A3 (lcs*CRS*MHR, i.e., customer responsiveness strategy with management & human resources but without low cost strategy) and A6 (lcs*CRS*opl*MHR, i.e., customer responsiveness strategy with management & human resources but without low cost strategy and operations & logistics resources)

TABLE 5.7
CONFIGURATIONS FOR PERCEPTUAL PERFORMANCE MEASURES

Configuration name/ High emphasis on:	Combinations	Compositions	N	Mean QUALITY	TIMELINESS	FLEXIBILITY	EFFICIENCY	RESOURCE ACQUISITION
C1: CRS (Service Firms)	A1	lcs*CRS*ins	16	.53	.70	.54	.44	.46
C2: CRS-MHR (Professional Service Firms)			53	.74	.75	.69	.54	.63
	A3	lcs*CRS*MHR	9					
	A3 & A6	lcs*CRS*MHR	29					
		lcs*CRS*opl*MHR						
	A1, A3 & A6	lcs*CRS*ins	15					
		lcs*CRS*MHR						
		lcs*CRS*opl*MHR						
C3: CRS-OPL (Logistics Service Firms)			24	.59	.63	.59	.48	.55
	A1, A2 & A5	lcs*CRS*ins	13					
		lcs*CRS*OPL						
		lcs*CRS*OPL*mhr						
	A2 & A5	lcs*CRS*OPL	11					
		lcs*CRS*OPL*mhr						
C4: CRS-MHR-OPL (Professional Logistics Service Firms)			40	.68	.73	.69	.53	.60
	A1, A2 & A3	lcs*CRS*ins						
		lcs*CRS*OPL						
		lcs*CRS*MHR						
C5: INS-CRS-MHR-OPL (Innovative Professional and Logistics Service Firms)			101	.73	.81	.76	.56	.70
	A2, A3 & A4	lcs*CRS*OPL						
		lcs*CRS*MHR						
		CRS*INS*OPL*MHR						
C6: INS-CRS-LCS-MHR-OPL (All-rounder)			32	.66	.76	.70	.64	.69
	A4 & A7	CRS*INS*OPL*MHR						
		LCS*CRS*INS*OPL*MHR						
Total number:			266					

N = Number of companies

Note: A1 - lcs*CRS*ins
A2 - lcs*CRS*OPL
A3 - lcs*CRS*MHR
A4 - CRS*INS*OPL*MHR
A5 - lcs*CRS*OPL*mhr
A6 - lcs*CRS*opl*MHR
A7 - LCS*CRS*INS*OPL*MHR

simultaneously in order to achieve high performance in all five dimensions of quality, timeliness, flexibility, efficiency, and resource acquisition. In fact, I found 29 firms that used these two combinations (A3 and A6, in Table 5.7). Additionally, I found another 15 firms that simultaneously used combination A1 (lcs*CRS*ins, i.e., pure customer responsiveness strategy without low cost and innovation strategies) in addition to combinations A3 and A6 (Table 5.7).

A closer look at the set membership data of the three sets of firms mentioned above (9, 29, and 15 firms) revealed that they were all high on customer responsiveness strategy and management & human resources but not on the other three constructs (i.e., low cost strategy, innovation strategy, and operations & logistics resources). In other words, the three sets totalling 53 firms used a configuration of customer responsiveness strategy with management & human resources in this study (as in configuration C2, see Table 5.7).

I conducted similar analyses for the rest of the firms in the sample. In total, I found six configurations of firms (i.e., C1 to C6, see Table 5.7) that have different emphases on the use of strategies and resources leading to high performance. In conclusion, combinations represent compositions of constructs (i.e., strategies and resources) that are sufficient to achieve superior performance; whereas configurations depict the sets of firms that use these combinations simultaneously in order to achieve their goals. These goals are achieved using a variety of strategic recipes, given their resource, industry structure, and top management preferences. To further understand the difference between combinations and configurations, please refer to a common sense example in Appendix 4.

As a result, I continued investigating which combinations were likely to be mixed together in the form of the configurations in this study. Additionally, the number of firms following the same configuration also gave a sense of its dominance. The results of the analysis are given in Table 5.7.

ii. Relative frequency of strategy-resource configurations

Overall, I found evidence of six different configurations (i.e., C1 to C6) depicted in Table 5.7. There were 16 firms in configuration C1 (named as *Service Firms*) using pure customer responsiveness strategy which represents the smallest group of our sample firms (i.e., lcs*CRS*ins). By contrast, the other five configurations used strategies with resources. Configuration C2 (named as *Professional Service Firms*) was composed of 53 firms using paired customer responsiveness strategy and management & human resources which were explicitly explained in the above section.

In contrast to configuration C2, configuration C3 ((named as *Logistics Service Firms*, n=24) combined customer responsiveness strategy and operations & logistics resources. Specifically, 13 firms chose to use combinations A1 (lcs*CRS*ins, i.e., pure customer responsiveness strategy without low cost and innovation strategies), A2 (lcs*CRS*OPL, i.e., customer responsiveness strategy and operations & logistics resources without low cost strategy), and A5 (lcs*CRS*OPL*mhr, i.e., combination A2 sans management & human resources). Additionally, another 11 firms combined A2 and A5 which also indicated the use of customer responsiveness strategy and operations & logistics resources.

Different from configurations C2 and C3, which emphasized single categories of resources, configuration C4 (named as *Professional Logistics Service Firms*) included 40

firms that pursued a customer responsiveness strategy coupled with the use of both resources. Specifically, they were composed of firms that simultaneously used combination A1 (lcs*CRS*ins, i.e., pure customer responsiveness strategy without low cost and innovation strategies), combination A2 (lcs*CRS*OPL, i.e., customer responsiveness strategy and operations & logistics resources without low cost strategy), and combination A3 (lcs*CRS*MHR, i.e., customer responsiveness strategy pairing with management & human resources but without low cost strategy). A closer look at the data of the 40 firms in configuration C4 indicated that these firms had higher membership in the three sets of customer responsiveness strategies, management & human resources, and operations & logistics resources.

Configurations C5 and C6 also emphasized the use of both resources but with multiple strategies. Specifically, 101 trucking firms in this study used both strategies of innovation and customer responsiveness in configuration C5 (named as *Innovative Professional and Logistics Service Firms*), which represented the largest group of our sample firms. All these 101 firms chose to mix combinations A2 (lcs*CRS*OPL, i.e., customer responsiveness strategy and operations & logistics resources without low cost strategy), A3 (lcs*CRS*MHR, i.e., customer responsiveness strategy with management & human resources but without low cost strategy), and A4 (CRS*INS*OPL*MHR). Overall, they represented the configuration of firms that combined two differentiation strategies of innovation and customer responsiveness with two resources.

In configuration C6 (named as *All-rounder*), 32 firms used innovation, customer responsiveness and low cost strategies which represented hybrid groups; however, the two resources (i.e., management & human resources, operations & logistics resources)

were indispensable in this configuration, which revealed a similar pattern to configuration C5. Thus, firms may choose multiple or hybrid strategies only when they emphasize the value of both resources.

iii. Supplementary analysis of equifinality

Overall, the emergence of the six configurations (i.e., C1 to C6) provided support for the existence of multiple configurations linking strategies and resources with high firm performance. I conducted supplementary analysis to compare performance across various configurations found in the sample.

Table 5.7 provides the mean values of each of the five dimensions of perceptual performance. Among all the six configurations, configuration C5, which coupled innovation and customer responsiveness strategies with the two resources, had the highest mean values (ranging from .70 to .81) in the dimensions of timeliness, flexibility, and resource acquisition. Configuration C6, using three strategies (low cost, customer responsiveness, and innovation) with two resources, had the highest mean value in the dimension of efficiency. Configuration C1 that adopted the pure customer responsiveness strategy had the lowest mean values of firm performance (ranging from .44 to .54) with all dimensions of performance except timeliness (mean value of .70).

Following previous studies testing equifinality (Jennings & Hindle, 2004; Jennings et al., 2003; Marlin, Ketchen, & Lamont, 2007), I did a one-way analysis of variance (ANOVA) among the six configurations. Table 5.8 provides the results of ANOVA for the six configurations with regard to the dimensions of quality, timeliness, flexibility, efficiency, and resource acquisition. There were three steps involved in ANOVA: I first did the omnibus F-test to establish an overall relationship of the six

configurations with regard to the five dimensions of firm performance. The F test statistics shown in Table 5.8 indicated that there was sufficient evidence of different means across these configurations.

Then the second step was to find which pairs of configurations differed. I did post hoc tests starting with the Levene test to see whether the variances of different groups were equal. The appropriate test depends on whether the variances are equal or not. If the Levene tests produce significant results (i.e., p value is less than .05 level), the variances of the groups are not equal, and Games-Howell test is then used to compare the means of each group in the third step. By contrast, insignificant results support the assumption that variances of the groups are equal, suggesting the use of the Hochberg test in step 3 to see if the means are the same for individual pairs of groups. Nevertheless, the Games-Howell test is recommended for most post hoc tests because there may be a suspicion that the population variances are not equivalent even though sample variances may be equal (Field, 2000).

The results of the tests for homogeneity of variances for the five dimensions of firm performance across the six configurations are given in Table 5.8. As is evident, the results indicated that the variances of the six configurations for the four dimensions of firm performance were equal. The only exception was efficiency.

TABLE 5.8 +
RESULTS OF ONE-WAY ANALYSIS OF VARIANCE (ANOVA) ACROSS CONFIGURATIONS: USING PERCEPTUAL PERFORMANCE MEASURES

	Step 1: Omnibus test			Step 2: Test of homogeneity of variances		Step 3: Post hoc multiple comparisons across configurations	
		F-statistic	Sig.	Levene Statistic	Sig.	Different pairs of group means using Hochberg test (equal variance assumed)	Different pairs of group means using Games-Howell test (equal variance not assumed)
Perceptual performance	Quality	3.46	.00	.85	.51	C1 < C2, C1 < C5	C1 < C2, C1 < C5
	Timeliness	3.29	.01	2.17	.06	C3 < C5	C3 < C5
	Flexibility	4.79	.00	1.43	.21	C1 < C5, C3<C5	C1 < C5, C3<C5
	Resource acquisition	3.88	.00	.20	.96	C1 < C5, C1<C6	C1 < C5, C1<C6
	Efficiency	2.22	.05	3.25	.01**	N/A	C1 < C6

+ Configurations were based upon results of perceptual performance measures. Six configurations were used in one-way analysis of ANOVA.
** A significant p-value at the 0.01 level (2-tailed) means the variances of all the configurations are significantly different.

The subsequent Hochberg test showed seven different pairs of means among all 60 comparisons (there are 15 comparisons for each pair of the six configurations. I did the Hochberg test for the four dimensions of quality, timeliness, flexibility, and resource acquisition). Among them, the performance means for configuration C1 (the high emphasis on customer responsiveness strategy) were significantly lower than configuration C5 (the pairing of customer responsiveness and innovation strategies with management & human resources and operations &logistics resources) with respect to the dimensions of quality, flexibility, and resource acquisition. The performance means of configuration C3 (described as the pairing of customer responsiveness strategy and operations & logistics resources) were significantly lower than configuration C5 (representing the pairing of two strategies of customer responsiveness and innovation with management & human resources and operations & logistics resources) for the dimensions of timeliness and flexibility. Similarly, the performance means of configuration C1 (customer responsiveness strategy) were lower than C2 (customer responsiveness strategy plus management & human resources) for quality. Likewise, the mean value of configuration C1 (the high emphasis on customer responsiveness strategy) was significantly lower than that of configuration C6 (the most complex configuration with three strategies and two resources in the study) with respect to resource acquisition.

The supplementary Games-Howell test, which was used in the event that population variances were not the same, found the same seven significant comparisons. For efficiency, I used the Games-Howell test because various groups were found to have unequal variances. This test revealed that configuration C1 (customer responsiveness strategy) has significantly lower mean value than C6 (the most complex configuration

with all three strategies and both resources) in terms of efficiency. The comparisons may be easier to grasp using plots of the means of the six configurations on each dimension of perceptual performance. Figure 5.4 shows these plots.

Overall, eight out of the 75 comparisons (about 89 per cent of the total) were found to have different values of means on the five perceptual performance measures. To summarize, among these eight comparisons, I found the mean values of different configurations were as follows: C1<C2 for quality, C1<C5 for quality, flexibility and resource acquisition, C1<C6 for resource acquisition and efficiency, C3<C5 for timeliness and flexibility. This finding indicated that some configurations varied with respect to their performance and might yield a higher level of performance than others with respect to certain dimensions of perceptual performance. Thus, these differences implied that managers had different choices of strategies and resources because they may value various dimensions of firm performance differently. Some dimensions may be more important for them, so they may stick with configurations that enable them to achieve high performance in these aspects.

Nevertheless, an overwhelming majority of the configurations proved to be equally effective thus supporting the idea of equifinality in this preliminary analysis pointing to the need for its potential in future research.

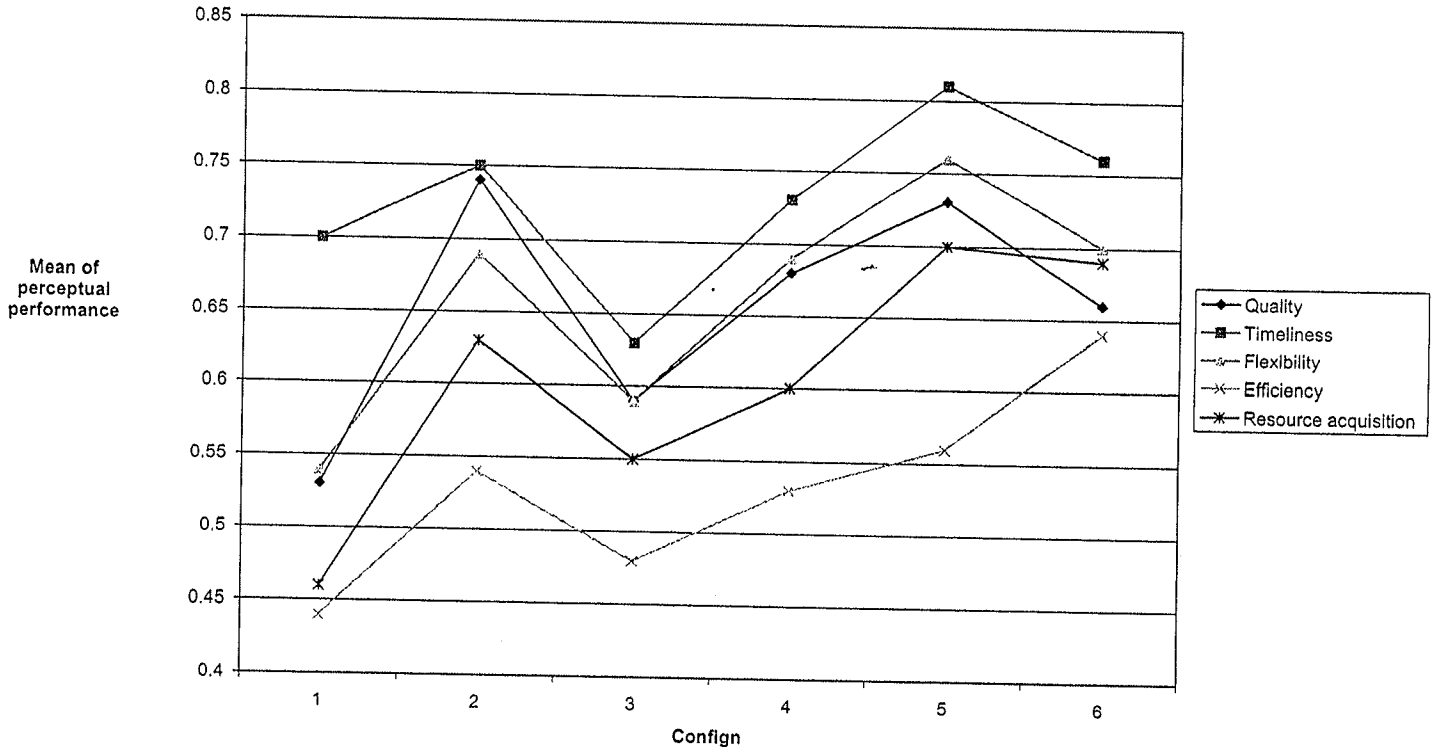
5.3.5 Supplementary Analysis Using Financial Performance Measures

In order to remedy the limitations associated with the use of perceptual measures of firm performance, I conducted further supplementary analysis by using objective financial performance measures (i.e., ROA, return on assets; ROS, return on sales; ROE,

return on equity; OPT, operating ratio, and ROI, return on investment). Table 5.9 presents the results of this analysis using the five measures of financial performance. Overall, there were 14 significant combinations of strategies and resources, of which there were five unique combinations. In contrast to the analysis with perceptual dimensions of firm performance, I did not find support for combinations A1 (lcs*CRS*ins), A2 (lcs*CRS*OPL), and A5 (lcs*CRS*OPL*mhr). Instead, the paths leading to high performance in terms of the four dimensions of ROA, ROS, ROE, and OPT were composed of the same three combinations: combination A6 (lcs*CRS*opl*MHR), combination A7 (LCS*CRS*INS*OPL*MHR), and combination A8 (lcs*CRS*ins*MHR). In addition, the paths leading to high ROI consist of two different combinations: Combination A3 (lcs*CRS*MHR) and A4 (CRS*INS*OPL*MHR). Therefore, these five significant combinations of strategies and resources were associated with high financial performance. Out of these five combinations, four of them (i.e., A3, A4, A6, and A7) were the same as those derived from the use of perceptual performance measures, and one was different (i.e., A8).

As illustrated in Column 5 of Table 5.9, the solution consistency (or overall consistency) scores were above .80 except the case of ROI where it received marginal support (consistency score was .75). Therefore, most of the proposed solutions were strongly associated with high firm performance. Further, the overall coverage for the five solutions ranged from .62 to .81, which implied that 62 to 81 per cent of the variance was explained by different combinations of strategies and resources for the five different measures of financial performance (see Column 7 of Table 5.9). In all these 14

FIGURE 5.4
MEANS PLOT (CONFIGURATIONS AND PERCEPTUAL PERFORMANCE DIMENSIONS)



Confign 1 represents configuration C1: CRS (Service Firms)
Confign 2 represents configuration C2: CRS-MHR (Professional Service Firms)
Confign 3 represents configuration C3: CRS-OPL (Logistics Service Firms)
Confign 4 represents configuration C4: CRS-MHR-OPL (Professional Logistics Service Firms)
Confign 5 represents configuration C5: INS-CRS-MHR-OPL (Innovative Professional and Logistics Service Firms)
Confign 6 represents configuration C6: INS-CRS-LCS-MHR-OPL (All-rounder)

TABLE 5.9
COMBINATIONS AND THEIR CONSISTENCY & COVERAGE USING FINANCIAL PERFORMANCE MEASURES

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
DV	Hypothesis	Combination#	combinations	Solution Consistency	Unique Consistency +	Solution coverage	Unique coverage
ROA	H3d	A6	lcs*CRS*opl*MHR		.88		.07
	H4b	A7	LCS*CRS*INS*OPL*MHR		.88		.06
	H3d	A8	lcs*CRS*ins*MHR		.86		.11
				.84		.65	
ROS	H3d	A6	lcs*CRS*opl*MHR		.87		.07
	H4b	A7	LCS*CRS*INS*OPL*MHR		.87		.06
	H3d	A8	lcs*CRS*ins*MHR		.84		.10
				.82		.62	
ROE	H3d	A6	lcs*CRS*opl*MHR		.89		.07
	H4b	A7	LCS*CRS*INS*OPL*MHR		.92		.07
	H3d	A8	lcs*CRS*ins*MHR		.85		.10
				.85		.65	
OPT	H3d	A6	lcs*CRS*opl*MHR		.90		.07
	H4b	A7	LCS*CRS*INS*OPL*MHR		.89		.06
	H3d	A8	lcs*CRS*ins*MHR		.87		.11
				.84		.67	
ROI	H3d	A3	lcs*CRS*MHR		.77		.20
	H4a	A4	CRS*INS*OPL*MHR		.82		.04
				.75		.81	

ROA= return on assets (Operating income/total assets);
ROS= return on sales (Operating income/total sales);
ROE= return on equity;
OPT= operating ratio (Total operating expenses/Operating revenues);
ROI= return on investment.

combinations, eleven unique consistency scores were over .85, two scores were over .80, and combination A3 (i.e., lcs*CRS*MHR) for the dimension of ROI was the only case with consistency score of .77 which showed marginal support for this combination. All the unique coverage scores ranged from .04 to .20 (see Column 6 of Table 5.9), thereby implying that the individual contributions of these combinations to high financial performance ranged from 4 to 20 per cent.

i. Hypothesis testing: *H1a* to *H4b*

By analyzing financial performance outcomes, I did not find support for the first set of hypotheses (i.e., *H1a* to *H1c*) associated with the use of pure strategies. Neither did I find support for the second set of hypotheses regarding multiple competitive strategies (i.e., *H2a* to *H2d*).

My data analysis also did not support Hypotheses *H3a* to *H3c* regarding the pairing of single strategies with one resource; however, I did find support for *H3d* which predicted the pairing of customer responsiveness strategy with management & human resources. Specifically, combination A6 (lcs*CRS*opl*MHR, i.e., the use of customer responsiveness strategy and management & human resources without low cost strategy and operations & logistics resources) received strong empirical support (unique consistency scores were .88 to .90 and unique coverage scores were .07). This combination was supported with the four dimensions of ROA, ROS, ROE, and OPT. In my analysis of perceptual data, combination A6 was associated with the dimension of efficiency.

Similarly, another combination A8 (lcs*CRS*ins*MHR, that is, the use of customer responsiveness strategy and management & human resources without low cost

and innovation strategies) also provided support for *H3d* (i.e., the pairing of customer responsiveness strategy and management & human resources leads to high performance) with unique coverage scores ranging from .84 to .87. It covered 10 to 11 per cent of the variance for the dimensions of ROA, ROS, ROE, and OPT in sample firms (see Column 8 of Table 5.9).

Additionally, combination A3 (lcs*CRS*MHR, i.e., customer responsiveness strategy and management & human resources without low cost strategy) also provided marginal support for Hypothesis *H3d* with regard to the dimension of ROI. Its unique consistency score was .77, and it accounted for 20 per cent of the variance with the dimension of ROI (its unique coverage score was equal to .20).

Hypothesis *H4a* predicted the use of two strategies of customer responsiveness and innovation with both resources. Combination A4 (CRS*INS*OPL*MHR) represented the use of customer responsiveness and innovation strategies coupled with operations & logistics resources and management & human resources; therefore, it provided empirical support for this hypothesis. However, firms only used it in order to achieve high financial performance in terms of ROI (unique consistency score was .82 and coverage score was .04) but not for the other four financial measures.

Hypothesis *H4b* predicted the use of three strategies with both resources. Combination A7 (LCS*CRS*INS*OPL*MHR, i.e., low cost, customer responsiveness, and innovation strategies with operations & logistics resources as well as management & human resources) was related to the four dimensions of ROA, ROS, ROE and OPT (unique consistency scores were above .87 and coverage scores ranged from .06 to .07) except ROI. Therefore, it provided strong empirical support for the hypothesis *H4b*.

In sum, as depicted in Table 5.6 and 5.9, combinations A1 (lcs*CRS*ins), A2 (lcs*CRS*OPL), A3 (lcs*CRS*MHR), and A4 (CRS*INS*OPL*MHR) helped in realizing competitive advantages of quality, timeliness, flexibility, and resource acquisition. Combination A5 was only helpful for firms to achieve high efficiency. Combinations A6 (lcs*CRS*opl*MHR), A7 (LCS*CRS*INS*OPL*MHR), and A8 (lcs*CRS*ins*MHR) facilitated firms in terms of achieving high financial performance (i.e., ROA, ROS, ROE, OPT) and the perceived dimension of efficiency.

ii. From combinations of constructs to configurations of firms

As in the analysis of configurations using perceptual performance measures, I were interested in exploring the sets of firms that chose from these five different combinations (i.e., A3, A4, A6, A7, and A8) in order to achieve high financial performance with respect to more than one dimension. In other words, firms may follow single or multiple combinations of strategies and resources to achieve high financial performance in terms of ROA, ROS, ROI, OPT, and ROE. Table 5.10 provides the four configurations associated with financial performance. Figure 5.5 shows the plots of the means of the four configurations on each dimension of financial performance.

Comparing Table 5.7 and 5.10 revealed interesting results. Four configurations were present in the analysis of financial performance data. Specifically, I found exactly the same four configurations C2, C4, C5, and C6 in both sets of analyses - perceptual and financial performance measures. Specifically, the 53 firms in configuration C2 used the pairing of customer responsiveness strategy and management & human resources. Configuration C4 (n=40) adopted customer responsiveness strategy with both management & human resources and operations & logistics resources. The largest

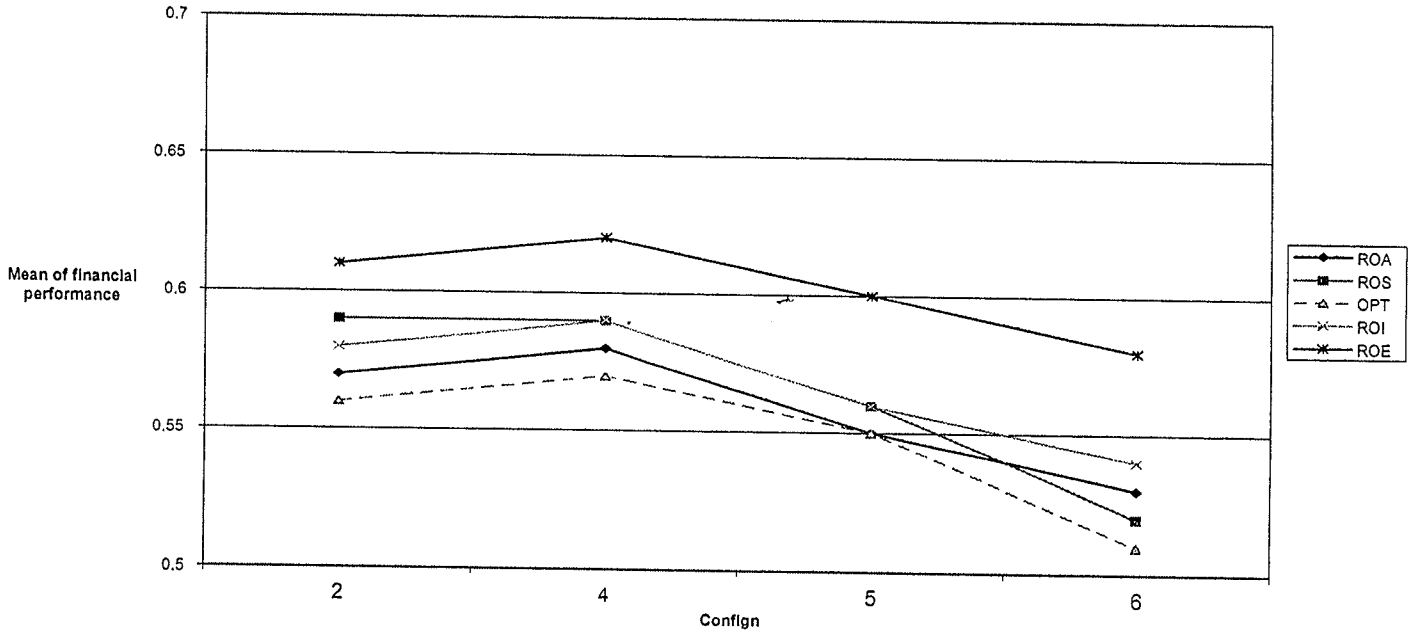
TABLE 5.10

CONFIGURATIONS FOR FINANCIAL PERFORMANCE MEASURES

Configuration name/ High emphasis on:	Combinations	Compositions	N	Mean ROA	ROS	OPT	ROI	ROE
C2: CRS-MHR (Professional Service Firms)			53	.57	.59	.56	.58	.61
	A3, A6 & A8	lcs*CRS*MHR	15					
		lcs*CRS*opl*MHR						
		lcs*CRS*ins*MHR						
	A3 & A6	lcs*CRS*MHR	38					
		lcs*CRS*opl*MHR						
C4: CRS-MHR-OPL (Professional Logistics Service Firms)			40	.58	.59	.57	.59	.62
	A3 & A8	lcs*CRS*MHR						
		lcs*CRS*ins*MHR						
C5: INS-CRS-MHR-OPL (Innovative Professional and Logistics Service Firms)			101	.55	.56	.55	.56	.60
	A3 & A4	lcs*CRS*MHR						
		CRS*INS*OPL*MHR						
C6: INS-CRS-LCS-MHR-OPL (All-rounder)			32	.53	.52	.51	.54	.58
	A4 & A7	CRS*INS*OPL*MHR						
		LCS*CRS*INS*OPL*MHR						
Total number:			226					
N = Number of companies								

Note: A3 - lcs*CRS*MHR
A4 - CRS*INS*OPL*MHR
A6 - lcs*CRS*opl*MHR
A7 - LCS*CRS*INS*OPL*MHR
A8 - lcs*CRS*ins*MHR

FIGURE 5.5
MEANS PLOT (CONFIGURATIONS AND FINANCIAL PERFORMANCE DIMENSIONS)



Confign 2 represents configuration C2: CRS-MHR (Professional Service Firms)
Confign 4 represents configuration C4: CRS-MHR-OPL (Professional Logistics Service Firms)
Confign 5 represents configuration C5: INS-CRS-MHR-OPL (Innovative Professional and Logistics Service Firms)
Confign 6 represents configuration C6: INS-CRS-LCS-MHR-OPL (All-rounder)

configuration, C5, that emphasized the pairing of innovation and customer responsiveness strategies and both resources, were composed of the same 101 firms as found in the analysis of perceptual performance measures. Again, the same 32 firms in configuration C6 simultaneously used low cost, innovation, and customer responsiveness strategies coupled with management & human resources as well as operations & logistics resources.

Differing from the results based on the analysis of perceptual performance measures, the use of pure customer responsiveness strategies (where n=16 in configuration C1) and the pairing of customer responsiveness strategy along with operations & logistics resources (where n=24 in configuration C3) were not found for financial performance data; therefore, the total number of companies came to 242, whereas it was 266 firms when I used perceptual performance measures in previous analysis.

I did one-way ANOVA to check the hypothesis of equifinality by conducting the F-test and test of homogeneity of variances (see Table 5.11). Overall, I did not find any empirical evidence of difference in means between any two of the five configurations, thereby supporting the notion of equifinality in this preliminary analysis.

5.4 CHAPTER CONCLUSION

This chapter has presented the data analysis utilizing the methodology discussed in Chapter 4. The analysis was carried out using two sets of performance data which might remedy the possible problem of common method bias. First, the five dimensions of perceptual performance data (i.e., quality, flexibility, timeliness, efficiency, and resource

TABLE 5.11*
RESULTS OF ONE-WAY ANALYSIS OF VARIANCE (ANOVA) ACROSS CONFIGURATIONS USING FINANCIAL PERFORMANCE MEASURES

	Step 1: Omnibus test			Step 2: Test of homogeneity of variances		Step 3: Post hoc multiple comparisons across configurations	
		F-statistic	Sig.	Levene Statistic	Sig.**	Different pairs of group means using Hochberg test (equal variance assumed)	Different pairs of group means using Games-Howell test (equal variance not assumed)
Financial measures of firm performance	ROA	.12	.97	.21	.51	None	None
	ROS	.21	.93	.49	.78	None	None
	ROI	.35	.84	.83	.53	None	None
	ROE	.84	.50	1.21	.31	None	None
	OPT	.57	.69	1.35	.24	None	None

* Configurations were based upon results of financial performance measures. Four configurations were used in one-way analysis of ANOVA.
** A significant p-value at the 0.01 level (2-tailed) means the variances of all the configurations are significantly different.

acquisition) were investigated. Seven combinations (A1 to A7) were found to be associated with high perceptual performance. The overall coverage and consistency scores using different perceptual performance measures showed the models to be acceptable.

The sample firms were then grouped into six configurations that used single factor (C1-customer responsiveness strategy, n=16), two factors (C2-customer responsiveness strategy and management & human resources, n=53; C3-customer responsiveness strategy and operations & logistics resources, n=24), three factors (C4-customer responsiveness strategy, management & human resources, and operations & logistics resources, n=40), four factors (C5-innovation strategy, customer responsiveness strategy, management & human resources, and operations & logistics resources, n=101) and five factors (C6-low cost, innovation, and customer responsiveness strategies with management & human resources and operations & logistics resources, n=32). The data analysis using five measures of financial performance (i.e., ROA, ROS, ROI, ROE, and OPT) showed very similar results. Despite the emergence of a new combination, A8, it produced the same configurations of firms except configurations C1 (pure customer responsiveness strategy) and C3 (customer responsiveness strategy and operations & logistics resources).

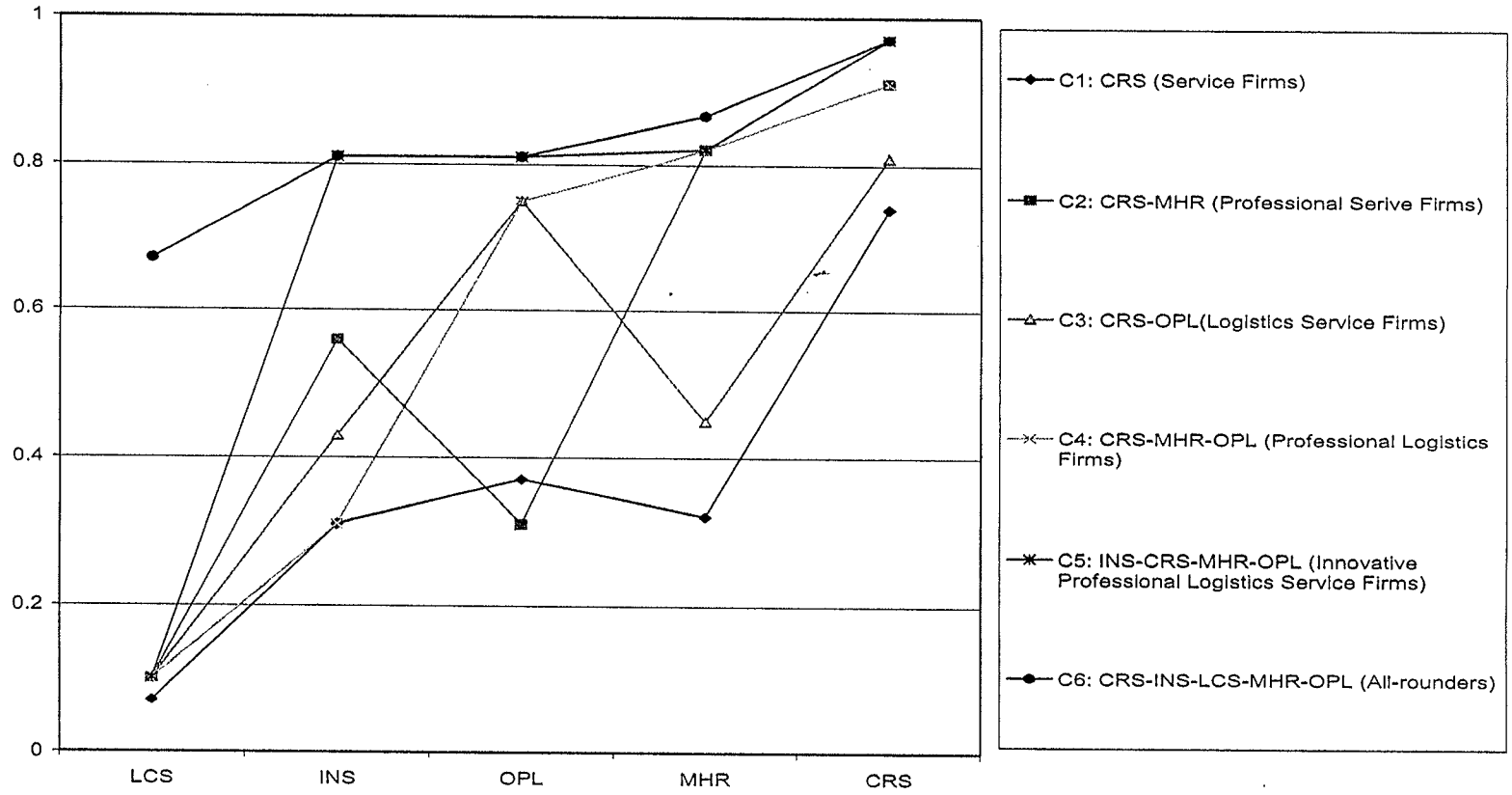
Table 5.12 represents the descriptives of major explanatory variables used in this study, and Figure 5.6 provides a detailed median plot of the six configurations. Each configuration is represented by the presence of consistently high levels of the one or more of the strategies and resources. For example, in configuration C2, customer responsiveness and management & human resources are consistently high (above .50;

TABLE 5.12
DESCRIPTIVE STATISTICS OF MAJOR EXPLANATORY VARIABLES *

Configurations		Low cost strategy (LCS)	innovation strategy (INS)	Operations & logistics resources (OPL)	Management & human resources (MHR)	Customer responsiveness strategy (CRS)
C1	mean	.10	.26	.34	.33	.74
	median	.07	.31	.37	.32	.74
	maximum	.29	.43	.43	.45	.99
	minimum	.01	.04	.01	.10	.52
C2	mean	.16	.61	.31	.80	.86
	median	.10	.56	.31	.82	.91
	maximum	.41	.99	.43	.99	.99
	minimum	.00	.04	.00	.57	.52
C3	mean	.11	.51	.75	.40	.77
	median	.10	.43	.75	.45	.81
	maximum	.41	.91	.99	.45	.97
	minimum	.01	.10	.56	.20	.52
C4	mean	.15	.31	.75	.78	.87
	median	.10	.31	.75	.82	.91
	maximum	.41	.43	.99	.99	.99
	minimum	.00	.01	.56	.57	.52
C5	mean	.15	.79	.82	.83	.92
	median	.10	.81	.81	.82	.97
	maximum	.41	.99	.99	.99	.99
	minimum	.00	.56	.56	.57	.52
C6	mean	.67	.83	.81	.84	.94
	median	.67	.81	.81	.87	.97
	maximum	.99	.99	.99	.99	.99
	minimum	.54	.56	.56	.57	.66

* These are calibrated measures of set membership of major explanatory variables within the interval of [0, 1]. They are used for fs/QCA in the study.

FIGURE 5.6
MEDIANS PLOT OF MAJOR EXPLANATORY VARIABLES ACROSS 6 CONFIGURATIONS *



* Data used in the plot was median values of major explanatory variables after calibration into the form of fuzzy sets.
* Data used in the plot was median values of major explanatory variables after calibration into the form of fuzzy sets.

from .52 to .99, and .57 to .99, respectively), whereas others may be low (below .50) or may vary from low to high. For instance, in C2, innovation strategy varies from low to high (.04 to .99), whereas low cost strategy and operations & logistics resources are low—i.e., from .00 to .41 and from .00 to .43, respectively. This revealed different emphases of strategies and resources across configurations found in this study.

Overall, Hypotheses *H3d, H4a,* and *H4b* received empirical support using both perceptual and financial performance measures, whereas Hypotheses *H1c* and *H3c* were supported only with the perceptual measures of firm performance in this study (see Table 5.13). Further, the results of one-way ANOVA showed preliminary support for the equifinality of different configurations. I did not find any support for the other proposed hypotheses. Configuration C5 had the largest number of sample firms (n=101) among all the six configurations. Therefore, C5 (i.e., the pairing of customer responsiveness and innovation strategies with multiple resources) is the dominant configuration in the sample firms.

In sum, customer responsiveness strategy appeared to be the most valuable strategy used by sample firms in the trucking industry due to the fact that all configurations leading to high firm performance involved customer responsiveness strategy. Customer responsiveness strategy by itself, or when combined with operations & logistics resources, or with innovation strategy coupled with both resources (i.e., management & human resources and operations & logistics resources) enables firms to achieve high performance with respect to the five perceptual measures (i.e., quality, timeliness, flexibility, efficiency, and resource acquisition). Customer responsiveness strategy together with management & human resources contributes to both perceptual and

TABLE 5.13
RESULTS OF HYPOTHESES TESTED IN THE STUDY

STRATEGIES	Absence of resources	Presence of OPL resources	Presence of MHR resources	Presence of both OPL and MHR resources
Single	Cell A H1a: LCS → PERF **(rejected)** H1b: INS → PERF **(rejected)** H1c: CRS → PERF **(supported for quality, timeliness, flexibility, efficiency, resource acquisition)**	Cell D H3a: LCS & OPL → PERF **(rejected)** H3c: CRS & OPL → PERF **(supported for quality, timeliness, flexibility, efficiency, resource acquisition)**	Cell E H3b: INS & MHR → PERF **(rejected)** H3d: CRS & MHR → PERF **(supported for quality, timeliness, flexibility, efficiency, resource acquisition)** **(supported for ROA, ROS, ROE, OPT, ROI)**	
Two	Cell B H2a: INS & CRS → PERF **(rejected)** H2b: LCS & INS → PERF **(rejected)** H2c: LCS & CRS → PERF **(rejected)**			Cell F H4a: CRS, INS, OPL, & MHR → PERF **(supported for quality, timeliness, flexibility, resource acquisition)** **(supported for ROI)**
Three	Cell C H2d: LCS, INS, & CRS → PERF **(rejected)**			Cell G H4b: LCS, CRS, INS, OPL & MHR → PERF **(supported for efficiency)** **(supported for ROA, ROS, ROE, OPT)**

LCS – Low cost strategy;
INS – Innovation strategy;
CRS – Customer responsiveness strategy;
OPL – Operations & logistics resources;
MHR – Management & human resources;
ROA= Return on assets (Operating income/total assets);
ROS= Return on sales (Operating income/total sales);
ROE= Return on equity;
OPT= Operating ratio (Total operating expenses/Operating income);
ROI= Return on investment.

financial measures of firm performance. Hybrid strategies (i.e., the combined strategies of low cost, innovation, and customer responsiveness) are used to achieve high efficiency as well as financial measures with both resources as necessary conditions. In addition, firms in most configurations (250 out of 266 firms) emphasize the co-alignment of resources with competitive strategies (as indicated in configuration C2 to C6). Finally, a set-theoretic approach appears to have excellent promise for integrating qualitative and quantitative methods to develop and examine a configuration approach to organizations in the future.

CHAPTER 6: DISCUSSION AND CONCLUSIONS

6.1 INTRODUCTION AND OVERVIEW OF THE CHAPTER

This research integrates the competitive positioning school with the resource-based view (RBV) of the firm to address the issue of what pairings of competitive strategies (i.e., low cost, differentiation, hybrid) and resources (i.e., management & human resources, operations & logistics resources) firms use to achieve superior firm performance. Chapter 3 developed a configurational framework considering relationships of strategies and resources with firm performance. In Chapter 4 I elaborated on a new research methodology, the set-theoretic approach, for testing the hypotheses. Chapter 5 outlined the analyses and results using perceptual and financial performance measures. Results derived from both sets of tests were quite similar.

Overall, I found the existence of eight strategic combinations (A1 to A8, see Tables 5.6 and 5.9) that firms used to compete in the trucking industry in this study. Building on these findings, I derived six configurations of the sample firms (C1 to C6, see Table 5.7) by investigating the use of these single or multiple strategic combinations by each firm. Specifically, all the resulting configurations associated with high performance involved customer responsiveness strategy. Further, configurations of pure and hybrid strategies both enabled firms to achieve high performance; however, pure customer responsiveness strategy only accounted for approximately 6 per cent of all successful firms (n=16). Further, its use was supported for perceptual performance dimensions (i.e., quality, timeliness, flexibility, efficiency, resource acquisition) but not for financial performance. A hybrid strategy involving low cost, customer

responsiveness, and innovation (n=32) was used for firms to achieve high efficiency and financial measures. Overall, most of the firms (n=250, i.e., 94 per cent of the 266 firms) emphasized the co-alignment of different types of resources with either single or multiple competitive strategies (as represented in configurations C2 to C5). I also conducted a preliminary test of the performance differences across configurations. Although a few configurations varied from one another with respect to firm performance, most of them appeared to be equifinal.

This chapter starts by discussing the seven major points based on the data analysis in this study, comparing its findings with pervious research. The following section articulates the conceptual, methodological, and substantive contributions of this study. Next, the limitations of the study are discussed. I then conclude the chapter by discussing the implications for future research.

6.2 DISCUSSION

6.2.1 Competitive Strategies of Firms

Among all research efforts that aim to explain the reason why some organizations are more successful than others, the competitive positioning school purports that business-level strategies lead to high firm performance based on the structure-conduct-performance (SCP) model from Industrial Organization (IO) economics (Bain, 1956; Mason, 1957; Porter, 1980, 1985). It was proposed that explicit competitive strategies (low cost vs. differentiation) enable firms to achieve high performance.

Results in this study, first, corroborate the role of competitive strategies for firms to achieve high performance as stated in the positioning school (Porter, 1980, 1985) and

supported by various studies (Campbell-Hunt, 2000; Dess & Davis, 1984; Hambrick, 1981, 1982; Thornhill & White, 2007). Specifically, within all the six configurations (i.e., C1 to C6) found in this study that lead to high performance of trucking firms (i.e., in terms of the five perceptual and the five financial dimensions), *customer responsiveness strategy* is included in all of them. Therefore, customer responsiveness strategy does seem to help firms in my sample to achieve competitive advantage and to be successful.

Nevertheless, although our results did provide support for the use of pure customer responsiveness strategy as proposed in Hypothesis *H1c*, I did not find the use of pure low cost and pure innovation strategies in the sample of firms. Customer responsiveness strategies actually appear in all the configurations that lead to high firm performance in the sample of firms in this study.

On the one hand, the results are in congruence with Menguc et al. (2007) in which marketing differentiation strategy appeared to be the only competitive strategy that was associated with both effectiveness and efficiency. It was also consistent with their notion that marketing differentiation strategy seemed to be most valuable for firms to achieve multidimensional performance benefits.

On the other, these results differ from Spanos et al. (2004) which, in their diverse sample of Greek manufacturing firms, found that *low cost strategy* was included in all strategic combinations. One of the possible reasons may lie in the fact that these two studies use different research contexts. While Greek firms are in a transitional economy and the low cost strategy may be "the only one 'real' advantage" (Spanos et al., 2004: 145), American trucking firms exist in the arena where customer service may be the basis for them to compete with each other. In fact, the results are consistent with Gallagher's

(1999) expression with respect to the transportation (rail) industry, "It's the service, stupid" (Gallagher, 1999: 31).

It may also be associated with the characteristics of the sample industry itself in this study. In contrast to other emerging high-tech or more traditional manufacturing industries, the trucking industry is basically service-focused that is composed of incumbents and new entrants with different characteristics (e.g., different ages, sizes, or ownership types). The profit margin is very low in this fragmented market. Rather than compete on the single factor of price, trucking firms may perceive the importance of establishing their brand names in building a sustainable competitive advantage and charging a premium price by providing timely, upgraded and high quality services for their customers. Consequently, customer responsiveness strategy is likely to gain the upper hand in order for trucking firms to compete.

6.2.2 Pure versus Hybrid Strategies

The current study provides useful insights into the debate of the use of pure versus hybrid strategies. Porter was the proponent of pure strategies and believed that firms trying to combine low cost and differentiation strategies are likely to be "stuck in the middle". The use of pure strategies has been supported by a few empirical studies (e.g., Campbell-Hunt, 2000; Dess & Davis, 1984; Hambrick, 1981, 1982; Thornhill & White, 2007). For example, in their recent study, Thornhill and White (2007) developed the construct of "strategic purity" (i.e., the ratio of low cost strategy to product leadership strategy) and supported its positive relationship with operating margin (measured as gross profits over gross revenues) across 2,351 businesses in four industry sectors (i.e., manufacturing, construction, retail, and business services).

Although the ongoing debate between the use of single competitive strategy and hybrid strategies has persisted for long time, recent studies have increasingly supported the presence of hybrid strategies. For example, Hill (1988) conceptually analyzed the feasibility of hybrid strategies because the differentiation strategy is helpful in decreasing overall costs of firms over the long run. Other studies provided empirical support for the use of combined low cost and differentiation strategies across different countries, industries, and contexts (e.g., Acquaah & Yasai-Ardekani, 2008; Kim & Lim, 1988; Kim et al., 2004; Spanos et al., 2004; Sum & Teo, 1999).

This study has provided mixed results towards the debate of pure vs. hybrid strategies. On the one hand, I find the presence of configuration C1 that focuses on pure customer responsiveness strategy with 16 trucking firms in order to achieve high performance in terms of quality, timeliness, flexibility, efficiency, and resource acquisition. This result is in line with previous findings that pure differentiation strategies were associated with the highest firm performance in the trucking industry (e.g., Corsi et al., 1991; Wang et al., 2006). Nevertheless, I do not find any evidence of firms using pure low cost or pure innovation strategy as in previous studies of trucking firms (e.g., Corsi et al., 1991; Wang et al., 2006). It may partly be attributed to the research context as well as the time of research study. Wang et al. (2006) focused on Chinese logistics firms for which pure low cost strategy or innovation strategy is more useful for competition. Corsi et al. (1991) examined trucking firms in the U.S. context; however, their study was conducted in 1980s. It appears that the significance of customer responsiveness strategies may have increased as a result of enhanced professionalization of trucking firms over the years.

Whereas customer responsiveness strategy has its own advantage, it does not prevent firms in this study from combining it with other strategies, although resources are also necessary with the use of multiple strategies. Specifically, configuration C6 (n=32) includes firms pairing the hybrid strategies (low cost, customer responsiveness, and innovation) coupled with the two resources (i.e., management & human resources and operations & logistics resources).

Furthermore, both pure and hybrid strategies enable firms to achieve high performance; however, pure customer responsiveness strategies are most helpful in the five perceptual performance dimensions (i.e., quality, timeliness, flexibility, efficiency, and resource acquisition), whereas firms adopting hybrid strategies of low cost, innovation, and customer responsiveness need to use the two resources to achieve high performance with respect to efficiency and financial measures.

6.2.3 Firm Resources

The resource-based view of the firm argues for the role of firm resources (e.g., Barney, 1986, 1991, 2001; Eisenhardt & Martin, 2000; Penrose, 1959; Wernerfelt, 1984) that help firms to achieve and retain competitive advantage. Further, different types of resources may be equivalent or complementary (Black & Boal, 1994; Milgrom & Roberts, 1990, 1995; Rhyne & Teagarden, 1997). For example, firms may combine human assets with financial resources (Rhyne and Teagarden, 1997) or information technology (Powell & Dent-Micallef, 1997) in order to achieve high firm performance. Likewise, marketing and technology resources may also be complementary (Song et al., 2005).

The usefulness of resources may vary according to the nature of the industry. For example, Miller and Shamsie (1996) demonstrated the difference between property-based resources and knowledge-based resources in the Hollywood's film industry. By comparison, in this study I found that operations & logistics resources and management & human resources were among the most critical resources in this context. Based on the previous literature on resources in the trucking industry (Lynch et al., 2000; Marchington, et al., 2003; Novack et al., 2001; Pettus, 2001; Stank, et al., 2005; Stank & Stephenson, 1995; Zhao et al., 2001) and insights from industry executives (e.g., Kleysen, 2007; Streuder, 2007), my findings indicate that resources are necessary in five configurations (C2 to C5, n=250, i.e., approximately 94 per cent of the 266 firms). Thus, our intention of locating the most valuable resources in the trucking industry was supported, which was consistent with the findings in extant literature (e.g., Lynch et al., 2000; Novack et al., 2001; Pettus, 2001; Stank & Stephenson, 1995; Zhao et al., 2001).

Resources are attached to strategies (Porter, 1991) and "not valuable in and of themselves" (Spanos & Lioukas, 2001). Corroborated by my intentions and primary strategic framework, I did not propose a specific hypothesis addressing the relationship between resources and firm performance. In this study, I did not find support for the two resources by themselves. Whereas this was at variance with the stream of research on the RBV in general (e.g., Dutta et al., 2005; Newbert, 2007; Song et al., 2005), it was specifically consistent with the stream of research on competitive strategies (e.g., Porter, 1980, 1985; Spanos & Lioukas, 2001).

6.2.4 Co-alignment between Strategies and Resources

The current study may enhance our understanding on the co-alignment between strategies and resources and its relationship with firm performance. Over the years, the positioning school (e.g., Porter, 1980, 1985) and the RBV of the firm (Barney, 1986, 1991, 2001; Wernerfelt, 1984) have often been studied separately because they investigate success factors with either external or internal emphasis; however, resources may enable the firm to formulate and implement its strategic choices in changing market conditions to attain and sustain competitive advantage (e.g., Spanos & Lioukas, 2001). Previous literature has proposed several conceptualizations of fit (e.g., moderation, mediation, and configuration) among major factors associated with firm performance (e.g., Drazin & Van de Ven, 1985; Van de Ven & Drazin, 1985; Venkatraman, 1990; Venkatraman & Prescott, 1990; Yin & Zajac, 2004). Accordingly, a few studies have incorporated these two constructs and emphasized the fit between strategies and resources.

For example, Chandler and Hanks (1994) found that quality-oriented strategy matches with firms' capabilities of customer service training and managerial expertise, whereas cost leadership strategy is congruent with capabilities of securing low-cost operating facilities. Lynch et al. (2000) found two types of fit leading to high firm performance in the retail grocery industry: one is between low cost strategy and process capabilities, and the other is between value-added capabilities and differentiation strategy. Spanos and Lioukas (2001) found the indirect effects of resources on market performance via competitive strategies through a path analysis. Nickerson et al. (2001) investigated international courier and small package services in Japan and found the co-

alignment between differentiation strategy and idiosyncratic resources leading to high performance. By contrast, Aragon-Correa & Sharma (2003) argued for the match of product-focused resources with a differentiation strategy and process-focused practices with a low cost strategy. Additionally, Edelman et al. (2005) found that quality/customer service and innovation strategies work as mediators between resource profiles (i.e., human and organizational resources) and firm performance; however, they studied the fit as mediation and also used a contingency framework which treats the fit of multiple factors as mediation (Venkatraman, 1989). Similarly, other studies also supported the fit between IT investment strategies and capabilities that lead to high firm performance (e.g., Aral & Weill, 2007)

Instead, some other researchers have attempted to examine the role of co-alignment between strategies and other organizational factors using the configurational perspective. For example, Doty et al. (1993) found support for Miles and Snow's model of *Prospectors*, *Defenders*, and *Analyzers* using the profile deviation method. Likewise, Hughes and Morgan (2008) examined the role of fit between resources (e.g., learning) and strategic orientations for firms to achieve high financial and customer-market performance. The proposed relationship between fit and firm performance was supported for *Defenders* and *Analyzers*, but not for *Prospectors*.

Similarly, this study also considers the match between resources and competitive strategies in helping firms to achieve high performance using a configurational perspective. Specifically, although configuration C1 provides support of the use of pure strategy without resources by trucking firms, all the other five configurations (i.e., C2 to C6) emphasize the role of resources when firms pursue pure or multiple strategies. In

other words, there are only 16 firms in configuration C1 out of the 266 successful trucking firms that stick with the pure customer responsiveness strategy without high emphasis on either management & human resources or operations & logistics resources.

Among the other configurations, configuration C2 (where n=53) emphasizes the pairing of management & human resources with customer responsiveness strategy, while configuration C3 (where n=24) includes firms valuing the co-alignment between operations & logistics resources and customer responsiveness strategy. There are still another 40 firms in configuration C4 that match both resources with customer responsiveness strategy. In configurations C5 and C6, I find the pairing of these two resources with multiple strategies in 101 and 32 trucking firms, respectively. In sum, an overwhelming majority of firms (250 out of 266 firms, i.e., 94 per cent of the total) belong to configurations that combine resources with the use of strategies (see Table 5.7 for details). This provides support for the complementarity of competitive strategies and resources. Compared to Doty et al. (1993) and Hughes and Morgan (2008), this study partially documents the existence of *Prospectors* (as in configurations C1 to C5) and *Analyzers* (in configuration C6), but there is no empirical support for *Defenders*. Again, the reason why *Defenders* are not available from the study may be related to the nature of the research context. After all, low cost strategy by itself may be not sufficient for trucking firms to compete.

6.2.5 Strategies and Resources in the Trucking Industry

The current study also provides new insights for the research in the trucking industry. Previous research in the trucking industry has documented the use of pure and hybrid strategies (e.g., Corsi et al., 1991; Stephenson & Stank, 1994; Sum & Teo, 1999;

Wang et al., 2006; Yeung et al., 2006). For example, Corsi et al. (1991) found the positive relationship between differentiation strategy and firm performance, whereas hybrid strategies of low cost and differentiation strategies were found in trucking firms in Singapore (Sum & Teo, 1999) and Hong Kong (Yeung et al., 2006). There were still other studies that investigated the major resources of trucking firms (Marchington et al., 2003; Novack et al., 1995; Pettus, 2001; Stank et al., 2005; Stank & Stephenson, 1995; Zhao et al., 2001). For example, Pettus and Munoz (2007) argued that the combined resources would create "synergistic capabilities" and therefore are the sources of value creation. Nevertheless, there has been no study to date that addresses these two major constructs in one integrative conceptual model or tests their relationship in empirical studies regarding trucking firms.

In this study, I argue that strategies and resources should not be studied separately. Instead, the match between strategies and resources makes more sense for trucking firms to compete with their rivals. Specifically, customer responsiveness strategies in this industry appear to be more dominant than innovation and low cost strategies. Firms may choose to use a hybrid strategy of low cost, innovation, and customer responsiveness; however, the hybrid strategy is mostly valuable for trucking firms to achieve high efficiency and financial performance. Most of the sample firms (in configurations C1 to C5) are focused on a single customer responsiveness strategy or combine innovation strategy with it. After all, both innovation and customer responsiveness strategies are intended to create more unique customer value than low cost strategy. Additionally, firms need to use single or combined resources to achieve high performance (in configurations C2 to C6).

As firms in this and other industries evolve and become more professional, they may not only emphasize service, but they may also emphasize the use of resources and capabilities to match their service. In other words, the simple message to the firms in the future may be: "It's the fit, stupid!" (Kay, 1993). A possible adaptation may be: it's the fit of service strategies and resources!

6.2.6 Equifinality

The results also provide preliminary support for equifinality regarding configurations of strategies and resources and their firm performance. The notion of equifinality addresses the existence of multiple paths that lead to the same outcome (Gresov & Drazin, 1997). It is implicit in Porter's (1980, 1985) theoretical model that any explicit competitive strategy (i.e., low cost vs. differentiation) is able to help firms to succeed. Additionally, the four archetypes of competition proposed by Miles and Snow (1978), i.e., *Prospectors, Defenders; Analyzers, and Reactors,* also provide support for equifinality (Doty et al., 1993). Using different techniques such as agent-based simulation (Siggelkow & Rivkin, 2005), qualitative approach (e.g., Anand et al., 2007), or ANOVA (e.g., Jennings & Hindle, 2004; Jennings et al., 2003; Marlin et al., 2007), researchers have been engaged in articulating and testing equifinality.

Using one-way ANOVA, I explore a comparison of firm level performance across configurations and find that a few pairs of configurations lead to different levels of firm performance. Specifically, performance of configuration C1 (the use of pure customer responsiveness strategy) is not as good as that of configuration C2 (the pairing of customer responsiveness strategy with management & human resources) in terms of quality. Performance of configuration C1 is also lower than configuration C5 (the pairing

of customer responsiveness and innovation strategies with operations & logistics and management & human resources) in terms of quality, flexibility, and resource acquisition. Further, performance of configuration C1 is less than that of C6 (i.e., the simultaneous use of innovation, customer responsiveness, and low cost strategies with operations & logistics and management & human resources) in terms of resource acquisition and efficiency. Lastly, configuration C5 outperforms configuration C3 (the pairing of customer responsiveness strategy with operations & logistics resources) in terms of timeliness and flexibility. Because managers may have different "dominant logics" regarding which dimensions of perceptual performance are more valuable for them, they may choose different configurations of strategies and resources in order to perform high in particular areas, e.g., the use of C5 for high quality, flexibility, and resource acquisition.

Most of the one-way ANOVA tests in Chapter 5 reveal that most pairwise comparisons of configurations (67 out of 75, 89 per cent of the total) in terms of the five dimensions of perceptual performance are not significant. Although I do not find the configurations of C1 (i.e., the pure customer responsiveness strategy) and C3 (i.e., the pairing of customer responsiveness strategy with operations & logistics resource) in the analysis of financial performance measures, there are no significant mean differences across the other four successful configurations (i.e., C2, C4, C5, and C6). These findings are in congruence with previous studies on strategic groups (e.g., Jennings et al., 2003; Marlin et al., 2007). However, these findings differ from Thornhill and White (2007) in which pure strategies often lead to better financial performance for firms in multiple

industry sectors. In sum, I conclude that different configurations of strategies and resources lead to similar levels of high performance in our sample of trucking firms.

The different results associated with the analyses of two sets of firm performance (e.g., the absence of the two configurations of C1 and C3 in the analysis of financial performance) may also be due to the fact that perceptual and financial performance measures are associated with different aspects of firms. Whereas perceptual measures concern firms' operational effectiveness, financial measures are related to firms' profitability (Venkatraman & Ramanujam, 1986). These two domains may not be highly correlated, which is reflected in their low correlation coefficients as revealed in Table 5.5. Nevertheless, the majority of our sample firms (85 per cent, i.e., 226 out of 266 firms using successful configurations) use the four configurations of C2, C4, C5, and C6 to achieve high performance in terms of operational effectiveness and profitability.

6.2.7 Innovative Methodology

Lastly, this study uses a more recently developed methodology of testing configurations (Ragin, 1986, 2000) in the area of management. Fiss (2007) argued that the most traditional methodologies (e.g., cluster analysis, profile deviation method, and regression analysis, among others) had limitations in testing configurational perspectives. He contended that in sharp contrast with these traditional methodologies, the set-theoretical approach has its distinctive advantage because of its emphasis on holisticity, causal complexity, nonlinearity, and asymmetry.

In this study of competition in the U.S. trucking industry, I have applied and developed the set-theoretic approach, which has been used in political science and sociology (Hodson & Roscigno, 2004; Kvist, 2006; Roscigno & Hodson, 2004) and has

recently been introduced to the area of management (Fiss, 2007; Kogut et al., 2004; Kogut & Ragin, 2006). I find eight significant combinations of strategies and resources (A1 to A8) that help trucking firms to achieve high performance with respect to both perceptual measures (i.e., quality, timeliness, flexibility, efficiency, and resource acquisition) and financial measures (i.e., ROA, ROS, ROI, ROE, and OPT). Further, the sample firms mix these combinations and then fall into six configurations (C1 to C6) to achieve more than one dimension of high performance. With the set-theoretic approach, I am able to examine the existence of combinations and configurations of strategies and resources in the trucking industry that cannot be detected in regression analysis (Zantow, Dass, & Ni, 2007) because the uniqueness of each case is lost when there is focus on central tendencies (Bowen & Wiersema, 1999). A set-theoretic approach treats each case as unique and holistic and compares it to other cases, thereby allowing researchers to match methodology to a configurational conceptualization.

6.3 CONTRIBUTIONS OF THE RESEARCH

6.3.1 Conceptual Contributions

This study attempts to make several contributions to the strategy and management literature in general. *First,* it provides insights into the use of competitive positioning strategies. As argued in Chapter 3, firms that perceive that it is complementary to provide both innovative and customer-oriented products/services may pursue multiple strategies of innovation and customer responsiveness. Similarly, low cost and differentiation strategy (i.e., customer responsiveness and innovation) are not mutually exclusive but reinforce each other because they could enhance the value of the whole firm in the

process (Hill, 1988). Low cost strategy may provide more leverage for a firm to adopt a differentiation strategy, whereas differentiation strategy makes it possible for a firm to achieve efficiency by reducing transaction costs in the value chain of manufacturing, marketing, and distribution, among others. These provide the rationale of the use of multiple and hybrid competitive strategies.

In this study, only a few firms followed the configuration C1 of pure customer responsiveness strategy without the support of resources. Specifically, in the test of *perceptual* measures of firm performance (see Table 5.7), firms following configuration C1 are composed of only 16 firms (about 6 per cent) in this study, which is the smallest group of all the six configurations. Moreover, this path does not even appear in the useful combinations that contributed to *financial* performance of the firm (see Table 5.9). Thus, I conclude that single positioning strategies alone may at best make a marginal contribution to high firm performance. A substantial proportion of firms (about 44 per cent) in Configurations C2, C3, and C4 do follow a customer responsiveness strategy, but they perceive its value only when using it with management & human resources and/or operations & logistics resources. It provides evidence that strategic purity pays but only when it is supported by the resources. In other words, it supports the *integration* of competitive positioning school and the RBV of the firm to explain the sources of high firm performance.

Whereas the customer responsiveness strategy is more dominant than low cost and innovation strategies, firms may combine it with the other two strategies in the presence of both resources (i.e., operations & logistics resources, management & human resource). Specifically, 101 firms (about 38 per cent) pursue multiple innovation and

customer responsiveness strategies while the other 32 firms (about 12 per cent) combine low cost, innovation, and customer responsiveness strategies. Although hybrid strategy (low cost and differentiation) faces the potential threat of a firm being "stuck-in-the-middle", more recent theoretical and empirical studies (e.g., Spanos et al., 2004) have documented the use of hybrid strategies, some of which have focused on the trucking industry (e.g., Sum & Teo, 1999; Yeung et al., 2006). This study therefore provides strong support for the existence of multiple (customer responsiveness and innovation) and hybrid (customer responsiveness, innovation, and low cost) strategies, albeit with the use of both management & human as well as operations & logistics resources. To conclude, competitive positioning strategies by themselves may be of limited use. However, strategic purity, mixing various differentiation strategies, even those involving low cost and differentiation strategies may pay in different firms but only when they are supported by the required resources.

Second, this study has implications regarding the use of the RBV of the firm. Guided by the role of resources in the achievement of high firm performance in literature (Barney, 1986, 1991, 2001; Newbert, 2007; Wernerfelt, 1984), I examine two types of internal resources that underlie the implementation of competitive strategies in the trucking industry. I believe that resources and strategies are complementary and they need to match with each other for the attainment of high performance. As evident in the previous section, approximately 94 per cent of the sample firms (i.e., 250 out of the total of 266 firms in the 6 strategic groups) emphasize the roles of either management & human resources, or operations & logistics resources, or both in addition to the use of competitive strategies. It turns out that resources are important in order for firms to

position themselves regarding which competitive strategy to adopt. On the other hand, I do not find any evidence of the use of single resource factors or configurations of resources factors, which may point toward a firm's need to complement resources with competitive strategies. [6] Thus, my results did not support the use of resources *by themselves* as predicted by the RBV. It is also possible that there may be other resources (e.g., marketing resources, Song et al. 2005), which by themselves may prove to be useful in future research.

Third, the study makes a contribution to the study of the role of co-alignment with resources when firms intend to use certain strategies. As argued above, to date there have been scant studies that integrate strategies with resources in one comprehensive framework because of the inherent conceptual limitations. Most of these studies examined strategies and resources either separately (e.g., Acquaah & Yasai-Ardekani, 2008; Ruiz-Ortega & Garcia-Villaverde, 2008) or used a contingency perspective of fit (e.g., Aragon-Correa & Sharma, 2003; Chandler & Hanks, 1994; Edelman et al., 2005; Nickerson et al., 2001; Spanos & Lioukas, 2001). In extant literature on the trucking industry, there are few studies that integrated competitive strategies and resources to explain firm performance.

The insufficiency of research in this area is the outcome of the lack of advanced theory. In this study, I propose a model that seeks to bring together the competitive strategy framework and the resource-based view (RBV) of the firm by following the configurational perspective of examining the gestalt concept of fit (Meyer et al., 1993; Miller & Friesen, 1984; Venkatraman, 1989). I argue that competitive strategies and

[6] I do not hypothesize about the resources in Chapter 3 but the set-theoretic approach still tests the feasibility of each of the 32 paths presented in the truth table (Appendix 3), including the relationships between resources and firm performance in the absence of strategies.

resources should be considered in a holistic pattern rather than be reductionistic. Thus, I conceptualize fit between strategies and resources as gestalts in contrast to moderation or mediation (Venkatraman, 1989). Accordingly, I raise different hypotheses that examine the holistic and nonlinear relationships among strategies and resources by going beyond the limitation of a contingency notion. I argue that strategies and resources work in a whole system, and the complementary effects between these two major constructs are basic elements contributing to a firm's success. Further, the use of a set-theoretic approach is in congruence with suggestions that appropriate techniques are necessary for testing the concept of configurations (Fiss, 2007).

Fourth, the findings also make an incremental contribution to our understanding of the notion of equifinality (Gresov & Drazin, 1997). In this study, I first conduct fs/QCA analysis in order to derive different configurations associated with high firm performance. Accordingly, I find eight combinations (i.e., A1 to A8) and then group them into six configurations (i.e., C1 to C6) that lead to similar levels of firm performance. To test equifinality, I then carry out one-way ANOVA tests of the configurations to examine equifinality among these configurations.

I find that the outcomes are similar in most configurations except for a few cases. For example, for the dimension of quality, configurations C2 and C5 have better performance than C1. For flexibility, the performance of configuration C5 is better than that of configurations C1 and C3. Configurations C5 and C6 perform better than configuration C1 for resource acquisition. For timeliness, configuration C5 performs better than configuration C3. Regarding efficiency, performance of configuration C1 is lower than that of configuration C6. Although the analysis of five perceptual measures of

firm performance does reveal some patterns in which several configurations are associated with different levels of firm performance, most of the configurations lead to similar levels of perceptual performance. In the analysis of financial measures, the performance levels of the derived four configurations are similar. In sum, I conclude that the notion of equifinality is supported in this study. However, executives may choose configurations based on their goals because some configurations may perform better than others under some circumstances.

6.3.2 Methodological Contributions

From a methodological perspective, this study has taken a major step in developing and testing theory by matching the fit as gestalt with the appropriate and novel method: a set-theoretic approach. Fiss (2007) argued that the most traditional quantitative methodologies (e.g., cluster analysis, profile deviation method, and regression analysis) had limitations in testing configurational perspectives. Previous research has mostly used the concpetualization of fit as moderation using a contingency perspective. Some have used other conceptualizations of fit, such as mediation, matching, or profile deviation. However, few studies have used the conceptualization of fit as gestalt using an appropriate methodology.

The set-theoretic approach, by contrast, examines the concept of fit as gestalts, which emphasize the synergistic, holistic, and nonlinear relationships among multiple variables. It also combines merits of both qualitative and quantitative methods which are reflected in this study. On the one hand, it conducts within-case and comparative analysis across different configurations and therefore provides rich information regarding qualitative differences. On the other hand, it applies the fuzzy set theory and produces

substantial quantitative indices such as consistency and coverage scores, which enable us to compare the goodness-of-fit of the overall solution and individual contribution of each path leading to the same outcome. Further, it overcomes the limitation of classifying configurations into over-simplified groups, for example, high/low, yes/no, or rich/poor. As a result, it deserves much attention from future researchers who conduct configurational studies.

Additionally, I compare the differences across two sets of firm performance variables (i.e., perceptual measures and financial measures) to corroborate the findings by controlling for common method bias, where problems usually occur with the use of single-source information.

6.3.3 Substantive Contributions

From a substantive standpoint, the study has provided a few patterns that may be of value for practitioners and managers. First, our finding is dominated by configurations composed of strategies of customer responsiveness rather than those of innovation and low cost. This indicates that market-oriented organizations may be the prototype for service firms. As an important means of differentiating themselves from rivals, customer responsiveness strategy enables firms to customize the attributes of their products/services and better suit the needs of customers. Customer responsiveness strategy may be the most effective competitive strategy for firms to attract and retain customers for service firms.

Secondly, since differentiation strategies (i.e., customer responsiveness and innovation) reinforce each other, firms may consider using multiple strategies which are associated with higher firm performance. Third, resources are valuable for firms to

implement strategies, so managers need to achieve the match between strategies and resources to attain high performance. Specifically, management & human resources are very helpful for firms to realize and sustain competitive advantage because they are intangible and difficult for competitors to imitate. In the trucking industry, the issues of safety and driver shortage will continue to be the most critical problems faced by firms. These key issues pose new challenges for managers who should put a high priority on the growth of human capital over time. On the other hand, supply chain management has attained increasing importance over the years. This allows trucking firms to develop their logistics resources and diversify into third party logistics companies.

Lastly, the preliminary test of equifinality among different configurations may also provide new insights for managers. Most of the configurations of strategies and resources are equal in terms of enabling trucking firms to achieve higher perceptual and financial performance. Equifinality is not equivalent to the exclusion of strategic plans. Instead, trucking firms have different resources and capabilities. It is critical for them to recognize their internal strengths and weaknesses and develop suitable competitive strategies in the market place.

6.4 LIMITATIONS OF THE STUDY AND FUTURE RESEARCH

No research study is without limitations, and this one is no exception. There are several limitations in the current study that may provide avenues for future research. These include issues of data calibration, methodology, research design, and sample selection.

First, calibration is one of the most critical steps in the application of a set-theoretic approach. It requires researchers' substantive knowledge of the literature and any error associated with coding may have huge impact on the results and subsequent interpretation. Although we consulted with industry experts and have taken extra care for calibrating our data (e.g., we analyzed financial performance measures using industry-level data), in order to enhance the reliability of the transformed data, future discussion and verification of the results in this study may authenticate our findings.

Secondly, because the methodology used in the study is still novel, it makes sense to compare the results found with those using more traditional methodologies, for example, the profile deviation approach (Doty et al., 1993) or the regression analysis. In a related paper (Zantow, Dass, & Ni, 2007), we used regression analysis that was based on central tendencies. We found few significant relationships. The results of a set-theoretic approach appear to be more interesting and useful as it allows fine-grained analysis of organizational asymmetries and idiosyncrasies.

In addition, Venkatraman (1989) proposed six types of fit among factors. Most research in organization studies (e.g., an analysis of strategies as mediators in Edelman et al., 2005) has been limited to only a few conceptualizations of fit (e.g., contingency and configurations). Relevant studies using other methods will significantly benefit the advancement of methodologies in testing relationships of strategies, resources, and firm performance.

The third issue is related to the research design. The cross-section design measures explanatory and outcome variables at the same time. There may be confounding effects of firm performance on the perception or evaluation of strategies

and/or resources. We took care to avoid the overlap of time periods of explanatory and outcome variables; however, a longitudinal design may make it possible to examine a more dynamic picture of competition for firms by exploring antecedents and consequences of major variables (i.e., strategy, resources, and firm performance). Further, it may be useful to control common method variance that may alter the relationship between explanatory variables and the outcome (Podsakoff et al., 2003). Additionally, I did not consider the relative importance of various dimensions of perceptual performance. Future researchers may ask the executives how they match their goals and the configurations of their firms' strategies and resources. Furthermore, it may be useful to get additional data on firm performance from other stakeholders, such as customers, and incorporate their perspectives as well.

The fourth concern is about the generalizability of the study results. Although studying one industry may enhance the internal validity of the findings and our confidence about testing configurations within a focused context (Ketchen et al., 1993), external validity may suffer as other industries may have varying dynamics in them. To increase the generalizability of the findings in this study, researchers may examine these relationships across different industries.

Finally, there seems to be good potential for developing the set-theoretic approach further. For example, one may explore the effect of using differing rules for determining the set membership of various combinations. As recommended (Ragin, 2000), I used the intersection rule in determining the set membership of combinations of multiple factors. In addition, it may be interesting to explore the use of regression techniques *within* the

sets of firms and control for various influences to examine the relationships of strategies, resources, and firm performance.

The first avenue of research in the future will be conducting detailed studies of firms in each configuration that we found in this study. For example, do these configurations have similar organizational characteristics such as firm size, age, or ownership type? Is there any difference in their perceptions of the task and institutional environments? Do they think of other firms within the same configuration as their competitors? Do they also pay attention to firms outside the same configuration? Then what is the basis for making judgments about who they should compete with?

The follow-up analysis may also focus on other major constructs related to the formulation and implementation of strategies. For example, will the focus strategy be useful in addition to the competitive strategies studied here (i.e., low cost, innovation, customer responsiveness)? Are there any other types of resources (e.g., accounting & finance, marketing, etc.) that might contribute to high firm performance as well? Structure is a major contingent factor relevant to firm-level strategies. Do internal administrative structures or transactional forms differ across configurations? Similarly, what are the cognition and knowledge structures of managers across configurations? Do they feel the same degree of institutional pressure from internal and external structures? What role does environment play when firms pursue certain types or combinations of strategies and resources? Adding these constructs into the current model may also address the issue of endogeneity (Shaver, 1988), which concerns the biases related to the exclusion of other variables such as environment, organizational structure, or managers'

cognition. Future researchers may address these and other related questions using various research methods and designs.

Finally, do the same or similar patterns exist in other industries? For example, is low cost or differentiation strategy dominant for manufacturing firms? Will firms prefer hybrid strategies over pure strategy? What kind of resources are the most valuable for them? Similarly, what configurations of strategies and resources are useful in other setting and locations (e.g., in emerging economies)? These questions deserve our attention and may bring increased dividends to the study of organizations in the future.

This research offers a holistic picture of how firms use competitive strategies and resources to achieve high performance in the U.S. trucking industry. Results derived from the use of the set-theoretic approach enable us to rethink the way of combining the traditional competitive positioning school and the RBV of the firm in trying to understand the sources of firms' success. It provides not only empirical and methodological implications for researchers along the area of strategic management but also managerial relevance to practitioners.

Overall, this research provides insights into the use of competitive positioning strategies and the RBV of the firm. Neither of these two theories by themselves is sufficient to explain high performance in the sample firms. Instead, single positioning strategies alone make contribution to high firm performance when they are supported by resources. Meanwhile, multiple and hybrid strategies also need to match with resources in the form of various configurations. The study develops the gestalt concept of fit and tests its relationship with two sets of firm performance (perceptual and financial measures) using a set-theoretic approach. This study takes a major step in matching theory with

method, thereby making a significant contribution to an understanding of gaining and sustaining competitive advantage in organizations.

APPENDIX 1
Major Studies Integrating Competitive Strategies and Resources in the Literature

CRITERIA	Chandler & Hanks (1994)	Lynch, Keller, & Ozment (2000)
a. Theoretical foundation	Porter's positioning school & the RBV	Porter's positioning school & the RBV
b. Hypotheses tested	4 hypotheses relating strategy, resources, and the fit between strategy and resources to firm performance	11 hypotheses relating strategy, logistics resources, and the fit between strategy and resources to firm performance
c. Independent variables	3 strategies (low cost, quality, and innovation) and 3 resource-based capabilities (supportive of quality, cost leadership, and innovation)	2 strategies (cost leadership and differentiation) and 2 logistics capabilities (process capabilities and value-added service capabilities)
d. Dependent variables	Business growth (in cash flow, market share and sales) and business volume (of earnings, net worth and sales)	ROA, ROI, net profit margin, general profitability, and overall competitive position
e. Measurement of variables	Seven-point Likert scales, ranging from 3-item to 7-item	Seven-point Likert scales, ranging from 4-item to 7-item
f. Research design	Survey design	Survey design
g. Sample size	155 small manufacturing firms (overall response rate 19%)	77 firms in the retail grocery industry (overall response rate 16%)
h. Analysis procedures	OLS regression	Structural equation modeling
i. Major results	The fit between quality-related capabilities and quality strategy led to high business growth; the fit between cost-related capabilities and low cost strategy led to high business volume.	The fit between process capabilities and cost leadership strategy led to high performance; the fit between value-added service capabilities and differentiation strategy led to high performance.
j. Conclusions	The fit between strategies and resources is associated with high firm performance.	Resources and strategies need to be integrated to explain firm performance.

APPENDIX 1 (cont'd)
Major Studies Integrating Competitive Strategies and Resources in the Literature

CRITERIA	Nickerson, Hamilton, & Wada (2001)	Spanos & Likouas (2001)
a. Theoretical foundation	Porter's positioning school and Williamson's economizing theory	Porter's positioning school & the RBV
b. Hypotheses tested	3 hypotheses relating market position, resource profiles, and organizational form	2 hypotheses regarding the effects of strategy, industry, and firm assets on firm performance (profitability and market performance)
c. Independent variables	Resource profile, resource-profile/organization pairing, and product attribute (i.e., delivery time)	Porter's industry forces, 3 strategies (innovative differentiation, marketing differentiation and low cost), and 3 firm assets (managerial, technical, and marketing)
d. Dependent variables	Couriers' market positions (specialists vs. generalists)	profitability and market performance
e. Measurement of variables	995 observations of transactions	Five-point Likert scales, ranging from 3-item to 7-item
f. Research design	Archival data	Survey design
g. Sample size	Information on 995 parcels shipped in Japan to other 42 countries during February and March 1998	147 Greek firms (overall response rate 17%)
h. Analysis procedures	Three-stage, reduced form, endogenous self-selection model	Structural equation modeling
i. Major results	Document specialists use idiosyncratic resources in IT and vertical integration.	The indirect effects of resources on market performance via competitive strategies
j. Conclusions	The notion of fit among market position, resource profile, and organizational forms. They are made to reinforce one another.	The importance of industry and firm specific effects on firm performance

APPENDIX 1 (cont'd)
Major Studies Integrating Competitive Strategies and Resources in the Literature

CRITERIA	Edelman, Brush, & Manolova (2005)	Aral & Weill (2007)
a. Theoretical foundation	Porter's positioning school & the RBV	IT resources, investments, and capabilities
b. Hypotheses tested	4 sets of hypotheses relating strategy, resources, and the fit between strategy and resources to firm performance	3 hypotheses relating IT assets, organizational capabilities, and firm performance
c. Independent variables	2 strategies (quality/customer service and innovation) and 2 resources (human and organizational resources)	IT assets (infrastructure-oriented, informational, transactional, and strategic investments) and IT capabilities (3 IT practices in communication, transaction, and Internet architecture, and competencies in HR and management)
d. Dependent variables	Change in return on sales	Four dimensions of firm performance: market valuation, profitability, cost, and innovation
e. Measurement of variables	Five-point Likert scales, ranging from 2-item to 7-item	Five-point Likert scales, ranging from 1-item to 4-item
f. Research design	Survey design	Survey design and Compustat data
g. Sample size	192 small firms (overall response rate 19.6%)	147 firms publicly traded US. firms
h. Analysis procedures	Structural equation modeling	OLS analysis
i. Major results	Quality/customer service strategy is a mediating mechanism between human and organizational resources and performance.	IT investment allocations and organizational IT capabilities are associated with different performance dimensions. IT capabilities strengthen the performance effects of IT assets.
j. Conclusions	Resources and strategies need to be integrated to explain firm performance.	The impact of the alignment between IT assets and resources on performance in organizations

APPENDIX 1 (cont'd)
Major Studies Integrating Competitive Strategies and Resources in the Literature

CRITERIA	Menguc, Auh, & Shih (2007)	Ruiz-Ortega & Garcia-Villaverde (2008)
a. Theoretical foundation	The development of a model of source-positional advantage-firm performance	Porter's positioning school & the RBV
b. Hypotheses tested	4 sets of hypotheses relating strategies, resources, and firm performance	3 hypotheses relating strategic groups (pioneers, early followers and late followers), strategies (differentiation and cost leadership), and firm performance.
c. Independent variables	2 resources of the transformational leadership (managerial-based competency) and market orientation (transformational-based competency) and 3 strategies	Moment of entry, capabilities variables (managerial, marketing, and technical capabilities), and strategies (low cost and differentiation)
d. Dependent variables	Firm efficiency (ROI, ROS, and ROA) and firm effectiveness (profit growth, sales growth, and market share growth)	Performance measured using five items: profitability over investment, net margin of benefit, market share, growth of sales, and general performance
e. Measurement of variables	Five-point Likert scales, ranging from 3-item to 5-item	Seven-point Likert scales, ranging from 4-item to 6-item
f. Research design		Survey design
g. Sample size	260 strategic business units across industrial sectors (overall response rate 26.5%)	253 Spanish firms in the information and communication technology industry (overall response rate 13.69%).
h. Analysis procedures	Partial least Squares (PLS)	OLS regression
i. Major results	Marketing differentiation is the only strategy positively related to both transformational leadership and market orientation and contributes to both efficiency and effectiveness. Innovation strategy enhances effectiveness, whereas cost leadership contributes to efficiency.	Individual positive relationship of marketing capabilities, technical capabilities, and low cost strategy with firm performance
j. Conclusions	Marketing differentiation strategy seems to be valuable for multidimensional firm performance benefits.	The complementary role of positioning school and the RBV in explaining entry timing.

APPENDIX 2
An Example of Testing Hypotheses Using Regression and Set-theoretic Approaches

Hypothesis 1a: Firms with an innovation strategy will have high performance.

To keep it simple, let us test this hypothesis using crisp sets. Suppose we have a sample of 26 firms some of which use an innovation strategy and others do not. Further, they fall into the sets of either high-performing or low-performing firms. We can test the hypothesis using the following data:

Table A

Performance (Y)	Number	Number
High	a (8)	b (12)
Low	c (2)	d (4)
Innovation strategy (X)	No	Yes

i. Using traditional correlation/regression methods

The traditional correlation/regression methods are essentially symmetric approaches. Therefore, to test the hypothesis, we need to find the number of cases that have high performance with an innovation strategy and that have low performance without the innovation strategy. Then, we can find out the proportion of cases consistent with the hypothesis, as follows:

$$= (c+b)/(a+b+c+d)= (2+12)/ (8+12+2+4)= 14/26= 54\%$$

Comparing the results to a chance occurrence, the hypothesis is rejected. In a regression approach, we will fit one line for all cases following a symmetric approach. However, it is possible that innovation strategy may lead to high performance but a lack of innovation strategy could also lead to high performance if we consider some asymmetric theories. For example, equifinality (Gresov and Drazin, 1997) emphasizes infinite ways, which are not necessarily symmetric. Furthermore, the absence of strategy (Inkpen & Chowdhury, 1995) may also be able to explain high performance. The correlation/regression method does not consider these concepts.

ii. Using set-theoretic method

Alternatively, we may choose to use set theoretic method to test the hypothesis by examining the consistency and coverage scores of the firms. In this example, *Consistency* is calculated by dividing the number of cases that have high performance with innovation strategy by the number of all cases that *follow the innovation strategy (X)*. Therefore, it measures the extent to which firms following an innovation strategy have high performance (as a proportion of all firms that follow this strategy). In other words, if there are a total of 16

firms (12 in cell b plus 4 in cell d of Table A) that follow an innovation strategy, and 12 of them have high performance (cell b in Table 1), it means that 12 divided by 16 = 75% of the firms are consistent with the hypothesis H1a. That is,

$$\text{Consistency} = b/(b+d) = 12/(12+4) = 12/16 = 75\%$$

Given a standard criterion of 85% as the threshold for a significant level of consistency (Ragin, 2000), Hypothesis 1a is rejected.

In testing Hypothesis 1a, *Coverage* is calculated by dividing the number of cases that have high performance with innovation strategy by the number of all cases that *have high performance (Y)*. It is similar to the usual R^2 employed in regression. It measures the proportion of variance in high performance firms (Y) that is explained by an innovation strategy (X). In other words, it calculates the overlap (firms with an innovation strategy and high performance) as a proportion of all high-performing firms. For example, if there are 12 firms (cell b in Table A) that have high performance due to their following an innovation strategy, and there are a total of 20 firms (12 in cell b plus 8 in cell a of Table A) that have high performance, it means that 12 divided by 20 = 60% is the proportion of the results explained (or covered) by Hypothesis 1a. Therefore,

$$\text{Coverage} = b/(a+b) = 12/(12+8) = 12/20 = 60\%$$

The formula used in testing Hypothesis 1a exclude cases that do not adopt the innovation strategy, but the related hypothesis can also be tested by the same logic:

Hypothesis 1b: Firms *without* an innovation strategy will have low performance.

Accordingly, consistency score is equal to the number of cases that have low performance without an innovation strategy as a proportion of all cases that do not use an innovation strategy. Thus,

$$\text{Consistency} = c/(a+c) = 2/(8+2) = 2/10 = 20\%$$

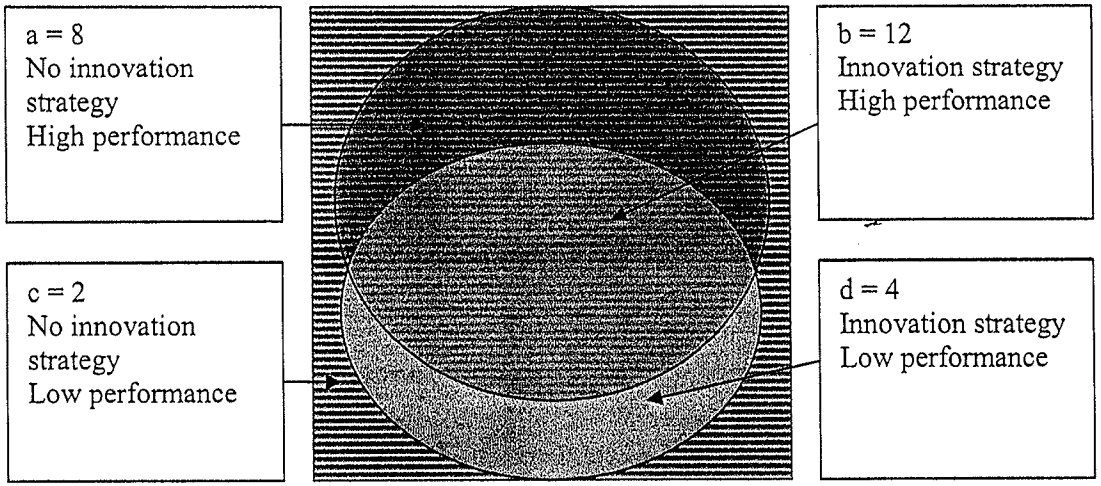
Comparison of the two consistency scores in testing Hypothesis 1a (75%) and Hypothesis 1b (20%) supports the notion that the set-theoretic approach is asymmetric rather than symmetric.

Similarly, the coverage score in testing hypothesis 1b is equal to the number of cases that have low performance without innovation strategy as a proportion of all cases that *have low performance (Y)*:

$$\text{Coverage} = c/(c+d) = 2/(2+4) = 2/6 = 33\%$$

There is no explicit criterion for testing hypotheses based on coverage. Coverage is similar to the R^2 in regression models. The higher the coverage score, the greater is the empirical importance of the model. Here, Hypothesis 1a is more supported by the data than Hypothesis 1b.

The set-theoretic approach can also be examined using Venn-diagram:



APPENDIX 3

Truth Table Used in fs/QCA Analysis: 32 Combinations of Strategies and Resources Examined in Proposed Hypotheses

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
	Strategy			Resources		
# of rows	Innovation	Customer responsiveness	Low cost	Management & human resources	Operations & Logistics resources	Corresponding Hypotheses
1	1	0	0	0	0	H1b
2	0	1	0	0	0	H1c
3	0	0	1	0	0	H1a
4	0	0	0	1	0	
5	0	0	0	0	1	
6	1	1	0	0	0	H2a
7	1	0	1	0	0	H2b
8	1	0	0	1	0	H3b
9	1	0	0	0	1	
10	0	1	1	0	0	H2c
11	0	1	0	1	0	H3d
12	0	1	0	0	1	H3c
13	0	0	1	1	0	
14	0	0	1	0	1	H3a
15	0	0	0	1	1	
16	1	1	1	0	0	H2d

APPENDIX 3 (Cont'd)

Truth Table Used in fs/QCA Analysis: 32 Combinations of Strategies and Resources Examined in Proposed Hypotheses

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
	Strategy			Resources		
# of rows	Innovation	Customer responsiveness	Low cost	Management & human resources	Operations & Logistics resources	Corresponding Hypotheses
17	1	1	0	1	0	
18	1	1	0	0	1	
19	1	0	1	1	0	
20	1	0	1	0	1	
21	1	0	0	1	1	
22	0	1	1	1	0	
23	0	1	1	0	1	
24	0	1		1	1	
25			1	1	1	
26	1	1	1	1	0	
27	1	1	1	0	1	
28	1	1	0	1	1	H4a
30		1	1	1	1	
31	1	1	1	1	1	H4b
32	0	0	0	0	0	

APPENDIX 4
An Example of Difference between Combinations and Configurations Used in the Analysis

To help understand the difference between combinations and configurations, we developed an example of the criteria needed for getting the tenure in North American universities.

To get tenure, numerous combinations of teaching, research, service, etc. are possible. The following table lists the six possible combinations of explanatory variables. Depending on the nature of institutions, some of them may be successful, and other may not be.

	TEACHING ABILITY	RESEARCH ABILITY	SERVICE	GRANTS	PATENTS
Combination 1	high	high	high	high	N/A
Combination 2	high	low	high	low	N/A
Combination 3	high	high	low	low	N/A
Combination 4	low	high	low	high	N/A
Combination 5	N/A	high	N/A	high	high
Combination 6 (may not be successful)	low	low	low	low	N/A

Which of these combinations are used by different professors? We then categorize professors in various configurations based on their use of various combinations. For example, in configuration 1, the three people (i.e., Professors X, Y, and Z) use combination 1 to get tenure, but they can also use combination 5 to achieve the same outcome. As a result, they belong to configuration 1, i.e., *Stars*.

By contrast, configuration 2 is composed of four people (i.e., Professors, A, B, C, and D) who use the single combination 1 to get tenure. They belong to *Inspiring Teachers and Institutional Builders*. Configuration 3 represents another group of people who follow combination 3. They are called *Teacher Scholars*.

	COMBINATIONS					
	1	2	3	4	5	6
Configuration 1: Stars. Used by Professors X, Y, Z.	x				x	
Configuration 2: Inspiring Teachers and Institutional Builders. Used by Professors A, B, C, D.		x				
Configuration 3. Teacher Scholars. Used by Professors H, I, J, K, L, M, N, O.			x			

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