THE ANTECEDENTS AND THE CONSEQUENCES OF INNOVATION CAPABILITIES

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ABSTRACT

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The innovation capabilities enable the firms to transform their knowledge into product innovations that lead to product performance. In spite of their importance the research about these capabilities is limited and the innovation capability is studied as a monolith construct in the extant literature. However there are different types of innovation capabilities that differ in their antecedents and consequences. This study differentiates the innovation capability and product innovation types (technological, aesthetic and market-based) and examines how they are created and used in two essays. Essay 1 includes 288 managers from the U.S. and 386 managers from the People's Republic of China (PRC) and focuses on strategic orientation as the antecedent of innovation capabilities and market knowledge competence. Essay 2 includes 304 managers from the U.S. and examines market knowledge dimensions and inter-functional cooperation as the antecedents of innovation capabilities and differentiates the effects of exploration and exploitation capabilities on product newness. Both of the essays examine product innovation types as the consequences of innovation capabilities that lead to product performance.

The results in Essay 1 indicate that the relationships of the innovation capabilities with their antecedents and consequences differ according to their types (technological, aesthetic and market-based), all of the product innovation types increase product performance, and market orientation has a positive effect on market knowledge competence. The comparison between U.S. and PRC indicates that, in the U.S., aesthetics innovation has a higher effect on product performance. Market-based innovation capability has a higher effect on market-based, and

aesthetic innovation but a lower effect on tech innovation. Market orientation has a higher effect on market knowledge competence and on market-based innovation capabilities, and customer knowledge process has a higher effect on product performance.

The results in Essay 2 indicate that innovation capabilities mediate the relationship between market knowledge dimensions and product innovations as well as the relationship between inter-functional cooperation and product innovations. Market knowledge dimensions have different effects on innovation capability types, product innovations and product performance. Exploration and exploitation capabilities have different effects on product innovations and they negatively interact with each other. The results have significant theoretical and managerial implications to better understand and facilitate the product innovation capabilities.

To my father

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CHAPTER 1

INTRODUCTION

The extant literature indicates that innovation and organizational capabilities are central to firm performance. First, product innovations have been shown to be determinants of firm performance (Booz and Booz 1982; Cooper and Kleinschmidt 1993; Wind and Mahajan 1997), survival in the market (Damanpour and Evan 1984; Han, Kim, and Srivastava 1998; Hurley and Hult 1998), economic growth (Sorescu, Chandy, and Prabhu 2003), and competitive advantage (Lawson and Samson 2001; Porter 1990; Teece, Pisano, and Shuen 1997). New products provide approximately one-third of firms' profits (Sivadas and Dwyer 2000) and forty percent of their sales in the past five years (Schmidt and Calantone 2002). However the high cost of development, as well as the rapid change in technology and customer preferences, increases the risk of innovations (Griffin and Hauser 1996; Sorescu, Chandy, and Prabhu 2003; Wind and Mahajan 1997). These risky environments increase the importance of the innovation capabilities that efficiently and effectively transform organizational resources into new products.

Second, organizational capabilities play a critical role in the overall performance of the firm. Capabilities enable the firm to use its resources to generate competitive advantages (Amit and Schoemaker 1993; Barney 2001; O'Connor 2008). This is due to the fact that capabilities cannot be readily assembled through markets (Teece, Pisano, and Shuen 1997). Resources are crucial for new product success and thus firms invest a substantial amount of resources for new product innovation (Nerkar and Roberts 2004). However resources by themselves are not adequate for competitive advantage (Ray, Barney, and Muhanna 2004). Firms need capabilities for reconfiguring their resources and adapting to changing market conditions in order to achieve a higher performance than competitors (Zahra and George 2002).

Decreased product life cycles, shortened lead times, and rapid change in technology and customer tastes lead firms to enhance their ability to adapt to new situations and to introduce new products more frequently. Thus firms need not only to innovate but they also need to innovate repeatedly while adapting to new conditions. Organizational capabilities enable the firm to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece, Pisano, and Shuen 1997).

Previous studies focused on either innovation capabilities or the product innovations but to the best of our knowledge, the relationship between different innovation capability types and product innovation types have not been empirically tested. Studies on innovation capabilities mostly focus on their effects on firm performance (Cavusgil, Calantone, and Zhao 2003; Hult and Ketchen Jr 2001). However these studies do not examine how innovation capabilities are created and used in detail. Thus, there is a need to uncover the factors that are used to develop different innovation capabilities and their effects on product innovations.

Statement of the Problem

As stated in the previous section, there is substantial amount of research on the factors affecting innovation and organizational capabilities and their effects on firm performance. Even though the relationship between innovation and organizational capabilities has been stated in the literature (e.g. Teece, Pisano, and Shuen 1997), there are very few studies including innovation capabilities. Extant literature mostly ignores the role of innovation capabilities in the development of product innovations. For example, Hult and Ketchen (2001) focus on the direct effect of innovation capabilities on positional advantages and Zhou, Yim, and Tse (2005) examine the effect of product innovations on firm performance. However a more complete picture can be drawn by focusing on innovation capabilities as important antecedents of product

innovations, which in turn lead to positional advantages. This dissertation aims to answer two main questions;

1. What is the importance of innovation capabilities in terms of their effect on product innovations and firm performance?
2. What are the factors that affect the formulation of innovation capabilities?

By answering these questions, this study aims to enhance the understanding about the antecedents and the consequences of innovation capabilities. The innovation capabilities covered in this study are technological, aesthetic and market-based. The distinction between these capabilities depends on their different characteristics. Thus, both essays investigate whether factors have different effects on innovation capabilities, and whether these individual capabilities lead to different outcomes.

Based on two broad research questions stated above, the two essays of this dissertation investigate several more specific questions. The first essay seeks to understand how strategic orientation contributes to innovation capabilities and external components of market knowledge competence. There are six specific questions.

1. How does the strategic orientation of the firm affect different types of innovation capabilities?
2. How does the strategic orientation of the firm affect market knowledge competence?
3. In what ways do different types of innovation capabilities lead to product innovations?
4. What is the role of aesthetics in strategic orientation, innovation capabilities, and product innovation?
5. How do innovations capabilities affect different types of product innovations?
6. How does market knowledge competence effect product innovations and performance?

The strategic orientations covered in this essay are customer and competitor orientation (Slater and Narver 1995), technological orientation (Gatignon and Xuereb 1997), and aesthetic orientation (Berkowitz 1987).

The effects of strategic orientations on product innovations have been previously studied (Zhou, Yim, and Tse 2005) however their effects on innovation capabilities have been overlooked. Strategic orientation by itself may not result in successful product innovations. Thus innovation capabilities are introduced as mediating variables that transform organizational resources into new products

The second essay seeks to understand the roles of inter-functional cooperation and market knowledge dimensions in both the formulation of innovation capabilities and their outcomes. There are five specific questions.

1. What is the influence of inter-functional cooperation on innovation capability?
2. Do the knowledge dimensions affect innovation capability types differently?
3. What are the effects of innovation capability types on product newness types?
4. What are the effects of quality improvement capability on product newness types?
5. How does innovation capabilities interact with quality improvement capability?

The characteristics of knowledge have differing effects on innovation performance (De Luca and Atuahene-Gima 2007; Prabhu, Chandy, and Ellis 2005). Thus, this study aims to explain how organizational knowledge contributes to innovation capabilities and whether knowledge dimensions (depth, breadth, specificity and tacitness) have different effects on innovation capabilities.

The theoretical framework of this dissertation is based upon the Resource-Based View (RBV), the Knowledge-Based View (KBV), market orientation and the organizational learning

theory. Similar to the work of Hult and Ketchen (2001), resources and capabilities framework is used to explain the relationship among these theoretical underpinnings. Knowledge-based view defines knowledge as the most important resource of the firm and explains its dimensions (De Luca and Atuahene-Gima 2007; Grant 1996a). Market orientation determines the content of the knowledge that the firm is interested in (Kohli and Jaworski 1990; Narver and Slater 1990). Organizational learning theory explains how knowledge is transformed in to capabilities (Cohen et al. 1996) and resource based-view explains how firm resources are transformed into new products and competitive advantage by organizational capabilities (Zahra and George 2002).

Contributions of the Dissertation

This dissertation contributes to the literature by introducing three different types of innovation capabilities. Innovation capability is studied as a monolith construct in the literature (Calantone, Cavusgil, and Zhao 2002; Cavusgil, Calantone, and Zhao 2003; Hult and Ketchen Jr 2001). However the different innovation capability types have different relationships with their antecedents and consequences. This dissertation enables the researchers to examine these different relationships that are unique to individual innovation capabilities.

The second major contribution of this dissertation is to examine the interrelated roles of aesthetics in firm's strategic orientation, innovation capabilities and product innovations. To achieve this goal, aesthetic orientation and aesthetic innovation capabilities are introduced to the literature. This provides a better understanding about the orientations, capabilities and innovations.

The third major contribution of this dissertation is to provide a comprehensive framework for the antecedents and the consequences of innovation capabilities. It aims to fill an important gap in the literature that results from focusing either on innovations or capabilities, thus

overlooking the mediating role of innovation capabilities between product innovation and its antecedents. Building on RBV, KBV, market orientation and organizational learning theory, this study aims to explain how the resources of the firm are translated into new products through innovation capabilities.

Essay 1 contributes to the literature by examining the different effects of strategic orientation types on innovation capability types and market competence. The second contribution is to find out whether and to what extent the innovation capabilities contribute to product innovations. The third contribution is examining the performance differences among product innovation types.

Essay 2 contributes to the literature by examining how knowledge dimensions and inter-functional cooperation affect innovation capabilities. The second contribution is examining how exploration vs. exploitation related organization capabilities affect product innovation types.

CHAPTER 2

THEORETICAL FOUNDATIONS OF INNOVATION CAPABILITIES

This section represents a comprehensive review of the recent theoretical research on innovation capabilities. The most common theories that incorporate innovation capabilities and their antecedents and consequences are: (1) Resource-based view, (2) Knowledge-based view, (3) Organizational learning theory, and (4) Market orientation. All of these theories contribute to explaining how organizational capabilities are developed and how they affect performance. Essay 1 explains the antecedents and consequences of innovation capabilities by organizational learning theory, knowledge based view, resource based view, and market orientation. Market orientation determines the content of the knowledge that the firm is interested in (Kohli and Jaworski 1990; Narver and Slater 1990). Organizational learning theory explains how knowledge is transformed in to capabilities (Cohen et al. 1996). Essay 2 explains the antecedents and the consequences of innovation capabilities by knowledge-based view and resource based view. Knowledge-based view defines knowledge as the most important resource of the firm and explains its dimensions (De Luca and Atuahene-Gima 2007; Grant 1996a). Resource based-view explains how firm resources are transformed into new products and competitive advantage by organizational capabilities (Zahra and George 2002).

Resource Based View and Innovation Capabilities

In this section (1) the origins of the research-based view (2) the definition of resources and (3) their relationships with organization capabilities, and (4) dynamic capabilities are discussed in relation to innovation capabilities.

The resource-based view indicates that firm is made up of heterogeneous resources that are the sources of competitive advantage (Wernerfelt 1984). The foundations of RBV can be

found in the early studies concerning the boundaries, the distinctive competencies and the competitive advantage of the firm (Andrews 1971; Ansoff 1965; Coase 1937; Nelson and Winter 1982; Penrose 1959; Stigler 1961).

Resources were defined as all the assets, capabilities, organizational processes, firm attributes, information, and knowledge of a firm (Barney 1991). However a distinction between resources and capabilities was later made by defining resources as the knowhow that can be traded (e.g., patents and licenses), financial or physical assets (e.g., property, plant and equipment), human capital, etc., while defining capabilities as the firm's capacity to deploy resources to effect a desired end (Amit and Schoemaker 1993).

This distinction is further emphasized by other studies that define capabilities as the ability of firms to use their resources to generate competitive advantages (Barney 2001) and the business processes needed to configure assets in advantageous ways (O'Connor 2008). Resources and products are two sides of the same coin (Wernerfelt 1984) and innovation capabilities are the link that transforms the firm’s resources into new products. Resources by themselves are not adequate for competitive advantage (Ray, Barney, and Muhanna 2004), so that the firms need capabilities for reconfiguring their resources and adapting to changing market conditions in order to achieve a higher performance than competitors (Zahra and George 2002).

There is a positive relationship between capabilities and competitive advantage (Grant 1991; Prahalad and Hamel 1990; Wernerfelt 1984). Competitive advantage arises from the effective and efficient utilization of resources via capabilities. Sustained competitive advantage can be obtained when other firms are unable to duplicate the benefits of the firm’s strategy (Barney 1991). The necessary, but not sufficient conditions for a sustained competitive advantage (Barney 1991; Dierickx and Cool 1989; Priem and Butler 2001) are;

Valuable: The value of a resources or capabilities is determined by their contribution to the firm strategy to exploit opportunities or neutralize threats (Amit and Schoemaker 1993; Barney 1991). These capabilities enable the firm to outperform its competitors in developing new products that are valued by its customers.

Rare: A firm cannot obtain a competitive advantage when other firms in the market are implementing the same strategy. Building the strategy via rare resources and capabilities enable the firm to have a unique strategy that can lead to competitive advantage (Barney 1991; Barney 1986b). Thus the more scarce the resources, the more valuable the capabilities are (Amit and Schoemaker 1993).

In-imitable: The imperfectly imitable resources enable the firm to increases its competitive advantage (Barney 1991). The very essence of most capabilities/competences is that they cannot be readily assembled through markets (Teece, Pisano, and Shuen 1997). The sustainability of the competitive advantage is dependent upon the time that it takes for the competitors to duplicate the capabilities of the firm (Barney 1986a) and these capabilities enable the firm to obtain above normal returns (Peteraf 1993). The imperfect imitability is dependent upon unique historic conditions, casual ambiguity, and social complexity (Barney 1991). These conditions can facilitate each other for example; the social complexity and tacitness of the resources increases their casual ambiguity (Dierickx and Cool 1989; Peteraf 1993). The existence of these conditions increases the uniqueness of the resources and the competitive advantage of the firm.

Non-substitutable: Porter's five forces model (Porter 1980) indicates the threat of substitution as an entry barrier. Similarly, non-substitutable resources enable the firm to gain competitive advantage because even if a resource is valuable, rare and in-imitable, it does not

provide a competitive advantage unless it is non-substitutable (Amit and Schoemaker 1993; Barney 1991; Dierickx and Cool 1989). This is due to the fact that substitutes reduce rents by making the demand curves of monopolists or oligopolists more elastic (Peteraf 1993).

The dynamic capabilities concept extends the RBV by including instability of market demand and the dynamic environment to the sustainable competitive advantage conditions. Dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece, Pisano, and Shuen 1997). Capabilities and innovation have similarities in their end results. Both innovations (Lawson and Samson 2001; Porter 1990; Teece, Pisano, and Shuen 1997) and capabilities (Vorhies and Morgan 2005; Weerawardena 2003) lead to competitive advantage. Dynamic capabilities are tools for obtaining competitive advantage via flexible product innovation under innovation-based competition (Teece, Pisano, and Shuen 1997). This emphasizes the relationship between innovation capabilities and competitive advantage.

Knowledge Based View and Innovation Capabilities

In this section (1) the relationship between the KBV and research based view, (2) the relationship between KBV and dynamic capabilities, and (3) the characteristics of knowledge are discussed in relation to innovation capabilities.

The knowledge-based view of the firm is built upon the resource-based view, organizational capabilities, organizational learning and competitive dynamics (Grant 1996b). Both KBV and resource-based view shares similar assumptions. KBV puts more emphasis on the importance of knowledge as a resource and its superior effect on competitive advantage. Thus, the KBV can be considered as an outgrowth of the resource- based view by its focus on a detailed examination of knowledge as a resource and its effects (Eisenhardt and Santos 2002).

KBV defines knowledge as one of the most important resources of the firm that is far more valuable than the tangible assets (Grant 1996b; Grant and Baden-Fuller 1995; Nelson and Winter 1982; Spender 1996). Knowledge satisfies the resource conditions for competitive advantage in RBV that are formerly listed as value, uniqueness, inimitability and non-substitutability (Barney 1986b; Collis 1994; Day and Wensley 1988; Grant and Baden-Fuller 1995; Peteraf 1993). The tacitness, stickiness and immobility of knowledge contribute to its inimitability and competitive advantage (Birkinshaw, Nobel, and Ridderstråle 2002; Galunic and Rodan 1998; Germain and Dröge 1997; Grant 1996b; Gupta and Govindarajan 2000; Szulanski 1996).

The knowledge-based view and the dynamic capabilities have some similarities. They are both suitable for dynamic market settings. Knowledge is used to develop dynamic and flexible capabilities that are suitable for changing environments. KBV and dynamic capabilities both adopt the Schumpeter's concept of competition as a process of "creative destruction" to explain how the knowledge and capabilities are created and changed over time (Grant 1996b; Nonaka and Takeuchi 1995; Teece, Pisano, and Shuen 1997). Thus KBV can explain the competitive advantage in dynamic environments and it extends the dynamic capabilities by its emphasis on knowledge (Eisenhardt and Santos 2002).

Kogut and Zander (1992) introduced the concept of knowledge as a source of advantage. Nonaka and Takeuchi (1995) complemented their work by providing a framework for understanding the integration of individual and organizational knowledge. This lays the foundation for the KBV and the integration of knowledge that leads to competitive advantage (Eisenhardt and Santos 2002). Kogut and Zander (1992) also emphasizes the relationship

between capabilities and knowledge, and the how capabilities of the firm are recombined by the help of accumulated knowledge to enter new markets.

The characteristics of knowledge gained attention in the literature due to their effects on innovation performance and competitive advantage. Knowledge can be obtained from external sources such as customers, competitors, and market conditions or it can be created within the company via interdepartmental coordination, organizational routines or R&D processes. Whether it is obtained from external or internal sources, knowledge has dimensions of depth, breadth, specificity and tacitness. The knowledge dimensions have differing effects on innovation performance (De Luca and Atuahene-Gima 2007; Prabhu, Chandy, and Ellis 2005).

Specific knowledge, when integrated properly, plays an important role in building organizational capabilities (Grant 1996b). Knowledge specificity may lead to routinization of firm activities (Galunic and Rodan 1998) that may decrease innovativeness. However knowledge specificity decreases the imitation of innovation (Sampler 1998), which increases the competitive advantage of the innovations. Knowledge specificity can also enable to firm to make an in-depth analysis of its customer and competitors (De Luca and Atuahene-Gima 2007) and develop custom tailored innovations for specific contexts.

Tacitness of knowledge is the source of sustained competitive advantage (Eisenhardt and Santos 2002) and team performance (Berman, Down, and Hill 2002). Tacit knowledge plays an important role in innovation (Senker 1995). Galunic and Rodan (1998) indicate that routines such as driving to work may transform explicit knowledge (route on map) to tacit knowledge (instinctive route). The more organizations run on tacit routines the less likely it will be that they will be able to realize novel resource recombinations that results in a decrease in innovativeness.

However Cavusgil, Calantone and Zhao (2003) suggest that tacit knowledge contributes to the development of new knowledge and innovations.

The depth and breadth of knowledge affect the process of building organizational capabilities because the wider the span of knowledge being integrated, the more complex are the problems of creating and managing organizational capability (Grant 1996b). Knowledge depth and breadth also affect new product introduction routines (Katila and Ahuja 2002). Increase in the depth of search can positively affect product innovations (Katila and Ahuja 2002; Sorescu, Chandy, and Prabhu 2003). Knowledge depth enables the firm to produce highly differentiated, high-quality products (Zahra, Ireland, and Hitt 2000). Knowledge breadth contributes to product innovation through enriching the knowledge pool by adding distinctive new variations (Katila and Ahuja 2002) and results in an increased variety of innovative products (Zahra, Ireland, and Hitt 2000).

Both the dynamic capabilities and the KBV states that knowledge is an important resource that contributes to building organizational capabilities. They both adopt Schumpeter's concept of competition as a process of "creative destruction" that emphasizes innovation. Thus the function of innovation capabilities is to utilize knowledge and transform it into new products to achieve competitive advantage.

Organizational Learning Theory and Innovation Capabilities

In this section (1) the relationship between organizational learning theory and KBV, (2) the sources of organizational learning theory, and (3) the process of organizational learning are discussed in relation to innovation capabilities.

The knowledge based-view and organizational learning theory are strongly connected. Knowledge as the most important organizational resource is central to KBV as it is to learning.

Knowledge may be obtained from another source and used as a part of the learning process, or it may be created as an outcome of the learning process. In either situation, knowledge is crucial in the organizational learning process.

This relation is apparent in the early works that inspired the development of organizational learning theory and KBV. Penrose (1959) lays out the foundations of a learning/knowledge based approach and examines the types of knowledge and learning. This work is central to the development of RB V and KBV in the literature.

Organizational learning theory explains the types of learning, and why learning takes place in the organizations (Argyris and Schön 1978). Argyris and Schön (1978) also mention the relationship between learning and capabilities. Cohen and Levinthal (1990) extend the discussion about this relationship by introducing the effect of prior knowledge on learning new knowledge. Their work also exemplifies the strong relationship between knowledge and learning. They also state that organizational learning that enables the firm to assimilate existing knowledge is critical to its innovative capabilities.

This discussion is extended by proposing that significant learning and innovation are generated via informal communities-of-practice and not by codified, transferable and objective knowledge (Brown and Duguid 1991). Individual learning and organizational learning is integrated through mental models (Kim 1993). Kim (1993) also discusses the factors that positively and negatively affect organizational learning.

Nonaka and Takeuchi (1995) extend Brown and Duguid's (1991) work by differentiating the effects of tacit and explicit knowledge. They explain the organizational learning processes by discussing how tacit knowledge is shared within the organization, how tacit knowledge can be transformed into explicit knowledge, and how the employees internalize explicit knowledge.

Similar to Cohen and Levinthal (1990), they argue that learning is affected by existing knowledge and they introduce the dynamic environment to the organizational learning process. Cohen et al. (1996) emphasize the relationship between organizational capabilities and organizational learning where capabilities are developed selectively by the learning process.

Organizational learning enables the firm to build innovation capabilities via acquiring information, disseminating it within the organization, building an organizational memory, and creating a shared response (Slater and Narver 1995). This learning by doing approach that is the essence of building capabilities. Accordingly, successful organizational learning leads to superior outcomes, such as greater new product success, superior customer retention, higher customer defined quality, and, ultimately, superior growth and/or profitability (Slater and Narver 1995). Thus it can be argued that firm knowledge is transformed into innovation capabilities through organizational learning.

The learning process enhances the relationship between strategic orientation and capabilities by creating a confirmatory feedback loop. The knowledge gained through organizational learning serves to confirm the current actions and strategies (Menon and Varadarajan 1992). The learning process may reveal that the current capabilities of the firm have an effective fit to the environment. In this case, the knowledge confirms the current strategy and strengthens the capabilities rather than changing them.

However the memory part of the learning process may also be dysfunctional when memory triggers path dependent actions. In other words, memory may lead the firm to act the same as before due to previous success; the changing environment may require a different strategy instead. This effect is strong because organizational memory serves as a repository of knowledge and the building blocks of capabilities. The strength of this relationship may lead to

dysfunctional learning (Abbey and Dickson 1983), which in turn create core rigidities rather than core capabilities thus inhibiting innovations (Leonard-Barton 1992). The organization can overcome this problem through generative learning, where the firm questions the long held assumptions in organizational memory (Slater and Narver 1995).

Market Orientation and Innovation Capabilities

In this section the (1) the development of market orientation, (2) relationship between market orientation and organizational learning theory, (3) relationship between market orientation and innovation, and (4) relationship between market orientation and organizational capabilities from a RBV perspective are discussed in relation to the innovation capabilities.

The works of Kohli and Jaworski (1990) and Narver and Slater (1990) lay the foundation of market orientation. Based upon the marketing concept (Felton 1959); that emphasizes the importance of marketing and the need to connect the marketing concept with related concepts in the literature, Kohli and Jaworski (1990) define market orientation as the organization-wide generation of market intelligence pertaining to current and future customer needs, the dissemination of the intelligence across departments, and the organization-wide responsiveness to it. They provide a model that explains the antecedents and the consequences of market orientation. In this model, market orientation is affected by organizational factors and it affects customers, employees, and business performance.

Narver and Slater (1990) focus on the behavioral components of market orientation: customer orientation, competitor orientation and inter-functional coordination. Their definition of customer orientation and competitor orientation include all of the activities involved in acquiring information about buyers and competitors in the target market and disseminating it throughout the business(es). Customer and competitor orientations provide specific sources for

information acquisition mentioned by Kohli and Jaworski (1990). Interfunctional coordination is the use of acquired information and the collective activity among departments to create superior value for buyers. From this perspective, inter-functional coordination is the way to create the "shared response" as introduced by Kohli and Jaworski (1990). Narver and Slater (1990) demonstrated the importance of market orientation by finding a positive effect of market orientation on profitability.

Kohli and Jaworski (1993) extend their model by including moderating environmental factors between market orientation and its antecedents. They also test their model and confirm the findings of Narver and Slater (1990).

Building on these studies, market orientation research follows three major perspectives that are (1) organizational learning (Sinkula 1994; Sinkula, Baker, and Noordewier 1997; Slater and Narver 1995), (2) innovation (Han, Kim, and Srivastava 1998; Hurley and Hult 1998) and (3) organizational capabilities (Day 1994). Previous studies (Hurley and Hult 1998; Slater and Narver 1995), as well as the more recent ones (Hult and Ketchen Jr 2001; Zhou, Yim, and Tse 2005) attempt to merge these streams via integrative models.

Sinkula (1994) states the relationship between market orientation and organizational learning. He focuses on organizational learning in a market information context. His work integrates market orientation and organizational learning by investigating the effects of supply and demand of information and organizational memory on market information processing and organizational learning.

Narver and Slater (1995) extend the work of Sinkula (1994) on integrating organizational learning and market orientation. They argue that market orientation provides strong norms for learning from customers and competitors. They extend the relationship between organizational

learning and market orientation by introducing entrepreneurship and appropriate organizational structures for higher-order learning. They define organizational learning as the development of new knowledge or insights that have the potential to influence behavior. Building upon the Sinkula's (1994) work, they define the process of organizational learning as acquisition, information dissemination, and shared interpretation. They define market orientation as a culture that focuses on superior customer value, interests of key stakeholders, and responsiveness to market information.

Sinkula, Baker, and Noordewier (1997) extend the research on market information and organizational learning by introducing the concept of learning orientation, which is composed of commitment to learning, open-mindedness and shared vision.

Narver and Slater (1995) introduce the relationship between innovation and market orientation. They include innovation as an outcome variable in their integrative model. Han, Kim and Srivastava (1998) extend this model by introducing technical and administrative innovation as a mediating variable between market orientation and organizational performance. Similar to Narver and Slater (1990) and Narver and Slater (1995) they follow a component-wise approach. They empirically test their model and confirm the mediating role of technical and administrative innovation. The difference between two approaches is that Narver and Slater (1995) focus on product innovations whereas Han, Kim and Srivastava (1998) focus on the technological innovations used in service delivery and administrative innovations.

Hurley and Hult (1998) integrate market orientation, organizational learning and innovation in their model. This integration becomes possible by the organizational culture approach where market orientation and organizational learning are embedded in the organizational culture and innovativeness has cultural antecedents. Thus culture creates a

common platform for these different concepts to be investigated in an integrated model. Similar to Slater and Narver (1995) and Han, Kim and Srivastava (1998), they model market orientation as an antecedent to innovation.

Day (1994) discusses the relationship between market orientation and organizational capabilities (including market sensing capabilities) via organizational learning. Both Kohli and Jaworski's (1990) and Narver and Slater's (1990) market orientation concepts provide a foundation for market sensing capabilities. Market sensing capability and customer linking capability are built via market intelligence generation, dissemination and responsiveness. Three behavioral components contribute to capability building by understanding of the target market, understanding competitor capabilities and utilizing customer resources to create superior customer value. These capabilities lead to positions of advantage and performance. Organizational capabilities' positive effect on performance and competitive advantage are also indicated by the RBV and dynamic capabilities.

Hult and Ketchen (2001) integrate market orientation, innovativeness, organizational learning, and entrepreneurship using the resource-based view. Similar to market sensing capabilities (Day 1994); these four capabilities lead to positional advantages. Hult and Ketchen (2001) found that positional advantages arising from the market orientation, entrepreneurship, innovativeness, and organizational learning capabilities have positive effects on firm performance.

Zhou, Yim, and Tse (2005) integrate market orientation, organizational learning and innovation in their model by building on the previous literature (Day 1994; Han, Kim, and Srivastava 1998; Hurley and Hult 1998). They use the resource-based view for integrating constructs, as do Hult and Ketchen (2001). Similar to the previous models, market orientation's

effect on performance is mediated by innovation. They extend the literature by introducing organizational learning as a mediating variable between market orientation and innovation.

These models suggest that market orientation contributes to the building of organizational capabilities. The effect of market orientation on product innovation is tested several times in the literature. These results indicate a possible mediating variable between market orientation and product innovation types.

CHAPTER 3

ESSAY ONE

STRATEGIC ORIENTATIONS AS THE ANTECEDENTS OF INNOVATION CAPABILITIES AND MARKET KNOWLEDGE COMPETENCE: A COMPARISON BETWEEN THE U.S. FIRMS AND THE CHINESE FIRMS

This chapter discusses the conceptual framework depicting how innovation capabilities are formulized and how they lead to organizational outcomes. This research examines the effect of strategic orientation on innovation capabilities and market knowledge competence, which lead to product innovations, product performance, and firm performance. The six research questions are;

1. How does the strategic orientation of the firm affect different types of innovation capabilities?
2. How does the strategic orientation of the firm affect market knowledge competence?
3. In what ways do different types of innovation capabilities lead to product innovations?
4. What is the role of aesthetics in strategic orientation, innovation capabilities, and product innovation?
5. How do innovations capabilities affect different types of product innovations?
6. How does market knowledge competence affect product innovations and performance?

Figure 1 illustrates the antecedents and the consequences of innovations capabilities and market knowledge competence that are examined in Essay 1. These casual relationships in the model are explained by knowledge-based view of the firm and marketing orientation.

Model 1

Strategic Orientations as the Antecedents of Innovation Capabilities: A Comparison Between U.S. and Chinese Firms

Conceptual Framework and Hypothesis Development

The conceptual framework of Essay 1-Model 1 represented in Figure 2 is a part of the Essay 1 conceptual framework on Figure 1.

Strategic Orientation

The innovation capabilities examined in this dissertation are technological, aesthetic and market-based innovation capabilities. Two fundamental aspects of product innovations are form and function (Bloch 1995; Chitturi, Raghunathan, and Mahajan 2007; Rindova and Petkova 2007; Talke et al. 2009; Verganti 2006). Aesthetic innovation capability covers the form-based innovations that are about the external appearance of the product. On the other hand, technological innovation capability covers the function-based innovations that are related to the performance of a product. For example the aesthetic features of a laptop include its color and shape whereas technological features include its processing speed and storage capacity. Technological and aesthetic innovation capabilities focus mostly on the existing markets. However market based innovations focus on new or emerging markets. Thus all together, technological, aesthetic and market-based innovations cover the major innovations that concern form vs. function and current vs. new markets.

Figure 1: Essay1 Conceptual Framework

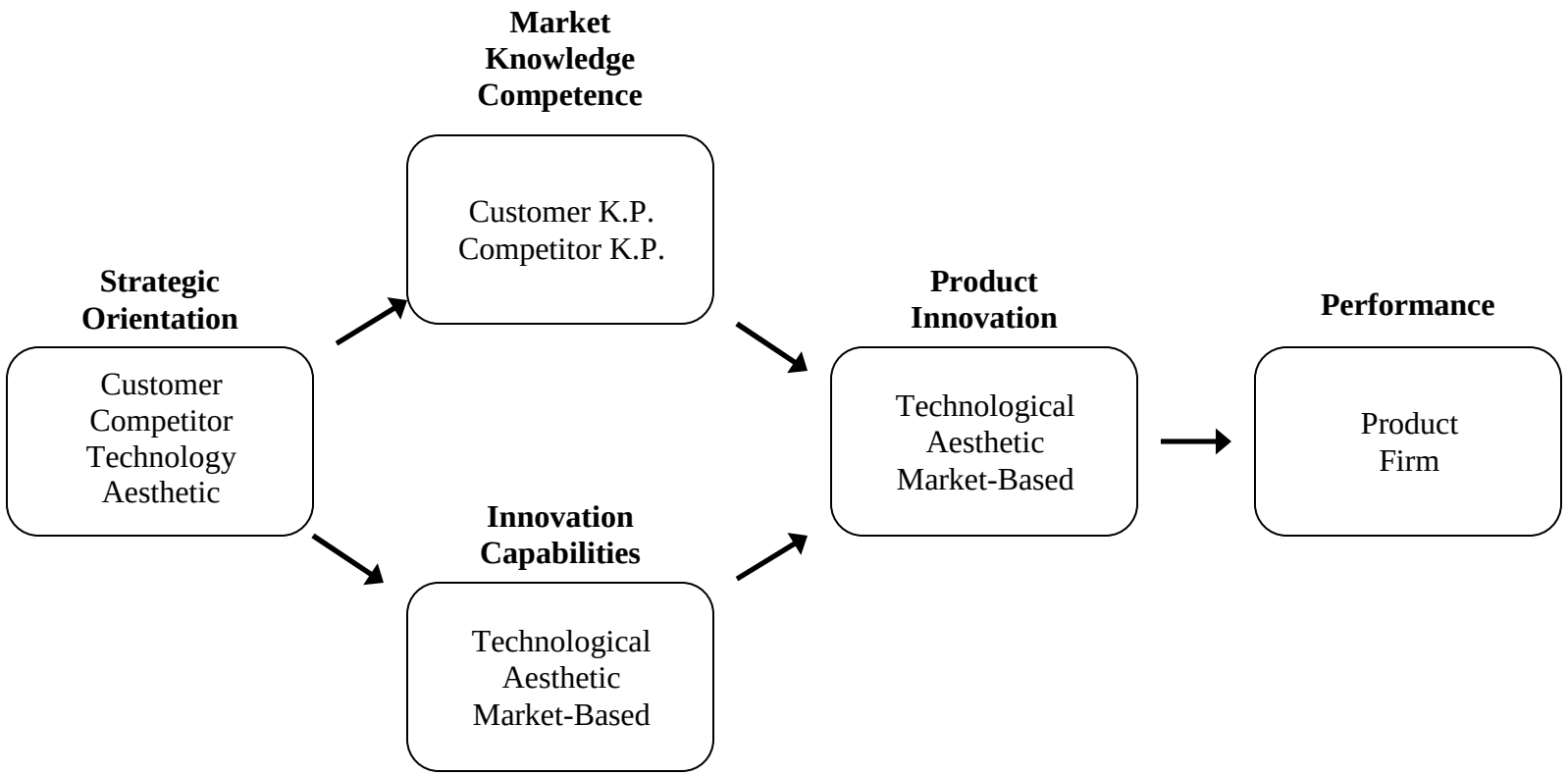
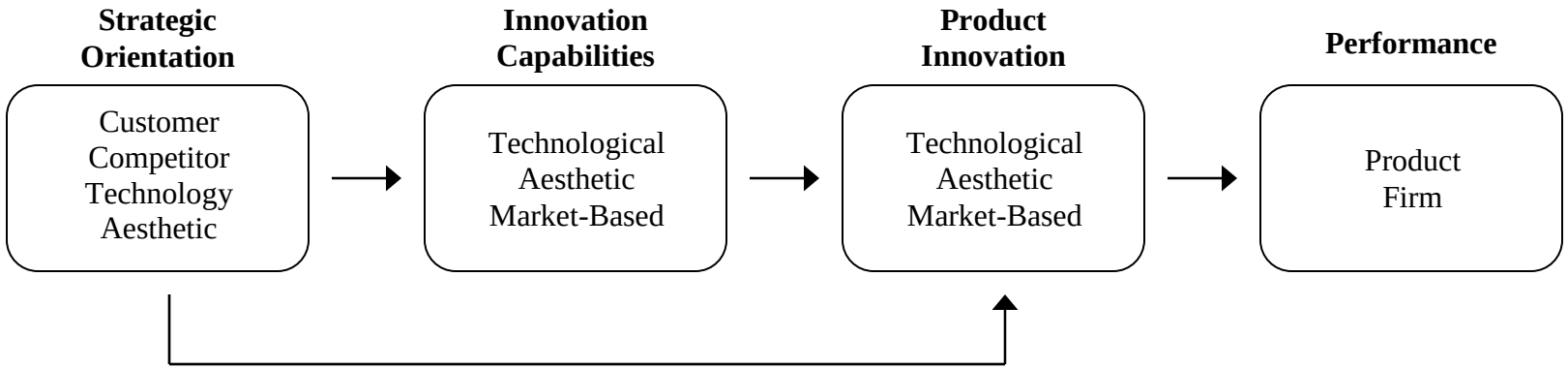


Table 1: Construct Definitions - Essay 1

Construct	Definition
Strategic Orientation	Reflects the firm's philosophy and direction that guides the firm's attempt to achieve superior performance (Gatignon and Xuereb 1997; Narver and Slater 1990; Zhou, Yim, and Tse 2005).
Technological Orientation	The firm's general focus on gathering, interpreting and transforming information about new technologies.
Aesthetic Orientation	The firm's focus on gathering and interpreting information about elements that change the external appearance of a product.
Customer Orientation	The direction and focus of the firm about gathering and disseminating information about its target customers (Gatignon and Xuereb 1997; Narver and Slater 1990).
Competitor Orientation	The direction and focus of the firm about gathering and disseminating information about its target competitors (Gatignon and Xuereb 1997; Narver and Slater 1990).
Technological Innovation Capability	The firm's ability to develop new technologies that can be used to develop new products.
Aesthetic Innovation Capability	The firm's ability to develop non-technological elements, which change the external appearance of the product.
Market-based innovation Capability	The firm's ability to develop new products, for new or emerging markets (Zhou, Yim, and Tse 2005).
Customer Knowledge Process	A customer knowledge process refers to the set of behavioral activities that generates customer knowledge pertaining to customers' current and potential needs for new products (Li and Calantone 1998).
Competitor Knowledge Process	A competitor knowledge process involves the set of behavioral activities that generates knowledge about competitors' products and strategies (Li and Calantone 1998).

Figure 2: Essay1 Model 1 Conceptual Framework



Strategic orientation reflects the firm's philosophy of how to conduct business through a deeply rooted set of values and beliefs that guides the firm's attempt to achieve superior performance (Zhou, Yim, and Tse 2005). It also represents the cognitive inclination of the firm that determines the type of knowledge to be acquired.

Strategic orientation reflects the firm's philosophy and direction that guides the firm's attempt to achieve superior performance (Gatignon and Xuereb 1997; Narver and Slater 1990; Zhou, Yim, and Tse 2005). This direction may include customers, competitors (Narver and Slater 1990), technology (Gatignon and Xuereb 1997), or aesthetics. However, merely an interest does not result in performance. Thus strategic orientation needs to be transformed into capabilities to have a performance outcome. In other words, orientation represents what a firm wants to do while the capabilities represent what the firm can do. What a firm actually does are product innovations that are the outcomes of specific innovation capabilities.

Customer Orientation

Market orientation consists of the customer orientation, competitor orientation and interdepartmental coordination (Narver and Slater 1990). These components can be classified as external or internal. The external components of the market orientation are the customers and competitors that are in the immediate environment of the company. Customer orientation and competitor orientation include all of the activities involved in acquiring information about buyers and competitors in the target market and disseminating it throughout the business(es) (Narver and Slater 1990). There is a strong link between innovation capabilities and the external components of market orientation. Because of the external emphasis on developing information about customers and competitors, the market-driven business is well positioned to anticipate the

developing needs of its customers and respond to them through the addition of innovative products and services (Slater and Narver 1995).

The organizational component of the market orientation involves the interdepartmental coordination. Inter-functional coordination is a mechanism used to increase the coordinated utilization of company resources in creating superior value for target customers and is based on the customer and competitor information, typically involving more than the marketing department (Narver and Slater 1990).

This study focuses on the external components of the market orientation because (1) they examine the effects of the external focus of the firm, and (2) the external focus of customer and competitor orientation is parallel with the external focus of technological and aesthetic orientations. However the effect of inter-functional cooperation on innovation capabilities is also important, thus this relationship is examined in Essay 2.

Customer orientation represents the direction and focus of the firm about gathering and disseminating information about its target customers (Gatignon and Xuereb 1997; Narver and Slater 1990). Customer orientation increases the firm's attention to the current and future needs of the customers. Thus it enables the firm to be aware of the current trends and respond to them in a timely manner.

Aesthetic innovation capability is defined as the firm's ability to develop non-technological elements, which change the external appearance of the product. It is different from the aesthetic orientation because the aesthetic orientation represents the firm's focus or direction about aesthetic innovation whereas aesthetic innovation capability represents the firm's ability to deliver these innovations. In other words aesthetic orientation represents what a firm wants to do and aesthetic innovation capability represents what a firm can do.

Aesthetic trends follow a wave like trend that increase with time, become popular and after becoming mainstream, die out rapidly. Due to the fragile and self-destructive nature of these trends, it is critical for the firm to act in the window of opportunity when the trend is about to take off. This requires a close contact with the customers to find out the types of aesthetic design features they value and a rapid implementation of this knowledge in new product concepts. Customer orientation provides a close relationship with the customers that enable the firm to monitor customer trends and respond to them while the window of opportunity is open. This significantly contributes to building aesthetic innovation capability.

Customer orientation may also have a positive effect on technological innovation capabilities because customer focus may reveal the need for a new technology or for an improvement of an existing technology. In these cases knowledge gathered from customers may have a positive effect on technological innovation capabilities. The rapid change in the technological innovations in the markets makes it more important for the firms to understand their customer needs and determine the type of technology to invest in.

Market-based innovation capability can be defined as a firm's ability to develop new products for new or emerging markets (Zhou, Yim, and Tse 2005). Understanding the needs of the customers in emerging markets is crucial for the firm to develop innovations for these markets before the competitors. Besides there is a one-to one match between the market orientation components and market-based innovation capability since they both involve the important components of market that are customers and competitors. Due to his one-to-one relationship, the effect of customer orientation on market-based innovation capability is expected to be higher than the effect of technological and aesthetic orientation. Similarly customer

orientation is expected to have a positive effect on market-based product innovations. Thus it can be hypothesized that:

H1a: Customer orientation positively affects technological innovation capability.

H1b: Customer orientation positively affects aesthetic innovation capability.

H1c: Customer orientation positively affects market-based innovation capability.

H1d: Customer orientation positively affects market-based product innovation.

H1e: Customer orientation affects market-based innovation capability more than technological and aesthetic orientations.

Competitor Orientation

Technological innovation capability is defined as the firm's ability to develop new technologies that can be used to develop new products. Technological innovations are very costly (Sorescu, Chandy, and Prabhu 2003; Wind and Mahajan 1997) and the high cost of technological innovations makes it crucial for the firms to invest in the right technology. This increases the importance of monitoring competitors. Competitor orientation, that is the will to identify, analyze, and respond to competitors' actions, enables the firm to rapidly detect, reverse engineer and improve the available technologies in the market.

Competitor orientation may also enable the firm to monitor competitors' moves about aesthetic innovations so that it may have a positive effect on aesthetic innovation capabilities. Since aesthetic innovations follow trends that may have a short window of opportunity, it is crucial for the firm to be aware of the aesthetic features of the competitor's products.

Competitor innovation is expected to have a positive effect on market-based innovation capability and market-based innovation because as previously discussed; all of them are related to the most important components of the market that are customers and competitors. Due to this

one-to-one match, competitor orientation is expected to have a higher positive effect on market-based innovation capability than the effects of technological and aesthetic orientations. Thus, competitor orientation is expected to have a positive effect on all of the innovation capability types and market-based product innovation.

H2a: Competitor orientation positively effects technological innovation capability.

H2b: Competitor orientation positively affects aesthetic innovation capability.

H2c: Competitor orientation positively effects market-based innovation capability.

H2d: Competitor orientation positively effects market-based product innovation.

H2e: Competitor orientation affects market-based innovation capability more than technological and aesthetic orientations.

Technological Orientation

Technological orientation can be defined as a firm's general focus on gathering, interpreting and transforming information about new technologies. This definition is parallel to the concept of market orientation of Narver and Slater (1990) that includes the creation and dissemination of information to establish a collective response. The company can use its technical knowledge to build a new technical solution that meets new needs of users (Gatignon and Xuereb 1997). Thus technological orientation includes all the activities that convert the information about new technologies into valuable knowledge that can be used to develop new products and processes. The information can be developed within the company (e.g. through R&D), gained from customers, competitors or the technological developments in other industries.

Similar to the previous findings (Zhou, Yim, and Tse 2005), technological orientation is expected to have a positive effect on technological product innovation. In addition to this effect, technological orientation is expected to have a positive effect also on technological innovation

capability since the technological innovation capability is needed to transform the knowledge resources into technological product innovations. Technological orientation is expected to have the highest positive effect on technological innovation capabilities since they are one-to-one related. On the other hand technological orientation may not necessarily contribute to aesthetic innovations. A company may be highly technology oriented and may position itself to compete in the technological innovativeness. This firm may not invest in aesthetic innovations if it is focused on function rather than form in the products. Allocation of the limited resources may require the firm to choose between technology and aesthetics. Thus a firm that has a technological orientation may focus on building technological innovations capabilities and not invest in its aesthetic capabilities.

Creating innovations for new or emerging markets can involve altering an existing product and serving it to a new market such as the early off-road motorcycles that are an offshoot of regular motorcycles. Market-based innovations can also benefit from technological orientation because a new technological knowledge acquired through technological orientation can be applied to an innovation in a new and/or emerging market. Companies can also gain important technological information via technological orientation about new and emerging markets that can be used to address the opportunities in these markets.

H3a: Technological orientation positively affects the technological innovation capability.

H3b: Technological orientation does not affect the aesthetic innovation capability.

H3c: Technological orientation positively affects the market-based innovation capability.

H3d: Technological orientation positively affects the technological product innovation.

H3e: Technological orientation has the highest positive effect on technological innovation capability.

Aesthetic Orientation

The aesthetic orientation is a firm's focus on gathering and interpreting information about elements that change the external appearance of the product. The aim is to convert the gathered information into valuable knowledge that can be used to spot aesthetic trends and develop aesthetically innovative products. The firm can also create and/or change trends depending on the impact of its aesthetic innovations. The aesthetic orientation is important not only for developing aesthetically innovative products but also building aesthetic capabilities.

Firms differ in their emphasis on aesthetics and technology. Some of the firms such as Intel are solely technology oriented. Aesthetic orientation for Intel has little value since the microprocessors are not visible to the consumer. Alessi on the other hand is an aesthetically oriented firm that produces anthropomorphic kitchenware that distinguish itself from competitors by its aesthetically innovative products. Apple is both aesthetically and technologically oriented; however it has a higher emphasis on aesthetics compared to Dell and HP.

Aesthetic orientation, due to its information focus on the new aesthetic innovations, contributes to building aesthetic innovation capabilities. Additionally, aesthetic orientation is expected to have the highest positive effect on aesthetic innovation capability since they are one-to-one related. However, as the examples suggest, aesthetic orientation does not necessarily contribute to technological innovation capabilities. Aesthetic knowledge gained by the company's aesthetic orientation can enable the firm to identify the opportunities in new and emerging markets, and develop innovations suited the customers in these markets. Thus, aesthetic orientation is expected to have a positive effect on market-based innovation capability.

H4a: Aesthetic orientation positively affects the aesthetic innovation capability.

H4b: Aesthetic orientation does not affect the technological innovation capability.

H4c: Aesthetic orientation positively affects the market-based innovation capability.

H4d: Aesthetic orientation positively affects the aesthetic product innovation.

H4e: Aesthetic orientation has the highest effect on aesthetic innovation capability.

Innovation Capabilities

The link between the capabilities and the firm performance has been extensively examined in the literature (Barney 1986a; Day 1994; Teece, Pisano, and Shuen 1997; Wernerfelt 1984). The relationship between innovation and performance is also widely studied stating that new products increase product performance (Booz and Booz 1982; Cooper and Kleinschmidt 1993; Wind and Mahajan 1997), and they are crucial for firm's survival (Damanpour and Evan 1984; Han, Kim, and Srivastava 1998; Hurley and Hult 1998). However the relationship between innovation capabilities and product innovations are not examined in detail. Innovation capabilities are very important for developing product innovations for several reasons. The innovation capabilities enable the firm to transform its knowledge into new products. The current technological developments enable the firms to re-engineer existing products and produce me-too products in a short time. High intellectual property piracy levels make it even harder for the firms in several countries where patents do not provide protection against competitors. Decreasing product life cycles require continuous and rapid innovation development. This increases the importance of the capabilities of the firms that leads to rapid new products innovations. These conditions emphasize the continuity and the speed of developing new products more than the products themselves.

The resource-based view of the firm looks at organizations in terms of their resources and capabilities rather than in terms of their products (Wernerfelt 1984). Capabilities of the firm are the determinants of firm performance; thus firms compete on their capabilities rather than

innovations (Prahalad and Hamel 1990). Rapidly changing environments mandate firms to modify and reshape their capabilities that lead to rapid and flexible product innovations (Teece and Pisano 1994). Capabilities to create the required innovative responses become more important, when time-to-market and timing are critical, the rate of technological change is rapid, and the nature of future competition and markets are difficult to determine (Teece, Pisano, and Shuen 1997).

Technological innovation capabilities are expected to have the highest positive effect on technological innovations since they are one-to-one related. The market-based innovations are designed for new or emerging markets. Technological innovation capabilities may contribute to developing product innovations by addressing the need for a technological product in new or emerging markets. Thus technological innovation capabilities are expected to have a positive effect on market-based innovations. Aesthetic innovations are about how a product looks whereas technological innovations are about how products perform. A laptop computer's performance is mainly based on its technological features rather than its shape or color. Thus technological innovation capabilities that enable the firm to produce innovations about technological innovations are not expected have an effect on aesthetic innovations.

H5a: Technological innovation capability positively affects technological product innovations.

H5b: Technological innovation capability does not affect aesthetic product innovations.

H5c: Technological innovation capability positively affects market-based product innovations.

H5d: Technological innovation capability has a higher positive effect on technological innovation than the effect of aesthetic and market-based innovation capabilities.

Aesthetic innovation capabilities are expected to have the highest positive effect on aesthetic innovations due to their one-to-one match. Since aesthetic product innovation does not contribute to product performance, aesthetic innovation capability is not expected to contribute to technological product innovations. Aesthetic innovation capabilities may contribute to developing product innovations by addressing need for an aesthetically innovative product in new or emerging markets for new and emerging markets. Thus aesthetic innovation capabilities are expected to have a positive effect on market-based innovations.

H6a: Aesthetic innovation capability does not affect technological product innovations.

H6b: Aesthetic innovation capability positively affects aesthetic product innovations.

H6c: Aesthetic innovation capability positively affects market-based product innovations.

H6d: Aesthetic innovation capability has a higher positive effect on aesthetic innovation than the effect of technological and market-based innovation capabilities.

Market-based innovation capabilities are expected to have the highest positive effect on market-based innovations due to their one-to-one match. Market-based innovation capabilities enable the firm to develop product innovations for the new and emerging markets. These innovations may be aesthetic and/or technological. Thus market-based innovation capabilities may have a positive effect on aesthetic and technological innovations. Thus it can be hypothesized that;

H7a: Market-based innovation capability positively affects technological product innovations.

H7b: Market-based innovation capability positively affects aesthetic product innovations.

H7c: Market-based innovation capability positively affects market-based product innovations

H7d: Market-based innovation capability has a higher positive effect on market-based innovation than the effect of technological and aesthetic innovation capabilities.

Product Innovations

There is a vast amount of literature stating the positive relationship between product innovations and performance. Product innovations have been shown to be determinants of firm performance (Booz and Booz 1982; Cooper and Kleinschmidt 1993; Wind and Mahajan 1997), survival in the market (Damanpour and Evan 1984; Han, Kim, and Srivastava 1998; Hurley and Hult 1998), economic growth (Sorescu, Chandy, and Prabhu 2003), and competitive advantage (Lawson and Samson 2001; Porter 1990; Teece, Pisano, and Shuen 1997). New products provide approximately one-third of firms' profits (Sivadas and Dwyer 2000) and forty percent of their sales in the past five years (Schmidt and Calantone 2002). Thus it can be hypothesized that product innovations have positive effects on product performance and firm performance.

H8a: Technological product innovation has a positive effect on product performance.

H8b: Technological product innovation has a positive effect on firm performance.

H9a: Aesthetic product innovation has a positive effect on product performance.

H9b: Aesthetic product innovation has a positive effect on firm performance.

H10a: Market-based product innovation has a positive effect on product performance.

H10b: Market-based product innovation has a positive effect on product performance.

U.S. - China Comparison

Even though there are several studies testing the market orientation in different countries (DeshpandÈ and Farley 1998; DeshpandÈ, Farley, and Webster 1993; Pitt, Caruana, and Berthon 1996; Savitt 1999), cross-country comparisons between countries on the effects of market orientation is very limited.

This study aims to uncover differences between the effects of market orientation in free economies and transition economies. Findings indicate that in a transition economy, market orientation does not appear to have a direct impact on sales growth or return on investment (Peng and Luo 2000). It is found that U.S. managers generally show higher levels of and customer orientation than their Asian counterparts (Huff and Kelley 2005). These findings indicate the levels and the effects of market orientation may differ across countries.

It may be expected that the free market economies would utilize market orientation better than the transition economies since they have more experience in a competitive environment that forces them to monitor and respond to their competitors. They are also more inclined to understand the needs of the customers. On the other hand, the effects of market orientation would be similar in economically similar countries. Findings show that the effects of market orientation are similar in the U.S. and Scandinavia (Selnes, Jaworski, and Kohli 1996). The CIA Factbook also indicates that U.S. and Scandinavian countries are similar in terms of their economic freedom and GDP per capita.

Another comparison between Hong Kong and Mainland China (Sin et al. 2003) supports the argument that the country/economic context influences the effect of market orientation. Hong Kong is a market-driven economy and it is ranked highest in the world at the 2011 index of economic freedom. On the other hand, China's economy is undergoing a transition from a planned to a market-driven system (Sin et al. 2003) and it ranks 135th at the 2011 index of economic freedom among 179 countries listed. For comparison purposes, U.S. ranks 9th (Table 2) in the index of economic freedom. The GDP per capita differences also show that Hong-Kong and Mainland China have significant economic differences. The results of this study indicate that

market orientation has a higher effect on business performance in free economies (Sin et al. 2003).

Table 2: Country Differences

	Index of Economic Freedom		GDP Per Capita		Gini Coefficient	
	Score	Rank	Score	Rank	Score	Rank
U.S.	77.8	9	$47,200	11	45	39
China	52	135	$7,600	126	41.5	52

Table 3: Country Differences - Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation	Number of Countries
Index of Economic Freedom	0	89.7	58.7	14	179
GDP Per Capita	$300	$179,000	$16,018	$20,567	228
Gini Coefficient	23	70.7	39.9	10	136

There are significant economic differences between U.S. and China. As seen in Table 2, U.S. is a free market economy that ranks 9th at the index of economic freedom however China is undergoing a transition from a planned to a market-driven system (Sin et al. 2003) and it ranks 135th at the index of economic freedom. Thus the U.S. firms are expected to utilize customer and competitor orientation better than Chinese firms.

H11a: Customer orientation has a higher effect on market-based innovation capability in the U.S. compared to China.

H11b: Customer orientation has a higher effect on market-based product innovation in the U.S. compared to China.

H11c: Competitor orientation has a higher effect on market-based innovation capability in U.S. compared to China.

H11d: Competitor orientation has a higher effect on market-based product innovation in U.S. compared to China.

The aesthetic features of a product are about the exterior looks, which do not contribute to its performance. Thus, compared to technological features, aesthetic features are less essential to the customers since they are not closely connected to product performance. A customer who would like to buy a laptop computer, would want secure first the performance features she needs such as the processing speed or storage space. Paying extra for a better-looking exterior usually becomes a secondary need. Priority of performance becomes more apparent when the income level decrease. When a person has a tight budget and in need of a well functioning laptop computer, she would be more likely to choose function over form. Thus aesthetic innovations are expected have a smaller effect in countries where the income is lower. A good indicator of per person income in a country is GDP per capita which is the gross domestic product divided by population. Table 2 indicates that there is a striking difference between U.S. and China. The GDP per capita in the U.S. is $47,200 vs. $7,600 in China. U.S. is 11th where China is 126th among 228 countries. These statistics are obtained from the CIA Factbook and the countries are ranked from high to low in their GDP per capita. The descriptive statistics about of 2010 GDP per capita estimates are provided in Table 3.

Income distribution needs to be taken into consideration while interpreting the differences between countries. The Gini coefficient is a popular and widely used index for measuring income distribution and inequality (Yitzhaki 1983). Gini coefficients indicate that U.S. and China are similar in their scores (45 vs. 41.5) and ranking (39 vs. 52) where U.S. is slightly

more unequal in terms of income distribution since a lower Gini Coefficient indicates lower equality. Due to the similarity in Gini coefficients and striking difference in GDP per capita, aesthetic product innovations are expected to have a higher effect on product performance in U.S. compared to China. An opposite effect is not expected for technological innovations because the technological features of a product determine product's performance they are essential for the customers in both U.S. and China.

H12: Aesthetic product innovation has a stronger effect on product performance in U.S. compared to China.

Market-based innovation capability is the ability of the firm to develop innovative products for new and emerging markets. These new products may include technological or aesthetic innovations. In other words, the managers may choose to utilize firm's market-based innovation capability to develop aesthetic and/or technological product innovations in addition to developing market-based product innovations. If aesthetic innovations affect product performance better in a certain country, the managers would be more inclined to use the market-based innovation capability towards developing aesthetic product innovations compared to developing technological product innovations. As hypothesized in H12, compared to the U.S., in China, aesthetic innovations are expected to have a smaller effect on product performance. In this case, it would be less beneficial for the Chinese managers to use their market-based innovation capabilities for developing aesthetic product innovations compared to their U.S. counterparts. On the other hand, lower returns to aesthetic product innovations, makes it beneficial for the Chinese managers to channel their market-based innovation capabilities towards technological innovations more than their U.S. counterparts. This is due to the allocation of limited resources (time and capabilities) for optimum outcomes. Since the Chinese managers

are expected to use market-based innovation capabilities less on developing aesthetic innovations, they can use these capabilities more on developing technological innovations, compared to their U.S. counterparts.

As discussed in H11, customer and competitor orientations are expected to have a higher effect on their matching innovation capability (market-based innovation capability) in the U.S. compared to China. This is due to the higher experience of the U.S. firms in a free market economy. This higher effect is expected to exist between market-based innovation capability and it's match that is the market-based product innovation. Thus it can be hypothesized that:

H13a: Market-based innovation capability has a higher effect on technological product innovation in China compared to the U.S..

H13b: Market-based innovation capability has a lower effect on aesthetic product innovation in China compared to the U.S..

H13c: Market-based innovation capability has a lower effect on market-based product innovation in China compared to the U.S..

Model 2

Strategic Orientations as the Antecedents of Market Knowledge Competence: A Comparison Between U.S. and Chinese Firms

Conceptual Framework and Hypothesis

The conceptual framework of Essay 1-Model 2 represented in Figure 3 is a part of the Essay 1 conceptual framework on Figure 1.

Customer Orientation

As discussed in Essay 1 Model 1, aesthetic trends follow a wave like pattern that increases with time, becomes popular and after becoming mainstream, dies out rapidly. Due to the fragile and self-destructive nature of the trend, it is critical for the firm to act in the window of opportunity when the trend is about to take off. A close contact with the customers enables the firms to find out the aesthetic design features valued by the customers and implement these features into new product concepts. Customer orientation provides a close relationship with the customer that enables the firm to monitor customer trends and respond to them while the window of opportunity is open. This significantly contributes to building aesthetic innovation capability.

Customer orientation may also have a positive effect on technological innovation capabilities because customer focus may reveal the need for a new technology or an improvement in an existing technology. In these cases knowledge gathered from customers may have a positive effect on technological innovation capabilities. The rapid change in the technological innovations in the markets makes it more important for the firms to understand their customer needs and determine which type of technology to invest in. Thus it can be hypothesized that:

H1a: Customer orientation positively affects technological innovation capability.

H1b: Customer orientation positively affects aesthetic innovation capability.

Market knowledge competence can be defined as a series of activities that generate and integrate market knowledge and it has three components that are (1) customer knowledge process, (2) competitor knowledge process, and (3) Marketing-R&D interface (Li and Calantone 1998). Customer and competitor knowledge processes such as the customer and competitor orientation have an external emphasis whereas marketing-R&D interface has an internal

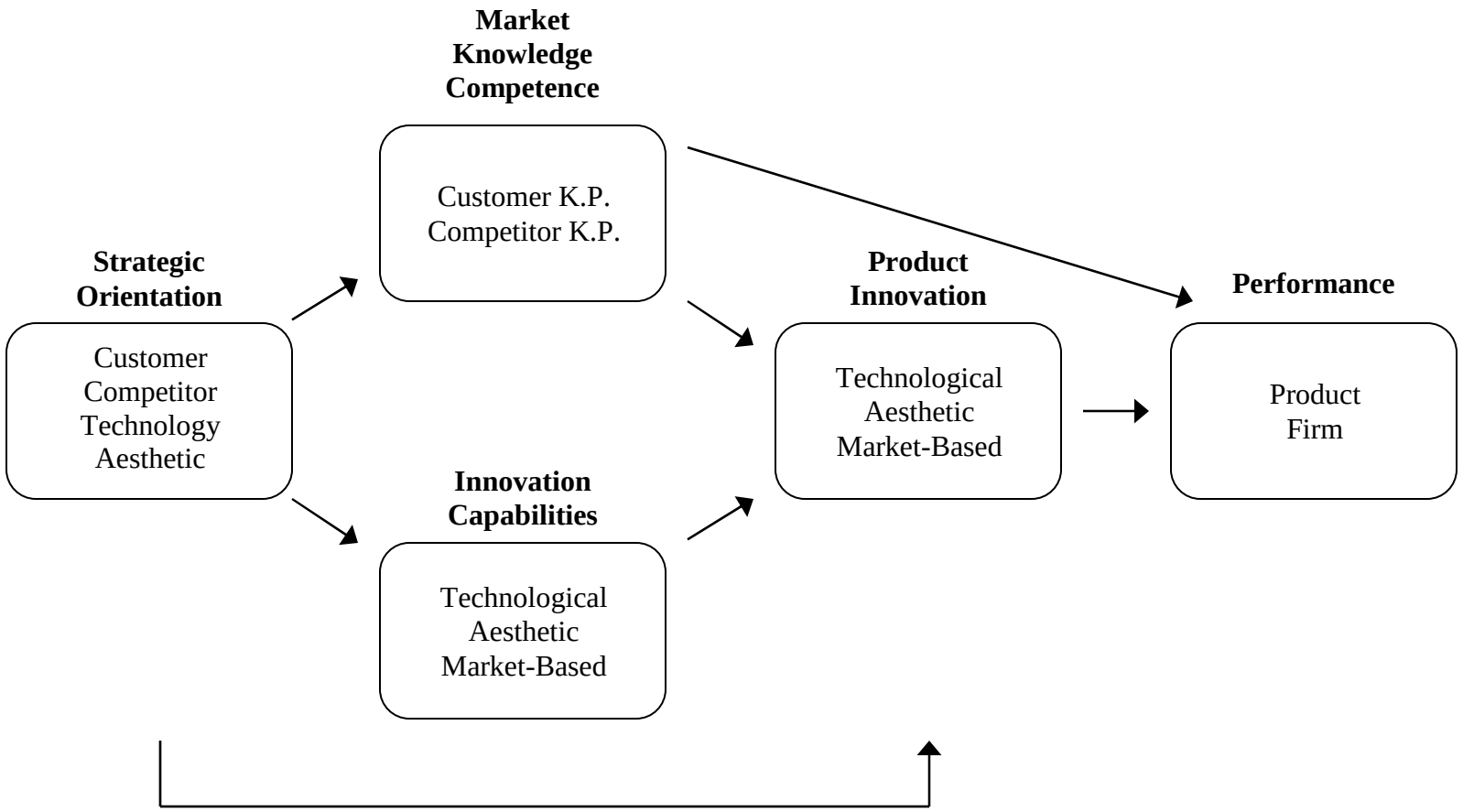
emphasis that involves the communication and cooperation between marketing and R&D function. Since this study focuses on the customer and competitor related constructs, the antecedents and consequences customer and competitor knowledge processes are investigated. The cooperation between functions and their effects are examined in Essay 2.

Customer knowledge process can be defined as the set of behavioral activities that generate knowledge pertaining to customer's current and potential need for a new product and it is anchored on the twin domain of customer orientation (Li and Calantone 1998). Even though customer orientation and customer knowledge processes are related, they are different concepts. Customer orientation indicates the general focus of the firm on customers whereas customer knowledge process covers the behavioral activities that are the acquisition, interpretation and integration of customer knowledge (Li and Cavusgil 1999). Thus, the focus of the firm that is the customer orientation would be expected to have a positive effect on customer knowledge process that is related to put this knowledge into use for developing products. Since there is a one-to-one match between customer orientation and customer knowledge process, customer orientation is expected to have the highest effect on customer knowledge process. Even though customers and competitors both affect the firm, they are different entities. More importantly the firm needs to put additional effort to focus on competitors while focusing on its customers.

Competitor knowledge process involves the set of behavioral activities that generates knowledge about competitors' products and strategies (Li and Calantone 1998). Since these activities are different from customers, firm's focus on customers does not necessarily contribute to competitor knowledge process. Thus it can be hypothesized that:

H1c: Customer orientation positively affects customer knowledge process.

Figure 3: Essay 1 Model 2 Conceptual Framework



H1d: Customer orientation does not affect competitor knowledge process.

H1e: Customer orientation has the highest effect on customer knowledge process.

Competitor Orientation

As discussed in Essay 1 Model 1, the high cost of technological innovations makes it crucial for the firms to invest in the right technology. This increases the importance of monitoring competitors and competitor orientation. Competitor orientation, that is will to identify, analyze, and respond to competitors' actions, enables the firm to rapidly detect, reverse engineer and improve the technology in the market.

Competitor orientation may also enable the firm to monitor competitors' moves about aesthetic innovations so that it may have a positive effect on aesthetic innovation capabilities. Since aesthetic innovations follow trends that may have a short window of opportunity, it is crucial for the firm to be aware of the competitor's products.

H2a: Competitor orientation positively effects technological innovation capability.

H2b: Competitor orientation positively affects aesthetic innovation capability.

Competitor knowledge process involves the set of behavioral activities that generates knowledge about competitors' products and strategies, and it is closely related to competitor orientation (Li and Calantone 1998). Competitor orientation indicates the focus of the firm to its competitors. In other words, it indicates the direction of the firm to a knowledge source. Competitor knowledge process on the other hand, involves the acquisition, interpretation and integration of knowledge obtained from that knowledge source (Li and Cavusgil 1999). Thus, competitor orientation can be expected to contribute to competitor knowledge process. Since there is a one-to-one match between competitor orientation and competitor knowledge process, competitor orientation is expected to have the highest effect on competitor knowledge process.

However, due to the mutually exclusive nature of customers and competitors, competitor orientation is not expected to contribute to customer knowledge process. The reason is that a focus on competitors does not necessarily create a chance for the firm to acquire, interpret and disseminate knowledge about customers. Thus, it can be hypothesized that:

H2c: Competitor orientation does not affect customer knowledge process.

H2d: Competitor orientation positively affects competitor knowledge process.

H2e: Competitor orientation has the highest effect on competitor knowledge process.

Technological Orientation

As discussed in Essay 1- Model 1, similar to the previous findings (Zhou, Yim, and Tse 2005) technological orientation is expected to have a positive effect on technological product innovation. In addition to this effect technological orientation is expected to have a positive effect also on technological innovation capability since the technological innovation capability is needed to transform the knowledge resources into new products. Since there is a one-to-one match between technological orientation and technological innovation capability, technological orientation is expected to have the highest effect on technological innovation capability. On the other hand technological orientation may not necessarily contribute to aesthetic innovations. Allocation of the limited resources may require the firm to choose between technology and aesthetics. Thus a firm that has a technological orientation may focus on building technological innovations capabilities and neglect its aesthetic capabilities.

A firm can gain important knowledge about its customers and competitors while focusing on the new and existing technologies. The knowledge gained about customer and competitors as a result of this focus can be interpret and disseminated within the company, thus contributing to the customer and competitor knowledge processes. For example by focusing on the existing

technologies, the firm can gain important knowledge about how its customers interact with the existing technology, how they utilize it and how can it be improved to serve their needs better. The firms can also detect new technologies in other industries that can be used for addressing an untapped customer need in their own industry. Focusing on the technological features of competitors' products can provide important knowledge for the firm to find out the strengths and weaknesses of its own products. Technological orientation also enables the firm to be aware of the emerging technology strategies of its competitors. Thus it can be hypothesized that;

H3a: Technological orientation positively affects the technological innovation capability.

H3b: Technological orientation does not affect the aesthetic innovation capability.

H3c: Technological orientation positively affects the customer knowledge process.

H3d: Technological orientation positively affects the competitor knowledge process.

H3e: Technological orientation positively affects the technological product innovation.

H3f: Technological orientation has the highest effect on technological innovation capability.

Aesthetic Orientation

As discussed in Essay1-Model 1, aesthetic orientation is important not only for developing aesthetically innovative products but also building aesthetic capabilities. Since there is a one-to-one match between aesthetic orientation and aesthetic innovation capability, aesthetic orientation is expected to have the highest effect on aesthetic innovation capability. However, it does not necessarily contribute to technological innovation capabilities.

A firm's focus on aesthetics may serve as an important source for customer and competitor knowledge processes to acquire, interpret and disseminate knowledge about customers and competitors. For example by focusing on the aesthetic trends, the firm can gain

important knowledge about the emerging customer preferences that creates and strengthens these trends. In an opposite case, by examining a declining aesthetic trend, the firm can gain important knowledge about the changes in customer tastes. Examining the aesthetic trends can provide the firm valuable information about the similarities and differences among competitors' products, and reveal important clues about competitor's aesthetic innovation strategies. Thus it can be hypothesized that;

H4a: Aesthetic orientation does not affect the technological innovation capability.

H4b: Aesthetic orientation positively affects aesthetic innovation capability.

H4c: Aesthetic orientation positively affects the customer knowledge process.

H4d: Aesthetic orientation positively affects the competitor knowledge process.

H4e: Aesthetic orientation positively affects the aesthetic product innovation.

H4f: Aesthetic orientation has the highest effect on aesthetic innovation capability.

Innovation Capabilities

As discussed in Essay 1, technological innovation capabilities are expected to have the highest positive effect on technological innovations since they are one-to-one related. Since aesthetic innovation and technological innovation are mutually exclusive concepts technological innovation capabilities that enable the firm to produce technological innovations are not expected have an effect on aesthetic innovations. Following the same reasoning, aesthetic innovation capabilities are expected to have the highest positive effect on aesthetic innovations due to their one-to-one match but they are not expected to affect technological product innovations.

H5a: Technological innovation capabilities positively affect technological innovation.

H5b: Technological innovation capability does not affect aesthetic product innovation.

H5c: Technological innovation capability has the highest effect on technological product innovation.

H6a: Aesthetic innovation capability positively affects aesthetic product innovation.

H6b: Aesthetic innovation capability does not affect technological product innovation.

H6c: Aesthetic innovation capability has the highest effect on aesthetic product innovation.

Customer and Competitor Knowledge Processes

Acquiring and utilizing information about customers and competitors are expected to have an important effect on product innovations. Li and Calantone (1998) state that a customer knowledge process enables a firm to explore innovation opportunities created by emerging market demand and reduce potential risks of misfitting buyer needs whereas competitor knowledge process contributes to innovation by providing diagnostic benchmarking. Their findings suggest that customer knowledge process and competitor knowledge process both positively affect new product advantage. A following study (Li and Cavusgil 1999) confirms these findings in an export setting. Learning more about customers may trigger new ideas to serve the needs of the customers by either generating remarkably new innovations or by improving the existing innovations. Similarly, learning more about competitors' products and strategies can create innovation ideas for the firm. Thus customer and competitor knowledge processes are expected to have a positive effect on product innovations.

Firms that have the competence to acquire, interpret and disseminate knowledge about their customers are expected to understand their customers' needs well. Products developed with this type of understanding are expected to perform better. A similar situation can be expected for firms who analyze the knowledge about their competitors' products and strategies effectively.

This type of knowledge can enable the firm to develop products that are positioned well in the market relative to the competitors that leads to higher performance. Findings also suggest a positive effect of customer and competitor knowledge processes on product performance (Li and Cavusgil 1999). Thus both customer and competitor knowledge processes are expected to have positive effects on performance.

H7a: Customer knowledge process positively affects technological product innovation.

H7b: Customer knowledge process positively affects aesthetic product innovation.

H7c: Customer knowledge process positively affects product performance.

H7d: Customer knowledge process positively affects firm performance

H8a: Competitor knowledge process positively affects technological product innovation.

H8b: Competitor knowledge process positively affects aesthetic product innovation.

H8c: Competitor knowledge process positively affects product performance.

H8d: Competitor knowledge process positively affects firm performance

Product Innovations

As discussed in Essay 1-Model 1, there is a vast amount of literature stating the positive relationship between product innovations and performance. Product innovations have been shown to be determinants of firm performance (Booz and Booz 1982; Pinto, Pinto, and Prescott 1993; Wind and Mahajan 1997), profits (Sivadas and Dwyer 2000) and sales (Schmidt and Calantone 2002). Thus it can be hypothesized that product innovations have positive effects on product performance and firm performance.

H9a: Technological product innovation has a positive effect on product performance.

H9b: Technological product innovation has a positive effect on firm performance.

H10a: Aesthetic product innovation has a positive effect on product performance.

H10b: Aesthetic product innovation has a positive effect on firm performance.

Country Differences

As discussed in Essay1 Model 1, country/economic context influences the effect of market orientation and a comparison between Hong Kong and China indicates market orientation has a higher effect on performance in a market-driven/free economy than in a transitional (comparatively less free) economy (Sin et al. 2003). The reason is that the firms operating in a free economy, due to higher competition, would be more focused on their customer and competitors. In time, with their experience of operating in a free economy, they can learn to utilize their market orientation better.

The GDP per capita and index of economic freedom differences show that Hong-Kong and Mainland China have significant economic differences. Similarly there are significant economic differences between U.S. and China. As seen in Table 2, U.S. is a free market economy that ranks 9th (similar to Hong Kong that ranks first) at the index of economic freedom however China is undergoing a transition from a planned to a market-driven system (Sin et al. 2003) and it ranks 135th at the index of economic freedom. Due to these striking economic differences between U.S. and China and the findings of Sin, Tse et al. (2003), the U.S. firms are expected to utilize customer orientation and competitor orientation better than Chinese firms.

H11a: Customer orientation has a higher effect on customer knowledge process in the U.S. compared to China.

H11b: Competitor orientation has a higher effect on competitor knowledge process in U.S. compared to China.

Customer (competitor) orientation is the general focus of the firm on its customers (competitors) whereas customer (competitor) knowledge process is the behavioral activities that

transform that knowledge into new products and product performance (Li and Cavusgil 1999). Since the customer and competitor processes are the behavioral counterparts of customer and competitor orientations, they are closely related. Thus, like orientations, firms may learn to utilize their customer and competitor knowledge processes better in a free market economy. The findings indicate that market orientation has a higher effect on performance in comparatively free market economies (Sin et al. 2003). Thus, customer and competitor knowledge processes, as the behavioral counterparts of market orientation, are expected to have a higher effect on product performance in U.S. than in China.

H12a: Customer orientation has a higher effect on product performance in the U.S. compared to China.

H12b: Competitor orientation has a higher effect on product performance in U.S. compared to China.

Research Methodology

Empirical Setting

The industries used in the empirical setting are selected due their relevance to technological, aesthetic and market innovations. The data is collected primarily from Consumer Electronics, Automobile, Home Appliances and PC industries.

Consumer electronics industry is highly innovative and firms compete both in technology and aesthetics. The miniaturization computing power increased the functionality of ever-smaller mobile devices. Firms are dedicated to introduce better performing, technologically innovative, integrated consumer electronics products that can serve multiple functions (e.g. mobile phones with digital cameras) (Han, Chung, and Sohn 2009). However, as the products become more mobile, they also more visible in daily life and become a part of the consumer outfit. Consumer

electronics products evolved from being just functional devices into indicators of consumer lifestyle (Gerson 2007). These factors increase the importance of the aesthetic design of these products and they create an incentive for the firms to be aesthetically innovative. Technology is another important way of competing in consumer electronics industry. Highly innovative products (e.g. introduction of iPhone) are followed by continuous innovations (e.g. iPhone 2g, 3g, 3gs 4g). Previous research also indicates that consumer the electronics industry is a relevant environment to study both technological and aesthetic aspects of the products (Brown 2008).

The automobile industry has been studied extensively in both technological innovation (Pauwels et al. 2004; Srinivasan et al. 2009) and aesthetic innovation areas (Cappetta, Cillo, and Ponti 2006; Hoffer and Reilly 1984). The aesthetic design of an automobile (e.g. color, shape, etc.) and its the technological features (e.g. gas consumption, engine type, heated seats etc.) are important factors affecting customer preferences. The findings in the literature emphasize that both design and technical newness are important drivers of automobile sales (Talke et al. 2009).

The PC industry has been driven by technological innovations since the introduction of early personal computer models. For a long period of time, the competition was based particularly on technological innovations. These included both incremental innovations (e.g. performance upgrades) and disruptive innovations (e.g. invention of operating systems, silicon microchips etc.). Aesthetic innovations became more important at the late 1990's due to the fact that PC's became similar in terms of their technological features (Eisenman 2006). The success of Apple indicates the importance of both technological and aesthetic innovations. The study on the PC industry reveals this changing emphasis on aesthetic and technological innovation (Eisenman 2006).

The Home appliances industry is relevant in terms of technological and aesthetic innovations. Technological innovations create an important edge for companies due to the intense competition. However home appliances, especially the more visible ones, act as pieces of furniture. This contributes to the importance of aesthetic innovations. The relevance of the appliances industry to technological innovations (Luo et al. 2005) (and aesthetic innovations (Gemser and Leenders 2001; Ravasi and Lojacono 2005; Yamamoto and Lambert 1994) has been emphasized in the literature.

Sample

The constructs in the theoretical model are measured via primary survey data. The data is collected from firms in U.S. and China that operate in industries such as Consumer Electronics, Automobile, Home Appliances and PC Industries where both aesthetic and technological innovations are important. The U.S. sample includes 288 mangers and the China sample includes 386 managers that have a responsibility in the development and/or launch of a new product. A national marketing research firm was commissioned to administer the survey in U.S. and another national firm in China administered the Chinese version of the survey. All respondents were informed about the confidentiality of their responses. The purpose of the study was explained before starting the survey. The respondents received compensation from the marketing research company for their time and effort. An individual translated the survey into Chinese. Another individual translated this version back to English. A third person evaluated the differences in the two English versions and concluded that the items and questions have the same meaning.

Similar to the previous studies (Hultink et al. 2003) screening questions have been used to ensure the eligibility of the companies and the managers in those companies. These screening questions are as follows:

1. Does your company have more than 25 employees?
2. Have your company developed and introduced a new product in the past 5 years?
3. Are you responsible for the development and/or launch of a new product?
4. Is your product designed to be both aesthetically pleasing and technologically advanced? In other words does it need to look good and perform well at the same time?
5. Do you have a general understanding about your company's strategies?
6. Do you have a general understanding about your company's current market?

Measures

Most of the items used to measure the constructs are adopted from previous studies. The measures of aesthetics are built according to their technological counterparts on orientation, capabilities and innovations in the literature. These measurement items can be found in the Appendix.

Customer Orientation and Competitor Orientation items are adopted from Narver and Slater (1990). These measurement items have 7-point scale ranging from 1-Not at all to 7- To a great extent.

Technology Orientation items are adopted from Gatignon and Xuereb (1997) and Zhou, Yim, and Tse (2005). These measurement items have 7-point scale ranging from 1-Not at all to 7- To a great extent and they cover the focus on R&D (Gatignon and Xuereb 1997) and openness to new ideas (Zhou, Yim, and Tse 2005) that are important aspects of technology orientation.

Aesthetic Orientation items are adopted from the technological orientation items of Gatignon and Xuereb (1997) and Zhou, Yim, and Tse (2005). These measurement items have 7-point scale ranging from 1-Not at all to 7- To a great extent.

Customer and Competitor Knowledge Competence items are adopted from Li and Calantone (1998). These measurement items have 7-point scale ranging from 1-Not at all to 7- To a great extent.

Innovation Capabilities: Technological innovation capability and aesthetic innovation capabilities are measured with the items adopted from Calantone, Cavusgil and Zhao (2002). Market innovation capability measures are based on the work of Christensen and Bower (1996), Benner and Tushman (2003), and Zhou, Yim, and Tse (2005).

Product Innovation**:** Technological innovation measures are adopted from Gatignon and Xuereb (1997). Aesthetic innovation measures that are about transformation and manipulation of the product's appearance, including changes made to the shape, colors, proportions, materials, textures, or ornamentation (Eisenman 2006) are created according to the technological innovation measures of the previous studies (Gatignon and Xuereb 1997; Zhou, Yim, and Tse 2005). The market-based innovation measures are adopted from Christensen and Bower (1996), Benner and Tushman (2003), and Zhou, Yim, and Tse (2005).

Product Performance: The survey measures about the innovations are at the product level so that the performances of the products were also measured in the survey. These items were used with a 7 points scale (ranging from “Much Worse” to “Much Better”) were used to measure product performance.

Analysis and Findings

Data Analysis Strategy

For both of the models, measurement testing was performed using Confirmatory Factor Analysis (CFA) in Lisrel. All of the items in the model are tested simultaneously. Following the established method in the literature (Fornell and Larcker 1981), convergent validity was established, as the average variance extracted for all constructs was greater than 0.50 (diagonals of Table 4, Table 5, Table 6 and Table 7) and discriminant validity was established, as the average variance extracted was greater than the squared correlation between constructs as seen in Table 4, Table 5, Table 6 and Table 7. Coefficient α values and composite reliabilities are also greater than 0.70 as seen in Table 8,9,10 and 11 that includes the measurement model statistics.

The measurement equivalence test was applied in three steps; (1) testing an unconstrained two group CFA, (2) testing a constrained model by constraining the loadings of the items to the factors to be equal between two groups, and (3) testing the significance of the Chi-square difference between the constrained and unconstrained models.

For the first model, the chi-square difference between the unconstrained model (Chi-square= 2361; df: 988) and the unconstrained model (Chi-square= 2391; df: 1011) was not significant (chi-square difference = 30, df difference: 23, $p > .05$) suggesting that the measurements used for the constructs were not statistically different between U.S. and China.

For the second model, the chi-square difference between the unconstrained model (Chi-square= 2323.9; df: 922) and the unconstrained model (Chi-square= 2356.5; df: 944) was not significant (chi-square difference = 32.6, df difference: 22, $p > .05$) suggesting that the measurements used for the constructs were not statistically different between U.S. and China.

For both of the models, two-group structural equation modeling with the maximum likelihood estimation method was used to test the hypotheses. Two-group structural equation analysis enables the researchers to compare the relative effects of constructs within and between countries. The standardized estimates are useful for comparing the relative effects (i.e., /Bs) within a country while the unstandardized estimates are used to compare the effects across countries (Calantone, Schmidt, and Song 1996). The between-country differences were tested in four steps; (1) testing an unconstrained model, (2) testing a constrained model by constraining relationships between constructs to be equal between two countries, (3) testing the significance of the chi-square difference, and (4) if the chi-square difference is significant, conducting an LM test to see which constraints need to be freed, meaning they are different between countries.

In the first model, the chi-square difference between the constrained model (Chi-Square=224.2; df=75) and the non-constrained model (Chi-Square=89.9; df=44) was significant (chi-square difference = 134, df difference: 31, $p < .05$) suggesting that there are differences between the models. The LM test results revealed that freeing some of the constraints in a particular order (Table 16) will significantly improve model fit, indicating that these constraints are not equal between two countries.

In the second model, the chi-square difference between the constrained model (Chi-Square=192.3; df=70) and the non-constrained model (Chi-Square=53.2; df=36) was significant (chi-square difference = 139.1, df difference: 34, $p < .05$) suggesting that there are differences between the models. The LM test results revealed that freeing some of the constraints in a particular order (Table 21) will significantly improve model fit, indicating that these constraints are not equal between two groups.

The within-country differences between parameters were tested in two steps: (1) checking the standardized parameters whether the hypothesized differences exist, (2) if some differences exist, checking whether these differences are statistically significant. The significance is tested by; (a) constraining the hypothesized parameters be equal within a country, (b) executing an LM test to see whether freeing some of the constraints in a particular order will significantly improve model fit (Table 17 and Table 22).

Model 1 - Results

Hypothesis 1-4: Strategic Orientation & Innovation Capabilities

As stated in Table 14 customer orientation has a positive effect on market innovation capability both in U.S. ($\beta = .18$, $p < 0.01$) and in China ($\beta = 0.10$, $p < 0.01$) supporting H1c. However other effects of customer orientation are not significant either in U.S. or in China samples. The univariate increments in Table 17 indicate that in U.S. firms, the effect of customer orientation on market-based innovation capability is not significantly different than the effect of technological orientation ($p=0.10$) or the aesthetic orientation ($p=.15$), refuting H1e. On the other hand, in China, the effect of customer orientation on market orientation is significantly different than the effect of technological orientation ($p=0.00$) or the effect of aesthetic orientation ($p=.01$), however the standardized effect of technological orientation ($\beta = .32$) and aesthetic orientation ($\beta = .28$) is greater than the effect of customer orientation ($\beta = .10$), refuting H1e.

Table 4: U.S. Squared Correlations and AVE's (Diagonals) - Essay 1 Model 1

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Customer Orientation	.817											
2	Competitor Orientation	.301	.707										
3	Technological Orientation	.384	.510	.823									
4	Aesthetic Orientation	.311	.543	.637	.890								
5	Market-Based Innovation Capability	.308	.437	.738	.554	.859							
6	Technological Innovation Capability	.262	.489	.582	.714	.734	.799						
7	Aesthetic Innovation Capability	.364	.452	.594	.563	.684	.681	.769					
8	Market Product Innovation	.271	.404	.653	.501	.721	.610	.596	.810				
9	Technological Product Innovation	.235	.486	.507	.654	.573	.741	.640	.624	.856			
10	Aesthetic Product Innovation	.245	.507	.449	.477	.520	.552	.651	.548	.642	.758		
11	Product Performance	.266	.269	.355	.299	.321	.307	.346	.336	.334	.317	.792	
12	Firm Performance	.176	.182	.293	.256	.251	.267	.308	.289	.257	.255	.615	.847

Table 5: China Squared Correlations and AVE's (Diagonals) - Essay 1 Model 1

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Customer Orientation	.735											
2	Competitor Orientation	.280	.592										
3	Technological Orientation	.352	.536	.680									
4	Aesthetic Orientation	.325	.423	.590	.777								
5	Market-Based Innovation Capability	.238	.319	.424	.453	.723							
6	Technological Innovation Capability	.266	.398	.476	.549	.677	.775						
7	Aesthetic Innovation Capability	.268	.336	.436	.411	.529	.591	.742					
8	Market Product Innovation	.211	.288	.387	.383	.457	.524	.504	.713				
9	Technological Product Innovation	.161	.296	.338	.445	.394	.585	.440	.613	.801			
10	Aesthetic Product Innovation	.114	.223	.261	.301	.333	.410	.349	.465	.520	.729		
11	Product Performance	.064	.100	.106	.091	.118	.133	.129	.166	.142	.095	.640	
12	Firm Performance	.104	.099	.116	.114	.163	.164	.132	.174	.174	.112	.629	.763

Table 6: U.S. Squared Correlations and AVE's (Diagonals) - Essay 1 Model 2

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Customer Orientation	.816											
2	Competitor Orientation	.301	.707										
3	Technological Orientation	.384	.510	.829									
4	Aesthetic Orientation	.311	.543	.637	.890								
5	Technological Innovation Capability	.308	.437	.738	.554	.859							
6	Aesthetic Innovation Capability	.262	.489	.582	.714	.734	.793						
7	Technological Product Innovation	.271	.404	.653	.501	.721	.610	.810					
8	Aesthetic Product Innovation	.235	.486	.507	.654	.573	.741	.624	.856				
9	Product Performance	.266	.269	.355	.299	.321	.307	.336	.334	.792			
10	Firm Performance	.176	.182	.293	.256	.251	.267	.289	.257	.615	.847		
11	Customer Knowledge Process	.527	.335	.496	.428	.503	.466	.466	.387	.307	.258	.802	
12	Competitor Knowledge Process	.300	.602	.491	.498	.533	.552	.493	.494	.303	.229	.533	.798

Table 7: China Squared Correlations and AVE's (Diagonals) - Essay 1 Model 2

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Customer Orientation	.735											
2	Competitor Orientation	.280	.591										
3	Technological Orientation	.352	.536	.680									
4	Aesthetic Orientation	.325	.423	.590	.777								
5	Technological Innovation Capability	.238	.319	.424	.453	.723							
6	Aesthetic Innovation Capability	.266	.398	.476	.549	.677	.775						
7	Technological Product Innovation	.211	.288	.387	.383	.457	.524	.718					
8	Aesthetic Product Innovation	.161	.296	.338	.445	.394	.585	.613	.801				
9	Product Performance	.064	.100	.106	.091	.118	.133	.166	.142	.632			
10	Firm Performance	.104	.099	.116	.114	.163	.164	.174	.174	.629	.763		
11	Customer Knowledge Process	.340	.245	.379	.361	.446	.433	.460	.334	.100	.144	.742	
12	Competitor Knowledge Process	.311	.429	.445	.480	.561	.590	.472	.408	.118	.152	.570	.723

Table 8: Measurement Model U.S. - Essay 1 Model 1

Construct Name	Item	Loading	t-Value	Cronbach's α	Internal Composite Reliability	AVE
Customer Orientation	CustO1	0.87	18.42	0.93	0.93	0.82
	CustO2	0.91	19.58			
	CustO3	0.93	20.45			
Competitor Orientation	CompO1	0.72	13.66	0.87	0.88	0.71
	CompO2	0.90	19.11			
	CompO3	0.89	19.00			
Technological Orientation	TecO1	0.92	20.52	0.93	0.93	0.82
	TecO2	0.93	20.72			
	TecO3	0.87	18.61			
Aesthetic Orientation	AestO1	0.93	20.69	0.96	0.96	0.89
	AestO2	0.95	21.68			
	AestO3	0.95	21.77			
Technological Innovation Capability	TecInC1	0.91	20.16	0.95	0.95	0.86
	TecInC2	0.93	20.62			
	TecInC3	0.94	21.36			
Aesthetic Innovation Capability	AestInC1	0.92	20.45	0.92	0.92	0.80
	AestInC2	0.90	19.45			
	AestInC3	0.86	18.05			
Market-Based Innovation Capability	MinC1	0.88	18.69	0.91	0.91	0.77
	MinC2	0.85	17.61			
	MinC3	0.90	19.62			
Technological Product Innovation	TecPrIn1	0.88	18.80	0.93	0.93	0.81
	TecPrIn2	0.92	20.41			
	TecPrIn3	0.90	19.66			
Aesthetic Product Innovation	AestPrIn1	0.93	20.72	0.92	0.92	0.86
	AestPrIn2	0.92	20.28			
Market-Based Product Innovation	MprIn1	0.83	16.90	0.90	0.90	0.76
	MprIn2	0.86	17.96			
	MprIn3	0.92	19.98			
Product Performance	ProdPerf1	0.89	18.90	0.89	0.88	0.79
	ProdPerf2	0.89	18.72			
Firm Performance	FirmPerf1	0.92	20.15	0.96	0.96	0.85
	FirmPerf2	0.95	21.38			
	FirmPerf3	0.94	21.32			
	FirmPerf4	0.87	18.63			

Chi Square: 1000 P-value=0.00 CFI= 0.99 RMSEA=0.060

Table 9: Measurement Model - China Essay1 Model 1

Construct Name	Item	Loading	t-Value	Cronbach's α	Internal Composite Reliability	AVE
Customer Orientation	CustO1	0.84	19.58	0.89	0.89	0.73
	CustO2	0.9	21.97			
	CustO3	0.83	19.31			
Competitor Orientation	CompO1	0.70	14.88	0.81	0.81	0.59
	CompO2	0.74	16.12			
	CompO3	0.86	19.86			
Technological Orientation	TecO1	0.87	21.05	0.85	0.86	0.68
	TecO2	0.89	21.75			
	TecO3	0.70	15.34			
Aesthetic Orientation	AestO1	0.91	22.74	0.91	0.91	0.78
	AestO2	0.92	23.48			
	AestO3	0.81	18.82			
Technological Innovation Capability	TecInC1	0.82	19.40	0.88	0.89	0.72
	TecInC2	0.87	21.09			
	TecInC3	0.86	20.63			
Aesthetic Innovation Capability	AestInC1	0.89	22.25	0.91	0.91	0.77
	AestInC2	0.89	22.33			
	AestInC3	0.86	20.77			
Market-Based Innovation Capability	MinC1	0.79	18.35	0.89	0.9	0.74
	MinC2	0.90	22.43			
	MinC3	0.89	21.88			
Technological Product Innovation	TecPrIn1	0.79	18.36	0.89	0.88	0.71
	TecPrIn2	0.84	19.82			
	TecPrIn3	0.90	22.27			
Aesthetic Product Innovation	AestPrIn1	0.90	22.48	0.89	0.89	0.80
	AestPrIn2	0.89	22.03			
Market-Based Product Innovation	MprIn1	0.84	19.64	0.89	0.89	0.73
	MprIn2	0.84	19.80			
	MprIn3	0.88	21.11			
Product Performance	ProdPerf1	0.80	17.86	0.78	0.78	0.64
	ProdPerf2	0.80	17.92			
Firm Performance	FirmPerf1	0.84	20.06	0.93	0.93	0.76
	FirmPerf2	0.92	23.29			
	FirmPerf3	0.91	23.08			
	FirmPerf4	0.82	19.55			

Chi Square: 1184 P-value=0.00 CFI= 0.99 RMSEA=0.060

Table 10: Measurement Model U.S. Essay 1 - Model 2

Construct Name	Item	Loading	t-Value	Cronbach's α	Internal Composite Reliability	AVE
Customer Orientation	CustO1	0.88	18.58	0.93	0.93	0.82
	CustO2	0.90	19.52			
	CustO3	0.93	20.50			
Competitor Orientation	CompO1	0.72	13.72	0.87	0.88	0.71
	CompO2	0.89	18.92			
	CompO3	0.90	19.37			
Technological Orientation	TecO1	0.92	20.44	0.93	0.94	0.83
	TecO2	0.93	20.72			
	TecO3	0.88	18.70			
Aesthetic Orientation	AestO1	0.93	20.70	0.96	0.96	0.89
	AestO2	0.95	21.67			
	AestO3	0.95	21.78			
Technological Innovation Capability	TecInC1	0.91	20.14	0.95	0.95	0.86
	TecInC2	0.93	20.67			
	TecInC3	0.94	21.32			
Aesthetic Innovation Capability	AestInC1	0.92	20.47	0.92	0.92	0.79
	AestInC2	0.90	19.43			
	AestInC3	0.85	18.03			
Technological Product Innovation	TecPrIn1	0.88	18.95	0.93	0.93	0.81
	TecPrIn2	0.92	20.44			
	TecPrIn3	0.90	19.49			
Aesthetic Product Innovation	AestPrIn1	0.93	20.73	0.92	0.92	0.86
	AestPrIn2	0.92	20.18			
Product Performance	ProdPerf1	0.89	18.84	0.89	0.88	0.79
	ProdPerf2	0.89	18.67			
Firm Performance	FirmPerf1	0.92	20.19	0.96	0.96	0.85
	FirmPerf2	0.95	21.40			
	FirmPerf3	0.94	21.31			
	FirmPerf4	0.87	18.61			
Customer Knowledge Process	CustKnow1	0.87	18.32	0.89	0.89	0.80
	CustKnow2	0.91	19.93			
Competitor Knowledge Process	CompKnow1	0.89	19.07	0.92	0.92	0.80
	CompKnow2	0.90	19.41			
	CompKnow3	0.89	19.04			

Chi Square: 917 P-value=0.00 CFI= 0.99 RMSEA=0.059

Table 11: Measurement Model China Essay 1 - Model 2

Construct Name	Item	Loading	t-Value	Cronbach's α	Internal Composite Reliability	AVE
Customer Orientation	CustO1	0.84	19.64	0.89	0.89	0.73
	CustO2	0.9	21.91			
	CustO3	0.83	19.41			
Competitor Orientation	CompO1	0.71	16.26	0.81	0.81	0.59
	CompO2	0.74	16.22			
	CompO3	0.85	19.68			
Technological Orientation	TecO1	0.87	21.03	0.85	0.86	0.68
	TecO2	0.89	21.77			
	TecO3	0.70	15.34			
Aesthetic Orientation	AestO1	0.91	22.74	0.91	0.91	0.78
	AestO2	0.92	23.44			
	AestO3	0.81	18.86			
Technological Innovation Capability	TecInC1	0.84	20.13	0.88	0.89	0.72
	TecInC2	0.86	21.72			
	TecInC3	0.85	20.32			
Aesthetic Innovation Capability	AestInC1	0.89	22.23	0.91	0.91	0.77
	AestInC2	0.89	22.24			
	AestInC3	0.86	20.84			
Technological Product Innovation	TecPrIn1	0.80	18.71	0.89	0.88	0.72
	TecPrIn2	0.85	20.19			
	TecPrIn3	0.89	21.71			
Aesthetic Product Innovation	AestPrIn1	0.91	22.69	0.89	0.89	0.8
	AestPrIn2	0.88	21.69			
	AestPrIn3	0.82	19.41			
Product Performance	ProdPerf1	0.79	17.72	0.78	0.77	0.63
	ProdPerf2	0.80	18.04			
Firm Performance	FirmPerf1	0.84	20.07	0.93	0.93	0.76
	FirmPerf2	0.92	23.28			
	FirmPerf3	0.91	23.07			
	FirmPerf4	0.82	19.55			
Customer Knowledge Process	CustK1	0.81	18.72	0.85	0.85	0.74
	CustK2	0.91	22.08			
Competitor Knowledge Process	CompK1	0.85	20.52	0.87	0.87	0.69
	CompK2	0.85	20.29			
	CompK3	0.79	18.3			

Chi Square: 1154 P-value=0.00 CFI= 0.99 RMSEA=0.063

Competitor orientation, on the other hand, has a positive effect on all the hypothesized constructs. These are technological innovation capability (U.S. & China: $\beta = .07$, $p < 0.05$), aesthetic innovation capability (U.S.: $\beta = .15$, $p < 0.01$; China: $\beta = .14$, $p < 0.01$), market-based innovation capability (U.S. & China: $\beta = .12$, $p < 0.01$), and market based product innovation (U.S.: $\beta = .25$, $p < 0.01$; China: $\beta = .08$, $p < 0.05$), supporting hypotheses 2a, 2b, 2c and 2d. The univariate increments in Table 17 indicate that the effect of competitor orientation on market-based innovation capability is significantly different than the effect of technological orientation (U.S.: p=0.01 China: p=0.00) and effect of the aesthetic orientation (U.S.: p=0.04 China: p=0.00), however the standardized effect of technological orientation (U.S.: $\beta = .33$ China:$\beta = .32$) and aesthetic orientation (U.S.: $\beta = .29$ China:$\beta = .28$) is greater than the effect of customer orientation (U.S.: $\beta = .12$ China:$\beta = .12$), refuting H2e.

Technological orientation positively effects technological innovation capability (U.S.: $\beta = .70$, $p < 0.01$; China: $\beta = .27$, $p < 0.01$), market-based innovation capability (U.S.: $\beta = .33$, $p < 0.01$; China: $\beta = .32$, $p < 0.01$), and technological product innovation (U.S.: $\beta = .20$, $p < 0.01$, $p < 0.01$; China: $\beta = .19$, $p < 0.01$), supporting hypotheses 3a, 3c and 3d. The technological orientation has a positive effect also on aesthetic innovation capability (U.S.: $\beta = .20$, $p < 0.01$; China: $\beta = .19$, $p < 0.01$), refuting the hypothesized null effect in H3b.

In U.S. firms, the standardized effect of technological orientation on technological innovation capability ($\beta = .70$) is higher than the effect of and aesthetic orientation ($\beta = .10$), competitor orientation ($\beta = .07$) and customer orientation ($\beta = .004$). Table 17 indicates that the effect of technological orientation on technological innovation capability is significantly different than the effect of aesthetic orientation (p=0.00), customer orientation (p=0.00), and competitor orientation (p=0.00), H3e for U.S. firms. On the other hand, in Chinese firms, the

effect of technological orientation on technological innovation capability is not significantly different than the effect of aesthetic orientation (p=0.16), refuting the H3e for Chinese firms.

Hypothesis 5-7: Innovation Capabilities & Product Innovations

Technological innovation capability has a positive effect on technological product innovation, (U.S.: $\beta = .42$, $p < 0.01$; China: $\beta = .16$, $p < 0.01$) and it doesn't have a significant effect on aesthetic product innovation (U.S. & China: $\beta = -.08$, $p > 0.05$), supporting H5a and H5b.

In U.S. firms, the standardized effect of technological innovation capability on technological innovation ($\beta = .42$) is higher than the effect of aesthetic innovation capability ($\beta = .19$), and market-based innovation capability ($\beta = .11$). Table 17 indicates that the effect of technological innovation capability on technological innovation is significantly different than the effect of aesthetic innovation capability (p=0.04), and market-based innovation capability (p=0.02), supporting H5e for U.S. firms. On the other hand, in Chinese firms, the standardized effect of technological innovation capability on technological innovation ($\beta = .16$) is not higher than the effect of aesthetic innovation capability ($\beta = .20$), and market-based innovation capability ($\beta = .32$).

Aesthetic innovation capability has a positive effect on aesthetic product innovation (U.S.: $\beta = .53$, $p < 0.01$; China: $\beta = .55$, $p < 0.01$) and market-based innovation (China: $\beta = .38$, $p < 0.01$), supporting H6b and H6c. However the latter effect is not significant in the U.S. sample ($\beta = .11$, $p > 0.05$). The aesthetic innovation capability has a positive effect also on technological product innovation (U.S.: $\beta = .19$, $p < 0.01$; China: $\beta = .20$, $p < 0.01$), refuting the hypothesized null effect in H6a.

Table 12: Correlations U.S. - Essay 1 Model 1

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Customer Orientation	1										
2	Competitor Orientation	.549**	1									
3	Technological Orientation	.620**	.714**	1								
4	Aesthetic Orientation	.558**	.737**	.798**	1							
5	Market-Based Innovation Capability	.555**	.661**	.859**	.744**	1						
6	Technological Innovation Capability	.512**	.699**	.763**	.845**	.857**	1					
7	Aesthetic Innovation Capability	.603**	.672**	.771**	.750**	.827**	.825**	1				
8	Market Product Innovation	.521**	.636**	.808**	.708**	.849**	.781**	.772**	1			
9	Technological Product Innovation	.485**	.697**	.712**	.809**	.757**	.861**	.800**	.790**	1		
10	Aesthetic Product Innovation	.495**	.712**	.670**	.691**	.721**	.743**	.807**	.740**	.801**	1	
11	Product Performance	.516**	.519**	.596**	.547**	.567**	.554**	.588**	.580**	.578**	.563**	1
12	Firm Performance	.419**	.427**	.541**	.506**	.501**	.517**	.555**	.538**	.507**	.505**	.784**

*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 13: Correlations China - Essay 1 Model 1

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Customer Orientation	1										
2	Competitor Orientation	.529**	1									
3	Technological Orientation	.593**	.732**	1								
4	Aesthetic Orientation	.570**	.650**	.768**	1							
5	Market-Based Innovation Capability	.488**	.565**	.651**	.673**	1						
6	Technological Innovation Capability	.516**	.631**	.690**	.741**	.823**	1					
7	Aesthetic Innovation Capability	.518**	.580**	.660**	.641**	.727**	.769**	1				
8	Market Product Innovation	.459**	.537**	.622**	.619**	.676**	.724**	.710**	1			
9	Technological Product Innovation	.401**	.544**	.581**	.667**	.628**	.765**	.663**	.783**	1		
10	Aesthetic Product Innovation	.337**	.472**	.511**	.549**	.577**	.640**	.591**	.682**	.721**	1	
11	Product Performance	.253**	.317**	.325**	.301**	.344**	.365**	.359**	.407**	.377**	.309**	1
12	Firm Performance	.323**	.314**	.341**	.338**	.404**	.405**	.364**	.417**	.417**	.334**	.793**

*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 14: Model 1 Results - Structural Equation Parameter Estimates Standardized, Unstandardized, t-Values

Independent variables	Country	Technological Innovation Capability			Aesthetic Innovation Capability			Market-Based Innovation Capability		
Customer Orientation	U.S.	.04	.04	(1.34)	.02	.02	0.53	.18**	.18	4.78
	China	.04	.04	(1.34)	.02	.02	0.53	.10**	.10	2.54
Competitor Orientation	U.S.	.07*	.07	(2.10)	.15**	.15	4.33	.12**	.12	3.21
	China	.07*	.07	(2.10)	.14**	.15	4.33	.12**	.12	3.21
Technological Orientation	U.S.	.70**	.69	(14.5)	.20**	.20	4.93	.33**	.32	7.21
	China	.27**	.27	(4.99)	.19**	.20	4.93	.32**	.32	7.21
Aesthetic Orientation	U.S.	.10*	.10	(2.07)	.55**	.53	14.1	.29**	.28	6.64
	China	.42**	.43	(8.30)	.52**	.53	14.1	.28**	.28	6.64
R^2	U.S.	.739			.722			.656		
	China	.523			.622			.515		

Table 14 (cont'd)

Independent variables	Country	Technological Product Innovation			Aesthetic Product Innovation			Market-Based Product Innovation		
Customer Orientation	U.S.							-.03	-.03	-1.19
	China							-.03	-.03	-1.19
Competitor Orientation	U.S.							.25**	.25	5.69
	China							.08*	.08	1.80
Technological Orientation	U.S.	.20**	.20	6.00						
	China	.19**	.20	6.00						
Aesthetic Orientation	U.S.				.21**	.20	6.59			
	China				.20**	.20	6.59			
Technological Innovation Capability	U.S.	.42**	.42	7.19	-.08	-.08	-1.91	.06	.06	1.28
	China	.16**	.16	3.05	-.08	-.08	-1.91	.06	.06	1.28
Aesthetic Innovation Capability	U.S.	.19**	. 20	4.35	.53**	.54	11.6	.11	.11	1.63
	China	.20**	.20	4.35	.55**	.54	11.6	.38**	.37	5.63
Market-Based Innovation Capability	U.S.	.11*	.11	2.05	.27**	.27	6.38	.52**	.52	8.64
	China	.32**	.32	6.40	.18**	.18	4.14	.23**	.23	3.88

Table 14 (cont'd)

Independent variables	Country	Technological Product Innovation	Aesthetic Product Innovation	Market-Based Product Innovation	Product Performance			Firm Performance		
Technological Product Innovation	U.S.				.29**	.28	5.09	.27**	.27	4.70
	China				.28**	.28	5.09	.26**	.27	4.70
Aesthetic Product Innovation	U.S.				.26**	.25	3.92	.19**	.19	3.06
	China				.12*	.12	1.89	.18**	.19	3.06
Market-Based Product Innovation	U.S.				.09*	.09	1.74	.09	.09	1.64
	China				.09*	.09	1.74	.09	.09	1.64
R^2	U.S.	.749	.775	.700		.350			.260	
	China	.604	.628	.449		.202			.235	

Goodness-of-fit: Chi Squared = 114.02; p = .00017; df = 65; GFI = .973; CFI = .993; IFI = .993; RMSEA = .047

In both U.S. and Chinese firms, the standardized effect of technological innovation capability on technological innovation (U.S.: $\beta = .53$, China: $\beta = .55$) is higher than the effect of aesthetic innovation capability (U.S.: $\beta = -.08$, China: $\beta = -.08$), and market-based innovation capability (U.S.: $\beta = .21$, China: $\beta = .20$). Table 17 indicates that the effect of technological innovation capability on technological innovation is significantly different than the effect of aesthetic innovation capability (U.S.: p=0.00, China: p=0.00), and market-based innovation capability (U.S.: p=0.00, China: p=0.00), supporting H6e.

Market-based innovation capability has a positive effect on all of the innovation types, that are technological product innovation (U.S.: $\beta = .11$, $p < 0.05$; China: $\beta = .32$, $p < 0.01$), aesthetic product innovation (U.S.: $\beta = .27$, $p < 0.01$; China: $\beta = .18p < 0.01$), and market-based product innovation (U.S.: $\beta = .52$, $p < 0.01$; China: $\beta = .23$, $p < 0.01$), supporting H7a, H7b and H7c.

In U.S. firms, the standardized effect of market-based innovation capability on market-based innovation ($\beta = .52$,) is higher than the effect of technological innovation capability (U.S.: $\beta = .06$,), and aesthetic innovation capability (U.S.: $\beta = .11$). Table 17 indicates that, for only U.S. firms, the effect of market-based innovation capability on market-based innovation is significantly different than the effect of technological innovation capability (p=0.00), and aesthetic innovation capability (p=0.00), supporting H7e for only U.S. firms.

Hypothesis 8-10: Product Innovations & Performance

Technological product innovation has a positive effect on product performance (U.S.: $\beta = .29$, $p < 0.01$; China: $\beta = .28$, $p < 0.01$) and firm performance (U.S.: $\beta = .27$, $p < 0.01$; China: $\beta = .26$, $p < 0.01$), supporting H8a and H8b. Aesthetic product innovation has a positive effect on product performance (U.S.: $\beta = .26$, $p < 0.01$; China: $\beta = .12$, $p < 0.05$) and firm performance

(U.S.: $\beta = .19$, $p < 0.01$; China: $\beta = .18$, $p < 0.01$), supporting H9a and H9b. Market-based product innovation has a positive effect on product performance (U.S. & China: $\beta = .09$, $p < 0.05$), supporting H10a.

Hypothesis 11-13: Differences between U.S. and China

The between country univariate increments in Table 16 indicate that there is a significant difference between the U.S. and China in the effect of customer orientation on market-based innovation capability ($p=0.05$). The unstandardized parameters indicate that customer orientation has a higher effect on market-based innovation in the U.S. ($\beta = .18$) compared to China ($\beta = .10$), supporting H11a. Table 16 indicates that there is a significant difference between the U.S. and China in the effect of competitor orientation on market-based product innovation ($p=0.01$). The unstandardized parameters indicate that customer orientation has a higher effect on market-based innovation in the U.S. ($\beta = .25$) compared to China ($\beta = .08$), supporting H11d.

There is a significant difference between the U.S. and China in the effect of aesthetic product innovation on product performance ($p=0.004$). The unstandardized parameters indicate that aesthetic product innovation has a higher effect on product performance in the U.S. ($\beta = .26$) compared to China ($\beta = .12$), supporting H12.

Table 16 indicates that there is a significant difference between the U.S. and China in the effect of market-based innovation capability on technological product innovation ($p=0.002$). The unstandardized parameters indicate that market-based innovation capability has a higher effect on technological product innovation in China ($\beta = .32$) compared to the U.S. ($\beta = .11$), supporting H13a. There is a significant difference between the U.S. and China in the effect of market-based innovation capability on aesthetic product innovation ($p=0.017$). The unstandardized parameters indicate that market-based innovation capability has a lower effect on

aesthetic product innovation in China (β = .18) compared to the U.S. (β = .27), supporting H13b. There is also a significant difference between the U.S. and China in the effect of market-based innovation capability on market-based product innovation (p=0.002). The unstandardized parameters indicate that market-based innovation capability has a lower effect on market-based product innovation in China (β = .23) compared to the U.S. (β = .52), supporting H13c.

Aesthetic orientation positively effects aesthetic innovation capability (U.S.: β = .55, p < 0.01; China: β = .52, p < 0.01), market based innovation capability (U.S.: β = .29, p < 0.01; China: β = .19, p < 0.01) and aesthetic product innovation (U.S.: β = 0.21, p < 0.01; China: β = 0.20, p < 0.01), supporting the hypotheses H4b, H4c, H4d. The aesthetic orientation has a positive effect also on technological innovation capability (U.S.: β = .10, p < 0.01; China: β = .42, p < 0.01), refuting the hypothesized null effect in H4a.

In both U.S. and Chinese firms, the standardized effect of aesthetic orientation on aesthetic innovation capability (U.S. β = .55, China β = .52) is higher than the effect of and technological orientation (U.S. β = .20, China β = .19), competitor orientation (U.S. β = .15, China β = .14), and customer orientation (U.S. β = .02, China β = .02). Table 17 indicates that the effect of aesthetic orientation on aesthetic innovation capability is significantly different than the effect of technological orientation (U.S.:p=0.00, China: p=0.00), customer orientation (U.S.:p=0.00, China: p=0.00), and competitor orientation (U.S.:p=0.00, China: p=0.00), supporting H4e.

Table 15: Hypothesis Overview - Essay 1 Model 1

Hypothesis	Predicted Effect	Predicted Direction	U.S.	China	Difference
H1a	CustO ->TecInC	Positive	No	No	
H1b	CustO ->AestInC	Positive	No	No	
H1c	CustO ->MInC	Positive	Yes	Yes	Yes
H1d	CustO ->MPrIn	Positive	No	No	
H1e	CustO ->MInC	Positive/Higher	No	No	
H2a	CompO ->TecInC	Positive	Yes	Yes	
H2b	CompO ->AestInC	Positive	Yes	Yes	
H2c	CompO ->MInC	Positive	Yes	Yes	Yes
H2d	CompO ->MPrIn	Positive	Yes	Yes	
H2e	CompO ->MInC	Positive/Higher	No	No	
H3a	TecO ->TecInC	Positive	Yes	Yes	Yes
H3b	TecO ->AestInC	Null	No	No	
H3c	TecO ->MInC	Positive	Yes	Yes	
H3d	TecO ->TecPrIn	Positive	Yes	Yes	
H3e	TecO ->TecInC	Positive/Higher	Yes	No	
H4a	AestO ->TecInC	Null	No	No	Yes
H4b	AestO ->AestInC	Positive	Yes	Yes	
H4c	AestO ->MInC	Positive	Yes	Yes	
H4d	AestO ->AestPrIn	Positive	Yes	Yes	
H4e	AestO ->AestInC	Positive/Higher	Yes	Yes	
H5a	TecInC ->TecPrIn	Positive	Yes	Yes	Yes
H5b	TecInC ->AestPrIn	Null	Yes	Yes	
H5c	TecInC ->MPrIn	Positive	No	No	
H5d	TecInC ->TecPrIn	Positive/Higher	Yes	No	
H6a	AestInC ->TecPrIn	Null	No	No	
H6b	AestInC ->AestPrIn	Positive	Yes	Yes	
H6c	AestInC ->MPrIn	Positive	No	Yes	Yes
H6d	AestInC ->AestPrIn	Positive/Higher	Yes	Yes	
H7a	MInC ->TecPrIn	Positive	Yes	Yes	Yes
H7b	MInC ->AestPrIn	Positive	Yes	Yes	Yes
H7c	MInC ->MPrIn	Positive	Yes	Yes	Yes
H7d	MInC ->MPrIn	Positive/Higher	Yes	No	
H8a	TecPrIn ->PrPerf	Positive	Yes	Yes	
H8b	TecPrIn ->FirmPerf	Positive	Yes	Yes	

Table 15 (cont'd)

Hypothesis	Predicted Effect	Predicted Direction	U.S.	China	Difference
H9a	AestPrIn ->ProdPerf	Positive	Yes	Yes	Yes
H9b	AestPrIn ->FirmPerf	Positive	Yes	Yes	
H10a	MPrIn ->ProdPerf	Positive	Yes	Yes	
H10b	MPrIn ->FirmPerf	Positive	No	No	
H11a	CustO ->MInC	Higher in U.S.	Supported		
H11b	CustO ->MPrIn	Higher in U.S	Not Supported		
H11c	CompO ->MInC	Higher in U.S.	Not Supported		
H11d	CompO ->MPrIn	Higher in U.S.	Supported		
H12	AestPrIn ->ProdPerf	Higher in U.S.	Supported		
H13a	MInC ->TecPrIn	Lower in U.S.	Supported		
H13b	MInC ->AestPrIn	Higher in U.S.	Supported		
H13c	MInC ->MPrIn	Higher in U.S.	Supported		

Discussion

The results indicate several important implications. In the U.S. all of the product innovation types have significant effects on product performance. This enhances the innovation literature by testing the effect of technological, aesthetic, market-based innovations all at the same time and differentiation their effects. Technological and market-based innovations or technological and aesthetic innovations are tested together in the literature however, to the best of our knowledge, it is the first time that a study empirically shows the positive effect of these three innovation types.

This study enhances the innovation and resource based view by introducing three different types of innovation capabilities and differentiating their effects. The results indicate that innovation capabilities have different effects on product innovation types. As hypothesized, market based innovation capability has a positive effect in all-three product innovation types. On the other hand technological innovation capability affects only technological product innovation.

Contrary to the expectations aesthetic innovation capability contributes to technological product innovations.

The results support the hypothesis that there is a one-to-one match between capabilities and product innovations that yield the highest effects. In other words, technological innovation capability has the highest effect on technological product innovation, aesthetic innovation capability on aesthetic product innovation, and market-based innovation capability on market-based product innovation.

The orientation-capability relationships reveal interesting results. Technology, aesthetic and competitor orientations positively affect all of the innovation capability types, however contrary to expectations, customer orientation affects only market-based innovation capabilities. These findings enhance the market orientation literature by (1) indicating that customer and competitor orientations have different effects on innovation capabilities, and (2) competitor orientation plays an important role in building innovation capabilities. Competitor orientation also has a direct positive effect on market-based innovations whereas customer orientation does not.

The results support the hypothesis that there is a one-to-one match between orientation and capabilities only on aesthetics and technology. In other words aesthetic orientation and technology orientation have the highest effects on aesthetic innovation capability and technological innovation capability respectively. These findings are parallel with the one-to-one relationship between capabilities and product innovations. Contrary to the hypothesized relationship, competitor orientation has a smaller effect on market-based innovation capability than technology orientation and aesthetic orientation. It is also important to note that there is a one-to-one positive direct relationship between orientation and product innovation types other

than the relationship between customer orientation and market-based innovation. In other words, technology orientation has a positive direct effect on technological product innovation, aesthetic orientation on aesthetic product innovation and competitor orientation on market-based product innovation. These findings enhance the market orientation literature by showing that the competitor orientation plays an important role not only on all innovation capability types but also the market-based innovations. This study contributes RBV and innovation literature by explaining that aesthetic and technology orientations have both a direct effect and an indirect effect on product innovations through innovation capabilities.

The results indicate important differences between U.S. and China. Six out of eight hypothesized differences are supported. Aesthetic innovation has a higher effect on product performance in the U.S. compared to China. As hypothesized this difference may be due to the difference in the income level of the customers. The explanation may be that a higher income level enables the customers to spend extra for the aesthetic features whereas a lower income level makes the customers focus on the basic performance features of the product. These findings contribute to the innovation literature by demonstrating that aesthetic product innovations have different effects on product performance in different type of economies.

There is an important distinction between U.S. and China at the effects of market-based innovation capability on product innovation types. As hypothesized, the market-based innovation capability has a higher effect on aesthetic innovation in the U.S. compared to China. It suits to the findings that aesthetic product innovation have a higher effect on product performance in the U.S.. Since aesthetic product innovation has a higher return in the U.S., managers would be more inclined to focus their market-based innovation capabilities towards aesthetic innovations more than their Chinese counterparts. Since the payoff for aesthetic innovation is lower in China, as

hypothesized, it would be better for the managers to divert the market-based innovation capabilities towards technological product innovations more than their U.S. counterparts. The results support both of these hypotheses, creating an important distinction between aesthetic and technological innovation as outcomes of market-based innovation capabilities. The results also indicate that, as hypothesized, market-based innovation capability has a higher effect on market-based product innovation in the U.S. compared to China. These findings contribute to the RBV literature by showing how the effects of organizational capabilities change across countries. The findings also enhance the innovation literature by introducing three different types of innovation capabilities and how their effects differ across countries.

There are also important differences between the U.S. and China at the effects of customer and competitor orientations. As hypothesized, customer orientation has a higher effect on market-based innovation capability and competitor orientation has a higher effect on market-based product innovation in the U.S.. This is due to the increased utilization of market orientation in relatively free economies. These results support the findings of Sin et al. (2003) that the country/economic context influences the effect of market orientation. However their findings are limited to the effect of market-orientation on performance. This study extends the market orientation literature by demonstrating the effects of market orientation on market-based innovation capabilities and on market-based product innovations differ across countries. These findings also complement the hypothesized higher effect of market-based innovation capability on market-based product innovation in the U.S. showing a consistency in the relationships.

The one-to-one relationships between technological orientation and technological innovation capability, technological innovation capability and technological product innovation, and market based innovation capability and market-based product innovation differ between the

U.S. and China. It is important to note that these one-to-one relationships have the highest effect the U.S., however they do not have the highest effect in China. These results contribute to RBV and innovation literature that the degree of the relationships between one-to-one matches at the orientation-capability-product innovation sequence (e.g. tech orientation-tech innovation capability-tech product innovation) differs across countries.

Managerial Implications

This study has several important managerial implications by explaining the orientation, capability, innovation, and performance relationships and laying out the similarities and differences of these relationships between U.S. and China.

Increasing product and firm performance is one of the most important challenges of managers. The results indicate that all three of the product innovation types increase product performance. To increase the product innovations, especially in the U.S., it would be most beneficial for the managers to focus on the matching innovation capability types. For example, if a manager wants to increase technological product innovations in the U.S., it would be the best for her to enhance the technological innovation capabilities.

Since the innovation capabilities have a positive effect on product innovations, it is important for the managers to know how to enhance them. Technology, aesthetic, and competitor orientations enhance all of the innovation capabilities. On the other hand, customer orientation increases only the market-based innovation capabilities. The U.S. managers can also directly increase the product innovations by their matching orientation types (e.g. tech orientation-tech product innovation).

The managers need to be aware of the differences between U.S. and China at the orientation-capability-product innovation- performance relationships. Most importantly, the

aesthetic innovations contribute less to product performance in China compared to the U.S.. These findings are particularly important for the managers who are involved in developing international innovation strategies. It is also important to note that market innovation capabilities contribute more to technological innovations and less to aesthetic innovations in China compared to the U.S.. The one-to-one relationships that have the highest effect in the U.S. do not entirely apply in China. In other words, technological orientation is not the highest contributor of technological innovation capability in China, as technological innovation capability is not the highest contributor of technological product innovation, and market based innovation capability is not the highest contributor of market-based product innovation.

Table 16: Between Country Univariate Increments - Essay 1 Model 1

Constraints to Free	Chi-Square	Probability
TecO -> TecInC	16.04	0
AestO -> TecInC	31.465	0
MInC -> MPrIn	9.813	0.002
AestPrIn -> ProdPerf	8.478	0.004
AestInC -> MPrIn	8.005	0.005
CompO -> MPrIn	6.592	0.01
MinC -> AestPrIn	5.698	0.017
TecInC -> TecPrIn	7.160	0.007
MinC -> TechPrIn	9.622	0.002
CustO -> MInc	3.844	0.05

Chi-Square = 227.462 df: 75 p = .0000 CFI=979, RMSEA= .078

Table 17: Within Country Univariate Increments - Essay 1 Model 1

Constraints to Free	Chi-Square		Probability		Significant Difference	
	U.S.	China	U.S.	China	U.S.	China
CustO->MktInC = TechO->MktInC	2.78	17.23	0.10	0.00	No	Yes
CustO->MktInC = AestO->MktInC	2.10	7.98	0.15	0.01	No	Yes
CompO -> MktInC = TechO -> MktInC	6.42	10.90	0.01	0.00	Yes	Yes
CompO->MktInC = AestO->MktInC	4.37	9.08	0.04	0.00	Yes	Yes
CustO->MktInC = CompO->MktInC	0.21	0.00	0.65	0.98	No	No
AestO->AestInC = TecO->AestInC	35.99	11.15	0.00	0.00	Yes	Yes
AestO->AestInC = CustO->AestInC	29.73	14.77	0.00	0.00	Yes	Yes
AestO->AestInC = CompO->AestInC	31.95	12.90	0.00	0.00	Yes	Yes
TechO->TechInC = AestO->TechInC	40.44	1.93	0.00	0.16	Yes	No
TechO->TechInC = CustO->TechInC	23.24	12.88	0.00	0.00	Yes	Yes
TechO->TechInC = CompO->TechInC	28.24	8.70	0.00	0.00	Yes	Yes
AestO->TechInC = CustO->TechInC	2.39	8.30	0.12	0.00	No	Yes
AestO->TechInC = CompO->TechInC	0.61	20.52	0.44	0.00	No	Yes
MktInC->MktPrIn = TecInC->MktPrIn	17.39	1.54	0.00	0.22	Yes	No
MktInC->MktPrIn = AestInC->MktPrIn	14.67	8.95	0.00	0.00	Yes	Yes
TecInC->MktPrIn = AestInC->MktPrIn	0.13	10.89	0.72	0.00	No	Yes
AestInC->AestPrIn = TecInC->AestPrIn	48.45	28.69	0.00	0.00	Yes	Yes
AestInC->AestPrIn = MktInC->AestPrIn	21.01	33.69	0.00	0.00	Yes	Yes
TecInC->AestPrIn = MktInC->AestPrIn	0.17	7.85	0.68	0.01	No	Yes
TecInC->TechPrIn = AestInC->TechPrIn	4.40	1.86	0.04	0.17	Yes	No
TecInC->TechPrIn = MktInC->TechPrIn	5.35	1.72	0.02	0.19	Yes	No
AestInC->TechPrIn = MktInC->TechPrIn	0.03	0.03	0.87	0.86	No	No
TecPrIn->Prodperf = AestPrIn->ProdPerf	0.51	5.24	0.48	0.02	No	Yes
TecPrIn->Prodperf = MktPrIn->ProdPerf	5.33	4.97	0.02	0.03	Yes	Yes
AestPrInProdPerf = MktInC-> ProdPerf	2.54	0.55	0.11	0.46	No	No

Model 2- Results

Hypothesis 1-4: Strategic Orientation

Customer orientation positively affects customer knowledge process (U.S.: $\beta = .45$, $p < 0.01$; China: $\beta = .29$, $p < 0.01$), supporting H1c. Customer orientation also has a positive effect on competitor knowledge process (U.S. & China: $\beta = .12$, $p < 0.01$), refuting the hypothesized null effect. As seen in the within country univariate increments Table 22, in U.S. firms, customer orientation has a significantly different effect on customer knowledge process than the effect of

technological orientation (p= 0.01), aesthetic orientation (p= 0.00), and competitor orientation (p= 0.00). Additionally, the standardized effect of customer orientation on customer knowledge process (β = .45) is higher than the effect of technological orientation (β = .28), aesthetic orientation (β = .20), and competitor orientation (β = -.01) supporting H1e for U.S. firms.

Competitor orientation positively affects technological innovation capability (U.S. & China β = .07, p < 0.05), aesthetic innovation capability (U.S. & China: β= .14, p < 0.01), and competitor knowledge process (U.S.: β = .49, p < 0.01; China: β = .26, p < 0.01), supporting H2a, H2b, H2d. Competitor orientation does not have a significant effect on customer knowledge process (U.S. & China: β = -.01, p > 0.05), supporting H2c.

In U.S. firms, the effect of competitor orientation on competitor knowledge process is significantly different than the effect of technological orientation (p= 0.01), aesthetic orientation (p= 0.00), and customer orientation (p= 0.00). Additionally, the standardized effect of competitor orientation on competitor knowledge process (β = .49) is higher than that of technological orientation (β = .14), aesthetic orientation (β = .17), and customer orientation (β = .12) supporting H2e for U.S. firms.

Technological orientation positively affects technological innovation capability (U.S.: β = .69, p < 0.01; China: β = .27, p < 0.01), customer knowledge process (U.S. & China: β = .28, p < 0.01), competitor knowledge process (U.S.: β = .14, p < 0.01; China: β = .15, p < 0.01), and technological product innovation (U.S.: β = .21, p < 0.01; China: β = .20, p < 0.01), supporting H3a, H3c, H3d and H3e. Technological orientation also has a positive effect on aesthetic innovation capability (U.S. & China: β = .20, p < 0.01), refuting the hypothesized null effect.

Table 18: Correlations U.S. - Essay1 Model 2

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Customer Orientation	1										
2	Competitor Orientation	.549**	1									
3	Technological Orientation	.620**	.714**	1								
4	Aesthetic Orientation	.558**	.737**	.798**	1							
5	Technological Innovation Capability	.555**	.661**	.859**	.744**	1						
6	Aesthetic Innovation Capability	.512**	.699**	.763**	.845**	.857**	1					
7	Technological Product Innovation	.521**	.636**	.808**	.708**	.849**	.781**	1				
8	Aesthetic Product Innovation	.485**	.697**	.712**	.809**	.757**	.861**	.790**	1			
9	Product Performance	.516**	.519**	.596**	.547**	.567**	.554**	.580**	.578**	1		
10	Firm Performance	.419**	.427**	.541**	.506**	.501**	.517**	.538**	.507**	.784**	1	
11	Customer Knowledge Process	.726**	.579**	.704**	.654**	.709**	.683**	.683**	.622**	.554**	.508**	1
12	Competitor Knowledge Process	.548**	.776**	.701**	.706**	.730**	.743**	.702**	.703**	.550**	.479**	.730**

*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 19: Correlations China - Essay1 Model 2

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Customer Orientation	1										
2	Competitor Orientation	.529**	1									
3	Technological Orientation	.593**	.732**	1								
4	Aesthetic Orientation	.570**	.650**	.768**	1							
5	Technological Innovation Capability	.488**	.565**	.651**	.673**	1						
6	Aesthetic Innovation Capability	.516**	.631**	.690**	.741**	.823**	1					
7	Technological Product Innovation	.459**	.537**	.622**	.619**	.676**	.724**	1				
8	Aesthetic Product Innovation	.401**	.544**	.581**	.667**	.628**	.765**	.783**	1			
9	Product Performance	.253**	.317**	.325**	.301**	.344**	.365**	.407**	.377**	1		
10	Firm Performance	.323**	.314**	.341**	.338**	.404**	.405**	.417**	.417**	.793**	1	
11	Customer Knowledge Process	.583**	.495**	.616**	.601**	.668**	.658**	.678**	.578**	.317**	.379**	1
12	Competitor Knowledge Process	.558**	.655**	.667**	.693**	.749**	.768**	.687**	.639**	.344**	.390**	.755**

*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 20: Essay 1 Model 2 Results - Structural Equation Parameter Estimates Standardized, Unstandardized, t-Values

Independent variables	Country	Technological Innovation Capability			Aesthetic Innovation Capability			Customer Knowledge Process			Competitor Knowledge Process		
Customer Orientation	U.S.	.04	.04	1.35	.02	.02	.55	.45**	.46	11.5	.12**	.12	3.82
	China	.04	.04	1.35	.02	.02	.55	.29**	.29	7.13	.12**	.12	3.82
Competitor Orientation	U.S.	.07*	.07	2.06	.14**	.14	4.21	-.01	-.01	-.32	.49**	.49	9.87
	China	.07*	.07	2.06	.14**	.14	4.21	-.01	-.01	-.32	.26**	.25	5.92
Technological Orientation	U.S.	.69**	.69	14.5	.20**	.20	4.96	.28**	.28	6.04	.14**	.14	3.33
	China	.27**	.27	4.99	.20**	. 20	4.96	.28**	.28	6.04	.15**	.14	3.33
Aesthetic Orientation	U.S.	.12**	.12	2.57	.58**	.58	13.5	.20**	.21	4.73	.17**	.18	3.26
	China	.39**	.39	7.40	.49**	.48	11.1	.21**	.21	4.73	.34**	.34	7.33
R^2	U.S.		.751			.744			.654			.665	
	China		.496			.592			.455			.563	

*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 20 (cont'd)

Independent variables	Country	Technological Product Innovation			Aesthetic Product Innovation			Product Performance			Firm Performance		
Technological Orientation	U.S.	.21**	.20	6.18									
	China	.20**	.20	6.18									
Aesthetic Orientation	U.S.				.25**	.24	7.22						
	China				.23**	.24	7.22						
Technological Innovation Capability	U.S.	.27**	.26	5.83	-.02	-.02	-.55						
	China	.25**	.26	5.83	-.02	-.02	-.55						
Aesthetic Innovation Capability	U.S.	.23**	.22	5.03	.59**	.58	12.4						
	China	.22**	.22	5.03	.55**	.58	12.4						
Customer Knowledge Process	U.S.	.16**	.16	4.54	.03	.03	.89	.20**	.19	3.35	.17**	.16	3.03
	China	.15**	.16	4.54	.03	.03	.89	.04	.04	.72	.15**	.16	3.03
Competitor Knowledge Process	U.S.	.08*	.08	2.08	.07*	.07	1.77	.10*	.10	1.85	.08	.08	1.41
	China	.08*	.08	2.08	.06*	.07	1.77	.10*	.10	1.85	.07	.08	1.41
Technological Product Innovation	U.S.							.21**	.21	3.52	.17**	.16	2.76
	China							.21**	.21	3.52	.16**	.16	2.76
Aesthetic Product Innovation	U.S.							.18**	.18	3.25	.19**	.19	3.38
	China							.18**	.18	3.25	.19**	.19	3.38
R^2	U.S.		.739			.755			.376			.288	
	China		.613			.632			.216			.252	

Goodness-of-fit: Chi Squared = 99.85; p = .00214; df = 63; GFI = .976; CFI = .995; IFI = .995; RMSEA = .042
*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

In U.S. firms, the effect of technology orientation on technological innovation capability is significantly different than the effect of aesthetic orientation (p= 0.00), customer orientation (p= 0.00), and competitor orientation (p= 0.00). Additionally, the standardized effect of technology orientation on technological innovation capability (β = .69) is higher than the effect of aesthetic orientation (β = .12), customer orientation (β = .04), and competitor orientation (β = .07) supporting H3f for U.S. firms.

Aesthetic orientation positively affects aesthetic innovation capability (U.S.: β = .58, p < 0.01; China: β = .49, p < 0.01), customer knowledge process (U.S.: β = .20, p < 0.01; China: β = .21, p < 0.01), competitor knowledge process (β = .17, p < 0.01; China: β = .34, p < 0.01), and aesthetic product innovation (U.S.: β = 0.25, p < 0.01; China β = 0.23, p < 0.01), supporting H4b, H4c, H4d and H4e. Aesthetic orientation also has a positive effect on technological innovation capability (U.S.: β = .12, p < 0.01; China: β = .39, p < 0.01), refuting the hypothesized null effect.

Both in U.S. and Chinese firms, the effect of aesthetic orientation on aesthetic innovation capability is significantly different than the effect of technology orientation (U.S.: p= 0.00, China: p= 0.00), customer orientation (U.S.: p= 0.00, China: p= 0.00), and competitor orientation (U.S.: p= 0.00, China: p= 0.00). Additionally, the standardized effect of aesthetic orientation on aesthetic innovation capability (U.S.: β = .58, China: β = .49) is higher than the effect of technology orientation capability (U.S.: β = .20, China: β = .20), customer orientation capability (U.S.: β = .02, China: β = .02), and competitor orientation capability (U.S.: β = .14, China: β = .14) supporting H4f for both U.S. and Chinese firms.

Hypothesis 5-8: Market Knowledge Competence & Innovation Capabilities

Technological innovation capability has a positive effect on technological product innovation (U.S.: β = .27, p < 0.01; China: β = .25, p < 0.01), supporting H5a. Technological

innovation capability does not have an effect on aesthetic product innovation (U.S. & China: β = -.02, p > 0.05), supporting H5b.

Table 21: Between Country Univariate Increments Essay 1 Model 2

Constraints to Free	Chi-Square	Probability
TecO ->TecInC	18.105	0
AestO ->TecInC	27.887	0
CustO ->CustKnow	11.263	0.001
CustKnP ->ProdPerf	9.946	0.002
CompO ->CompKnow	6.289	0.012
AestO ->CompKnow	11.185	0.001
AestO ->AestInC	5.268	0.022

Chi-Square = 185.052; df: 70; p = .0000; CFI=985; RMSEA= .070

Aesthetic innovation capability also has a positive effect on aesthetic product innovation (U.S.: β = .59, p < 0.01; China: β = .55, p < 0.01), supporting H6b. Aesthetic innovation capability has a significant effect on technological product innovation (U.S.: β = .23, p < 0.01; China: β = .22, p < 0.01), refuting the hypothesized null effect.

Both in U.S. and Chinese firms, the effect of aesthetic innovation capability on aesthetic product innovation is significantly different than the effect of technological innovation capability (U.S.: p= 0.00, China: p= 0.00), customer knowledge process (U.S.: p= 0.00, China: p= 0.00), and competitor knowledge process (U.S.: p= 0.00, China: p= 0.00). Additionally, the standardized effect of aesthetic innovation capability on aesthetic product innovation (U.S.: β = .59, China: β = .55) is higher than the effect of technological innovation capability (U.S.: β = -.02, China: β = -.02), customer knowledge process (U.S.: β = .03, China: β = .03), and competitor knowledge process (U.S.: β = .07, China: β = .06) supporting H6c for both U.S. and Chinese firms.

Table 22: Within Country Univariate Increments - Essay 1 Model 2

Constraints to Free	Chi-Square		Probability		Significant Difference	
	U.S.	China	U.S.	China	U.S.	China
CompO->CompKnPr = TechO->CompKnPr	6.36	5.76	0.01	0.02	Yes	Yes
CompO->CompKnPr = AestO->CompKnPr	12.49	1.43	0.00	0.23	Yes	No
CompO->CompKnPr = CustO->CompKnPr	22.64	5.59	0.00	0.02	Yes	No
CustO->CustKnPr = TechO->CustKnPr	6.15	0.06	0.01	0.82	Yes	No
CustO->CustKnPr = AestO->CustKnPr	13.81	14.62	0.00	0.00	Yes	Yes
CustO->CustKnPr = CompO->CustKnPr	57.77	30.22	0.00	0.00	Yes	Yes
AestO->AestInC = TecO->AestInC	19.20	9.51	0.00	0.00	Yes	Yes
AestO->AestInC = CustO->AestInC	48.15	17.30	0.00	0.00	Yes	Yes
AestO->AestInC = CompO->AestInC	37.80	10.15	0.00	0.00	Yes	Yes
TechO->TechInC = AestO->TechInC	35.74	1.61	0.00	0.21	Yes	No
TechO->TechInC = CustO->TechInC	56.02	40.71	0.00	0.00	Yes	Yes
TechO->TechInC = CompO->TechInC	76.08	18.08	0.00	0.00	Yes	Yes
AestO->TechInC = CustO->TechInC	1.23	5.20	0.27	0.02	No	Yes
AestO->TechInC = CompO->TechInC	0.50	12.36	0.48	0.00	No	Yes
AestInC->AestPrIn = TechInC->AestPrIn	60.88	66.43	0.00	0.00	Yes	Yes
AestInC->AestPrIn = CustKnPr->AestPrIn	76.87	76.84	0.00	0.00	Yes	Yes
AestInC->AestPrIn = CompKnPr->AestPrIn	23.25	23.89	0.00	0.00	Yes	Yes
CustKnPr->AestPrIn = CompKnPr->AestPrIn	1.21	0.49	0.27	0.48	No	No
TecInC->TechPrIn = AestInC->TechPrIn	1.56	1.23	0.21	0.27	No	No
TecInC->TechPrIn = CustKnPr->TechPrIn	4.94	2.68	0.03	0.10	Yes	No
TecInC->TechPrIn = CompKnPr->TechPrIn	8.73	9.56	0.00	0.00	Yes	Yes
CustKnPr->TechPrIn = CompKnPr->TechPrIn	0.01	1.52	0.94	0.22	No	No
TecPrIn->Prodperf = AestPrIn->ProdPerf	0.13	1.48	0.72	0.22	No	No
TecPrIn->Prodperf = CustKnPr->ProdPerf	0.03	2.57	0.87	0.11	No	No
TecPrIn->Prodperf = CompKnPr->ProdPerf	0.30	3.35	0.58	0.07	No	No
AestPrIn->ProdPerf = CustKnPr->ProdPerf	0.01	0.55	0.94	0.46	No	No
AestPrIn->ProdPerf = CompKnPr->ProdPerf	0.33	0.25	0.57	0.61	No	No
CustKnPr->ProdPerf = CompKnPr->ProdPerf	0.25	0.44	0.62	0.51	No	No

Customer knowledge process has a positive effect on technological product innovation (U.S.: $\beta = .16$, $p < 0.01$; China: $\beta = .15$, $p < 0.01$), product performance in U.S. ($\beta = .20$, $p < 0.01$), and firm performance (U.S.: $\beta = .17$, $p < 0.01$; China: $\beta = .15$, $p < 0.01$), supporting H7a, H7c and H7d for U.S. firms and H7a and H7d for Chinese firms.

Competitor knowledge process has a positive effect on technological product innovation (U.S. & China: $\beta = .08$, $p < 0.05$), aesthetic product innovation (U.S.: $\beta = .07$, $p < 0.05$; China: $\beta = .06$, $p < 0.05$) and product performance (U.S. & China: $\beta = .10$, $p < 0.05$) supporting H8a, H8b and H8c.

Technological product innovation has a positive effect on product performance (U.S. & China: $\beta = .21$, $p < 0.01$) and firm performance (U.S.: $\beta = .17$, $p < 0.01$; China: $\beta = .16$, $p < 0.01$), supporting H9a and H9b.

Aesthetic product innovation has a positive effect on product performance (U.S. & China: $\beta = .18$, $p < 0.01$) and firm performance (U.S. & China: $\beta = .19$, $p < 0.01$), supporting H10a and H10b.

The between country univariate increments in Table 21 indicate that the effect of customer orientation on customer knowledge process differs significantly ($p= .001$) between U.S. and China. The unstandardized parameter estimates show that the effect of customer orientation on customer knowledge process is higher in the U.S. ($\beta = .46$) than it is in China ($\beta = .29$), supporting 11a.

As seen in Table 21 the effect of competitor orientation on competitor knowledge process differs significantly ($p= .012$) between U.S. and China. The unstandardized parameter estimates show that the effect of competitor orientation on competitor knowledge process is higher in the U.S. ($\beta = .49$) than it is in China ($\beta = .25$), supporting 11b.

The effect of customer knowledge process on product performance differs significantly ($p = .002$) between U.S. and China. The unstandardized parameter estimates show that the effect of customer knowledge process on product performance is higher in the U.S. ($\beta = .19$) than it is in China ($\beta = .04$), supporting 12a.

Discussion

The results of this study provide an important insight about the antecedents and consequences of market knowledge competence. Additionally, the differences between Chinese and U.S. firms are examined.

In the U.S., customer knowledge process and competitor knowledge process have direct positive effects on product performance. These results support the findings of Li and Cavusgil (1999). Competitor knowledge process contributes to both technological and aesthetic product innovations whereas customer knowledge process contributes only to technological product innovations. Aesthetic and technological product innovations in turn, increase product performance. Thus, customer and competitor knowledge processes affect both product performance and its antecedents that are the aesthetic and technological product innovations. These findings contribute to both marketing and innovation literature by empirically testing the positive effects of customer and competitor knowledge processes on aesthetic innovation, technological innovation and product performance.

There is a distinction between the effects of aesthetic and technological innovation capabilities. Contrary to the expectations, aesthetic innovation capability positively effects not only aesthetic but also technological product innovations. On the other hand, as expected, technological innovation capability contributes only to technological product innovation.

Table 23: Hypotheses Overview - Essay 1 Model 2

Hypothesis	Predicted Effect	Predicted Direction	U.S.	China	Difference in Paths
H1a	CustO -> TecInC	Positive	No	No	
H1b	CustO -> AestInC	Positive	No	No	
H1c	CustO -> CustKnP	Positive	Yes	Yes	Yes
H1d	CustO -> CompKnP	Null	No	No	
H1e	CustO -> CustKnP	Positive/Higher	Yes	No	
H2a	CompO -> TecInC	Positive	Yes	Yes	
H2b	CompO -> AestInC	Positive	Yes	Yes	
H2c	CompO -> CustKnP	Null	Yes	Yes	
H2d	CompO -> CompKnP	Positive	Yes	Yes	Yes
H2e	CompO -> CompKnP	Positive/Higher	Yes	No	
H3a	TecO -> TecInC	Positive	Yes	Yes	Yes
H3b	TecO -> AestInC	Null	No	No	
H3c	TecO -> CustKnP	Positive	Yes	Yes	
H3d	TecO -> CompKnP	Positive	Yes	Yes	
H3e	TecO -> TecPrIn	Positive	Yes	Yes	
H3f	TecO ->TecInC	Positive/Higher	Yes	No	
H4a	AestO -> TecInC	Null	No	No	Yes
H4b	AestO -> AestInC	Positive	Yes	Yes	Yes
H4c	AestO -> CustKnP	Positive	Yes	Yes	
H4d	AestO -> CompKnP	Positive	Yes	Yes	Yes
H4e	AestO -> AestPrIn	Positive	Yes	Yes	
H4f	AestO ->AestInC	Positive/Higher	Yes	Yes	
H5a	TecInC -> TecPrIn	Positive	Yes	Yes	
H5b	TecInC -> AestPrIn	Null	Yes	Yes	
H5c	TecInC ->TecPrIn	Positive/Higher	No	No	
H6a	AestInC -> TecPrIn	Null	No	No	
H6b	AestInC -> AestPrIn	Positive	Yes	Yes	
H6c	AestInC ->AestPrIn	Positive/Higher	Yes	Yes	
H7a	CustKnP -> TecPrIn	Positive	Yes	Yes	
H7b	CustKnP -> AestPrIn	Positive	No	No	
H7c	CustKnP -> ProdPerf	Positive	Yes	No	Yes
H7d	CustKnP -> FirmPerf	Positive	Yes	Yes	
H8a	CompKnP -> TecPrIn	Positive	Yes	Yes	
H8b	CompKnP -> AestPrIn	Positive	Yes	Yes	
H8c	CompKnP -> ProdPerf	Positive	Yes	Yes	
H8d	CompKnP -> FirmPerf	Positive	No	No	
H9a	TecPrIn -> PrPerf	Positive	Yes	Yes	

Table 23 (cont'd)

Hypothesis	Predicted Effect	Predicted Direction	U.S.	China	Difference in Paths
H9b	TecPrIn -> FirmPerf	Positive	Yes	Yes	
H10a	AestPrIn -> PrPerf	Positive	Yes	Yes	
H10b	AestPrIn -> FirmPerf	Positive	Yes	Yes	
H11a	CustO -> CustKnP	Higher in U.S.	Supported		
H11b	CompO -> CompKnP	Higher in U.S.	Supported		
H12a	CustKnP -> ProdPerf	Higher in U.S.	Supported		
H12b	CompKnP -> ProdPerf	Higher in U.S.	Not Supported		

It is important to note that both aesthetic and technological orientations contribute to technological innovation capability, aesthetic innovation capability, customer knowledge process and competitor knowledge process. Customer orientation has a positive effect only on customer and competitor knowledge processes whereas competitor orientation contribute to all but the customer knowledge processes. These results indicate that having a customer focus contributes to the processing knowledge about both customers and competitors. On the other hand having a competitor focus contributes to processing knowledge about only competitors. This type of a distinction does not exist between aesthetic (technological) orientations and aesthetic (technological) innovation capabilities. In other words, contrary to the expectations, aesthetic and technological orientation contributes to both aesthetic and technological innovation capabilities. These findings contribute to the marketing literature by testing the relationship between the market orientation and the market knowledge competence. This study extends the innovation literature by examining the effects of technology and aesthetic orientation on market knowledge competence.

Five of the six hypotheses about the one-to-one relationships are supported. These findings indicate the primary importance of customer orientation to customer knowledge process, competitor orientation to competitor knowledge process, technological orientation to

technological innovation capability, aesthetic orientation to aesthetic innovation capability, and aesthetic innovation capability to aesthetic product innovation.

The results also indicate important differences between U.S. and China. Three out of the four hypothesized differences are supported. Customer orientation has a higher effect on customer knowledge process and competitor orientation has a higher effect on competitor knowledge process in the U.S. compared to China. This study extends the market orientation literature by demonstrating how the effects of customer and competitor orientation differ across countries.

Customer knowledge process has a higher positive effect on product performance in the U.S. than in China. This finding is particularly important because it extends the market knowledge competence literature by showing that the effect of customer knowledge process differs across countries with different economic conditions.

Managerial Implications

This study has several important implications for managers. The results indicate the importance of customer knowledge process and competitor knowledge process in the organizations. The reason is that they have positive effects on product performance as high as the effects of product innovations (Table 22). Customer and competitor knowledge processes improve the product innovations as well. These results indicate that customer and competitor knowledge processes are important for their positive effect on both product performance and its antecedents.

Product innovations have positive effects on both product performance and firm performance. Thus it is important for the managers to know the antecedents of product innovations. Competitor knowledge processes contributes to both technological and aesthetic

product innovations. Customer knowledge process on the other hand contributes only to technological product innovations. Aesthetic innovation capability increases both technological and aesthetic product innovations whereas technological innovation capability increases only the technological product innovations. The highest contributor of aesthetic product innovation is the aesthetic innovation capability. On the other hand technological and aesthetic innovation capabilities are the highest contributors of technological product innovations and they are statistically similar in their effects.

Since the customer knowledge process, competitor knowledge process and product innovation capabilities have positive effects on product innovation; it would be beneficial for the managers to know their contributors. It is important to note that technological orientation and aesthetic orientation have positive effects on all of the variables mentioned above. On the other hand customer orientation contribute only to customer knowledge processes and competitor knowledge processes. Competitor orientation has wider effect range that includes competitor knowledge process, technological innovation capability, and aesthetic innovation capability. As a rule of thumb, the one-to-one relations are the strongest. In other words, customer orientation has the highest effect on customer knowledge process, competitor orientation on competitor knowledge process and so on. The highest effect exists also between aesthetic innovation capability and aesthetic product innovation.

The U.S. managers need to be careful when applying these findings on their strategies in China. First, the one-to-one relationships between customer orientation on customer knowledge process, competitor orientation on competitor knowledge process and technological orientation on technological innovation capability do not hold in China. In other words, different from the U.S., in China, customer orientation, competitor orientation and technological orientation are not

the highest contributors of customer knowledge process, competitor knowledge process, and technological innovation capability respectively.

Second, customer knowledge process contributes to product performance less in China compared to the U.S.. It would be beneficial for the managers in China to find ways to utilize the customer knowledge process better to increase its effect on product performance. Third, customer orientation contributes to customer knowledge process lower in China compared to the U.S.. Fourth, competitor orientation contributes to competitor knowledge process less in China compared to the U.S.. These results inform the managers to make the necessary adjustments to utilize market orientation better in China to increase the customer and competitor knowledge processes which in turn increase product performance.

Essay 1 - Conclusions

This study provides an important insight about the antecedents and consequences of innovation capabilities, customer knowledge competence, and competitor knowledge competence.

The first model provides the orientation-capability-innovation-performance relationship and differentiates their types. This is particularly important since the antecedents of the capability types (technological, aesthetic, market-based) and the innovation types (technological, aesthetic, market-based) affect these constructs differently. They also have different effects on their consequences.

In the U.S. all of the product innovation types have positive effects on product performance. Innovation capabilities have different effects on product innovation types. The results support the hypothesis that there is a one-to-one match between capabilities and product innovations and these one-to-one relationships have the highest effects. In other words,

technological innovation capability has the highest effect on technological product innovation, aesthetic innovation capability on aesthetic product innovation, and market-based innovation capability on market-based product innovation. Technological, aesthetic and competitor orientations positively affect all of the innovation capability types, however, customer orientation affects only market-based innovation capabilities. These results contribute to the (1) market orientation, (2) resource based view, and (3) innovation literatures by (1) testing the different effects of customer orientation and competitor orientation on three innovation capability types, (2) introducing three different types of organizational capabilities and differentiating their effects and antecedents, (3) (a) empirically showing the positive effect of three innovation types on performance, (b) introducing three different types of innovation capabilities, and differentiating their effects and antecedents, (c) showing a one-to-one match between aesthetic (technological) orientation and aesthetic (technological) innovation capability, (d) testing the direct effect of aesthetic orientation and technology orientation on aesthetic product innovation and technological product innovation.

The results indicate seven important differences between U.S. and China: (1) Aesthetic innovation has a higher effect on product performance in the U.S. compared to China, (2) the market-based innovation capability has a higher effect on aesthetic innovation in the U.S. compared to China, (3) the market-based innovation capability has a lower effect on technological innovation in the U.S. compared to China, (4) market-based innovation capabilities have a higher effect on market-based product innovations in the U.S. compared to China, (5) customer orientation has a higher effect on market-based innovation capabilities in the U.S. compared to China, (6) competitor orientation has a higher effect on market-based product innovations in the U.S. compared to China, and (7) the one-to-one relationships between

technological orientation and technological innovation capabilities, technological innovation capabilities and technological product innovations, and market based innovation capabilities and market-based product innovations differ between the U.S. and China.

These findings contribute to the (1) market orientation, (2) RBV, and (3) innovation literatures by demonstration how the country/economic context influences (1) the effects of market orientation on market-based innovation capabilities and on market-based product innovations, (2) the effects of organizational capabilities, (3) (a) the effect of aesthetic product innovation on product performance, and (b) the effects of innovation capabilities.

The second model explains the antecedents and consequences of market knowledge competence and points out the differences between Chinese and U.S. firms. In the U.S., customer knowledge process and competitor knowledge process have direct positive effects on product performance. Aesthetic product innovation and technological product innovation also increase product performance. Customer knowledge process has a positive effect on technological product innovation and competitor knowledge processes have a positive effect on both aesthetic and technological product innovations. The results also indicate the positive effects of innovation capabilities on product innovations. Most of the orientation types positively affect their consequences. Customer orientation has a positive effect only on customer and competitor knowledge processes whereas competitor orientation contribute to all but the customer knowledge processes. The results also show the importance of one-to-one relationships between (1) innovation orientations and innovation capabilities, (2) market orientation and market knowledge competence, and (3) innovation capabilities and product innovations.

The findings extend the (1) marketing literature, and (2) innovation literatures by demonstrating (1-a) the relationship between the market orientation and the market knowledge

competence, (1-b) the positive effect of customer and competitor knowledge processes on aesthetic innovations, technological innovations and product performance, and (2) the effects of technology and aesthetic orientation on market knowledge competence.

The results indicate four important differences between U.S. and China. In the U.S., (1) customer orientation has a higher effect on customer knowledge process, (2) competitor orientation has a higher effect on competitor knowledge process, and (3) customer knowledge process has a higher positive effect on product performance compared to China.

This study extends the market orientation literature by demonstrating how (1) the effects of customer and competitor orientation, and (2) the effect of customer knowledge process differ across countries with different economic conditions.

Limitations and Future Research

There are several limitations of this study. First, these results indicate the relationships between the constructs but they do not indicate causality. To be certain of the causality between the constructs, the data should be collected in different times. The analysis of this study relies on cross-sectional data, which cannot suggest causal relationships. As a future research, a time series data can be collected both to test the causality among the constructs and to monitor the shifts of trends. The time series data can reveal the changes of in the performance of innovation types affected by the changes in the economic conditions. It would be interesting to test whether the aesthetic innovations suffer from economic crisis more than other innovation types. The findings of this study indicate a positive relationship between the per capita GDP and aesthetic innovation performance. However Apple products that are known for their high price due to their highly innovative aesthetic features, performed better than competitors during the economic recession. Thus, these mixed findings can be resolved by a time series analysis.

Second, the filter questions in the data collection qualify only the firms that value both aesthetic innovations and technological innovations. Thus the generalizability of the results is limited to the sample of the firms for which aesthetic and technological innovations are somewhat important. Accordingly, the results cannot be generalized to pure aesthetic or pure technology driven firms or industries. It would be interesting to see how do the different industries utilize innovation capabilities, customer knowledge competence and competitor knowledge competence. There may also be significant differences between the performances of technological, aesthetic and market-based innovations.

Research in this area may also enable the researchers to detect the industries that are changing from their traditional structure. For example, the effect of aesthetic product innovations can be increasing in some industries but has not reached its full potential. In the late 90's computer industry where it was technologically driven but by Apple's efforts, aesthetic innovations were gaining importance but it was still a technology driven industry. Including these types of industries may enable the researcher to pinpoint the industrial changes. Another potential research topic would be testing the environmental effects. Market turbulence, technological turbulence, aesthetic turbulence, and competitive intensity could reveal interesting results as moderating variables.

Third, the generalizability of the results is limited to the firms in U.S. and in China or at best the firms in very similar countries. China and the U.S. have significant economic differences and there are significant differences among firms in these countries in terms of their degree of market orientation and market competence utilization. Even though previous research supports these findings, the causality between economic differences and market orientation utilization has not been thoroughly established. To generalize the findings to different economic structures, a

more extensive comparison should be made that includes several countries. A multi-country comparison can reveal other factors that might affect the stated relationships. Another future research direction would be to conduct in depth interviews with managers from different countries. This may reveal not only additional factors effecting the relations tested, but also provide better understanding of the phenomena. A potential outcome of this research would be the effect of culture on the relations discussed in the two models.

Fourth; one of the product innovation, product performance and customer knowledge process measures had to be dropped due to their inequality of these measures between China and U.S.. There should be more emphasis on building better measures for these constructs.

CHAPTER 4

ESSAY TWO

MARKET KNOWLEDGE DIMENSIONS AND INTERDEPARTMENTAL COOPERATION AS THE ANTECEDENTS OF INNOVATION CAPABILITIES AND THE QUALITY IMPROVEMENT CAPABILITY

This chapter discusses the conceptual framework depicting how innovation capabilities are formulized and their antecedents. This research examines the effect inter-functional cooperation and knowledge dimensions on innovation capabilities that lead to product innovations and product performance. The seven research questions are.

1. What is the influence of inter-functional cooperation on innovation capabilities?
2. Do the knowledge dimensions affect innovation capability types differently?
3. What are the effects of innovation capability types on product newness types?
4. What are the effects of quality improvement capability on product newness types?
5. How does innovation capabilities interact with quality improvement capability?

The market knowledge dimensions affecting innovation capability are the breath, depth, tacitness and the specificity. The innovation capabilities that affect product innovation and product newness are aesthetic, technological and market-based innovations capabilities. Figure 4 illustrates the conceptual framework.

From the RBV standpoint the knowledge and inter-functional cooperation can be differentiated as stocks and processes. Knowledge is a stock that can be accumulated and is considered as a source of sustained competitive advantage and firm performance (Dierickx and

Cool 1989). On the other hand inter-functional cooperation is a process that involves several activities (Fisher, Maltz, and Jaworski 1997; Griffin and Hauser 1992; Lukas and Ferrell 2000).

Model 1

Market Knowledge Dimensions and Interdepartmental Cooperation as the Antecedents of Innovation Capabilities

Conceptual Framework and Hypothesis Development

Market Knowledge Dimensions and Innovation Capabilities

Knowledge is an important ingredient for developing skills and capabilities. For example, a person who is learning how to drive a car requires taking in considerable amount knowledge and transforming this knowledge into the capability to drive. Firm's resource allocations to exploit existing capabilities and to develop new ones are substantially affected by its knowledge (Atuahene-Gima 2005). Knowledge-based view of the firm indicates knowledge as the most important asset of a firm to achieve competitive advantage and superior firm performance and it indicates that the primary purpose of a firm is to create and apply knowledge (Grant 1996b; Nonaka 1994; Spender 1994).

Performance differences between firms are a result of their different knowledge bases and differing capabilities in developing and deploying knowledge (Bierly and Chakrabarti 1996). Knowledge that is gained from customers, competitors, and from internal processes (e.g. R&D) has a significant effect on innovation (Atuahene-Gima 1995; Atuahene-Gima 2005; Day 1994; Kohli and Jaworski 1993; Li and Calantone 1998; Olson, Slater, and Hult 2005).

Thus there is a strong relationship between knowledge and innovation capabilities that in turn affects overall performance of the firm. Knowledge is a stock that can be accumulated and is considered as a source of sustained competitive advantage and firm performance (Dierickx and Cool 1989). However, the knowledge itself does not necessarily turn into performance. The firm may have acquired crucial technological or aesthetic knowledge but innovation capabilities are needed to transform knowledge into new products and performance. This study focuses on the mediating role of innovation capabilities between knowledge dimensions and product innovations.

Knowledge dimensions are important because they reveal more information about the knowledge resources of the firm. Empirical studies indicate that the knowledge dimensions have differing significance and degrees in terms of their effect on innovation performance (De Luca and Atuahene-Gima 2007; Prabhu, Chandy, and Ellis 2005). Thus the effects of knowledge dimensions on innovation capabilities are studied individually.

Knowledge Breadth is defined as the firm's understanding of a wide range of diverse customer and competitor types and factors that describe them (De Luca and Atuahene-Gima 2007). Breadth represents the range of fields over which the firm has knowledge (Prabhu, Chandy, and Ellis 2005) and the multiple areas in which a firm has skills and expertise (Zahra, Ireland, and Hitt 2000). Knowledge breadth determines the extent of new knowledge that is explored (Katila and Ahuja 2002). This type of exploration requires combining a wide array of specialized knowledge (Grant 1996b).

Figure 4: Essay 2 Conceptual Framework

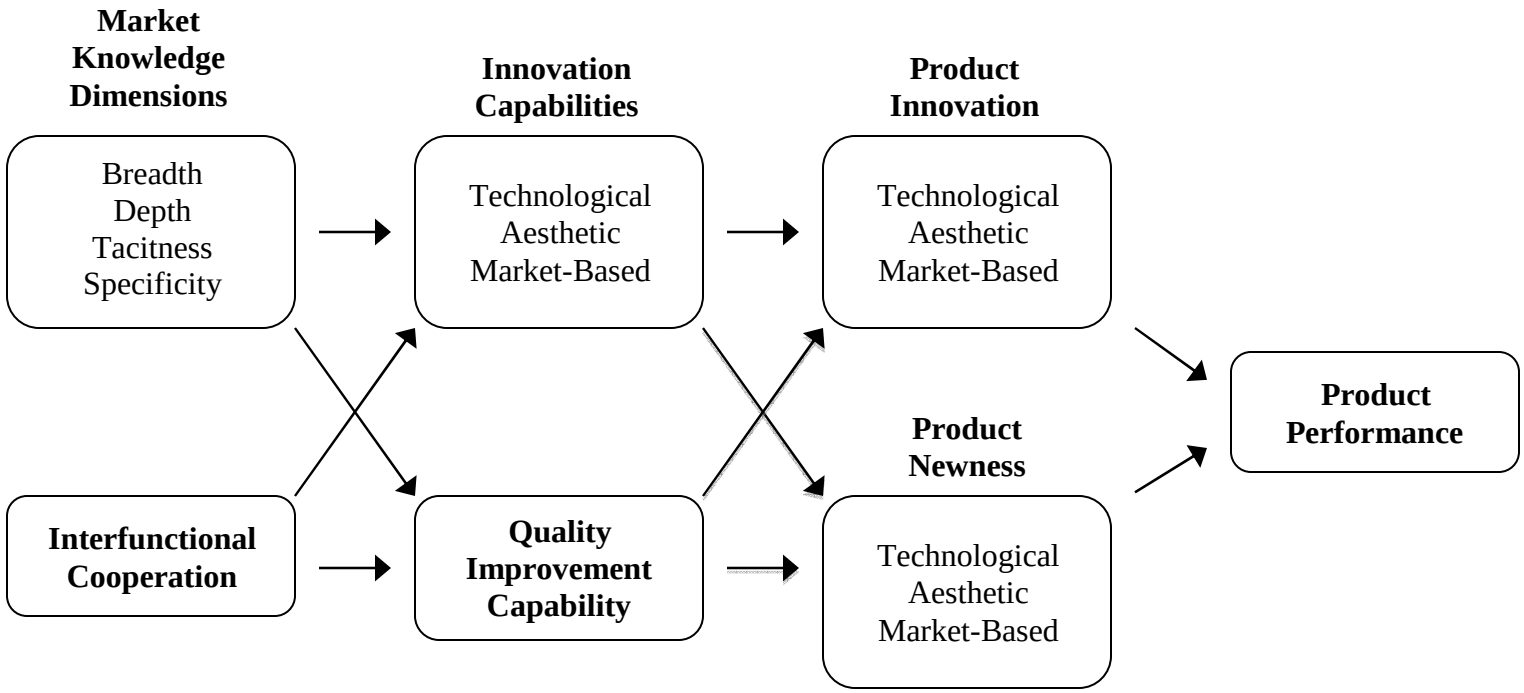


Figure 5: Essay 2 Model 1 Conceptual Framework

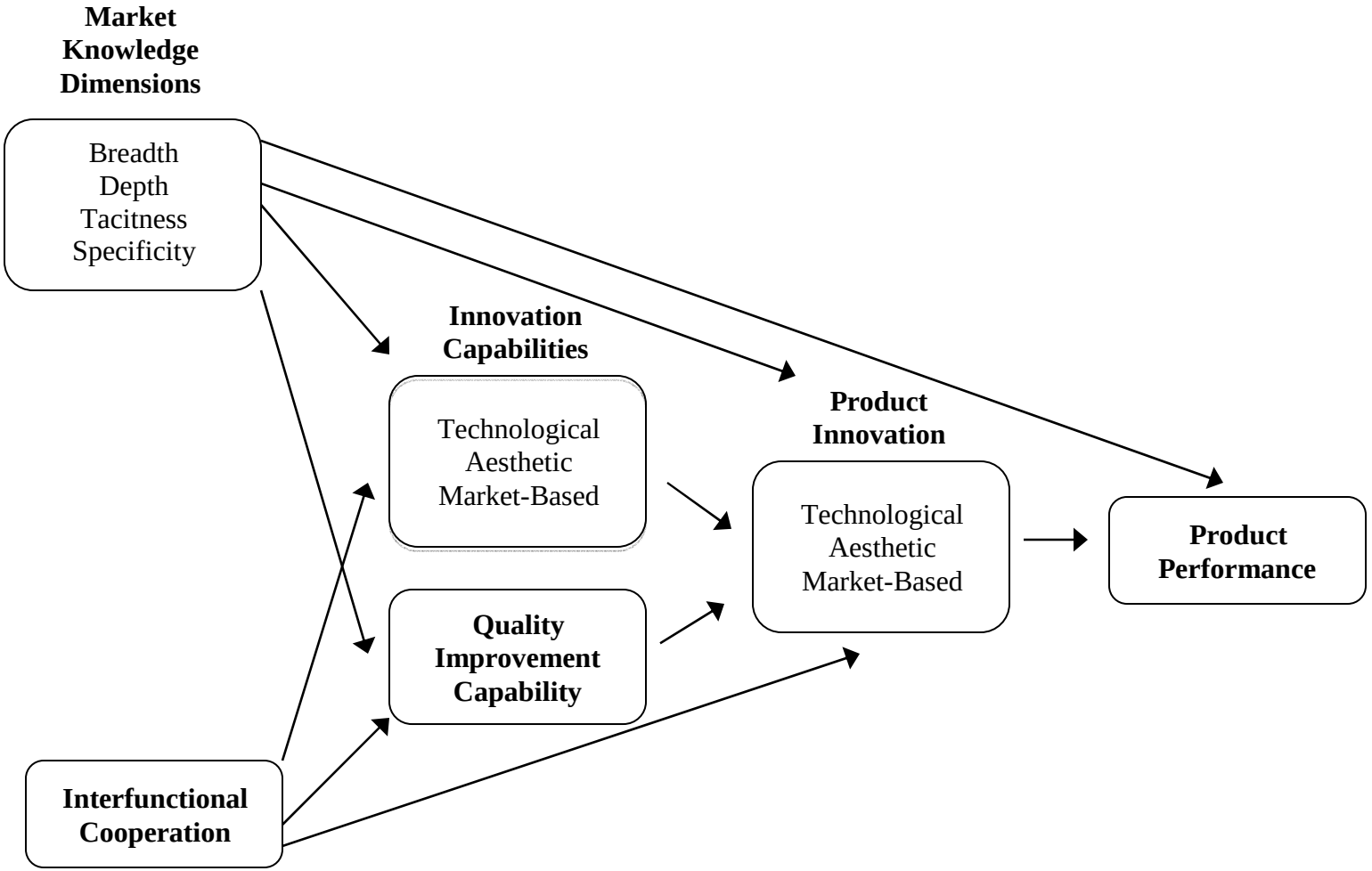


Table 24: Construct Definitions - Essay 2

Construct	Definition
Inter-functional cooperation	The joint behavior among the functions of a firm toward some goal of common interest (Pinto, Pinto, and Prescott 1993).
Knowledge Breadth	The firm's understanding of a wide range of diverse customer and competitor types and factors that describe them (De Luca and Atuahene-Gima 2007).
Knowledge Depth	The level of sophistication and complexity of a firm's knowledge and it captures the vertical dimension of knowledge (De Luca and Atuahene-Gima 2007).
Knowledge specificity	The heavy customization of knowledge to one particular use with high context specificity and low transferability to other contexts (Galunic and Rodan 1998).
Knowledge tacitnesss	The extent to which the knowledge is difficult to codify and communicate, intuitive, unarticulated, unobservable (Godfrey and Hill 1995; Lam 2000; Nonaka 1994).
Technological innovation capability	The firm's ability to develop new technologies that can be used to develop new products.
Aesthetic innovation capability	The firm's ability to develop non-technological elements, which change the external appearance of the product.
Market-based innovation capability	The firm's ability to develop new products, for new or emerging markets, that are often perceived as highly different, and require customers to make major changes in thinking and behavior (Zhou, Yim, and Tse 2005).
Quality improvement capability	The firm's ability to improve the quality of the end products via process management practices that focuses mainly on incremental innovations (Bessant and Francis 1999).

Recombination of knowledge from different sources increases the firm's creativity and opportunity recognition (Kogut and Zander 1992).

Knowledge depth and breadth affects new product introduction routines (Katila and Ahuja 2002). Knowledge breadth has a significant effect on product innovations (De Luca and

Atuahene-Gima 2007; Katila and Ahuja 2002). It affects product innovation positively through enriching the knowledge pool by adding distinctive new variations (Katila and Ahuja 2002) and results in increased variety of innovative products (Zahra, Ireland, and Hitt 2000).

Technological innovation capability is defined as the firm's ability to develop new technologies that can be used to develop new products. Firms with a broad knowledge base can develop more extensive products that include diverse technological features. The diverse knowledge base can also stimulate new and original ideas due to the broad technological perspective. Thus a broad knowledge base enhances technological development.

Aesthetic innovation capability is defined as the firm's ability to develop non-technological elements, which change the external appearance of the product. Knowledge breath increases firm's creativity and opportunity recognition (Kogut and Zander 1992). Thus, breadth of knowledge is positively related to market-based and aesthetic innovations. Aesthetic innovations in an industry can be influential in other industries. The firm can benefit from a broad perspective it can detect different aesthetic trends in other industries and successfully implement them to their products.

Market-based innovation capability can be defined as a firm's ability to develop new products for new or emerging markets (Zhou, Yim, and Tse 2005). A broad knowledge base about customer and competitors in different markets can increase the firm's chances to detect new opportunities in new and emerging markets and develop new products for them. Adopting innovation from other industries, due to their unconventional nature, increases the chances of producing innovations that require major changes in thinking and behavior of the customers.

Knowledge breadth is expected to have a positive effect also on quality improvement capability. The reason is that, having a wide-ranging knowledge enables the firm to be aware of

new quality improvement practices in other firms or industries. Thus it can be hypothesized that knowledge breadth positively affects the firm's innovation capabilities, product innovations, and quality improvement capability;

H1a: Knowledge breadth has a positive effect on technological innovation capability.

H1b: Knowledge breadth has a positive effect on aesthetic innovation capability.

H1c: Knowledge breadth has a positive effect on market-based innovation capability.

H1d: Knowledge breadth has a positive effect on quality improvement capability.

H1e: Knowledge breadth has a positive effect on technological product innovation.

H1f: Knowledge breadth has a positive effect on aesthetic product innovation.

H1g: Knowledge breadth has a positive effect on market-based product innovation.

De Luca and Atuahene-Gima (2007), state that a firm with broad market knowledge has heterogeneous information and understanding of customers and competitors, enabling it to design products that match the diverse needs of its customer segments. Their findings also show that knowledge breadth has a positive significant effect on firm performance. Thus, it is hypothesized that:

H1h: Knowledge breadth has a positive effect on product performance.

Knowledge Depth is defined as the level of sophistication and complexity of a firm's knowledge and it captures the vertical dimension of knowledge (De Luca and Atuahene-Gima 2007). Depth refers to the amount of within-field knowledge possessed by the acquiring firm (Prabhu, Chandy, and Ellis 2005) and it determines the degree to which search revisits a firm's prior knowledge (Katila and Ahuja 2002) which results in the mastery of that particular type of knowledge (Zahra, Ireland, and Hitt 2000). These knowledge areas are crucial for firm's performance (Cepeda and Vera 2007).

Increase in the depth of search can positively affect product innovations (Katila and Ahuja 2002; Prabhu, Chandy, and Ellis 2005) and it enables the firm to produce highly differentiated, high-quality products (Zahra, Ireland, and Hitt 2000).

Technological capabilities require in depth knowledge and are specialization-oriented. Acquiring sophisticated and complex in depth knowledge about a subject (e.g. customers, competitors, etc.,), and working on it for a period of time enables the firm to specialize in a certain type of technology. Advances in knowledge through knowledge depth are associated with increased specialization (Grant 1996b) and there is a positive relationship between knowledge depth and technological innovations (Dewar and Dutton 1986).

A sophisticated in-depth knowledge may enable the firm to acquire a sophisticated knowledge base and understanding about certain aesthetic concepts. This may increase the firm's ability to develop new product innovations better than its competitors.

Having a focus on certain type of knowledge and gaining in depth understanding about it may trigger new uses for that knowledge in new and/or emerging market. A firm, due to its expertise on a certain type of knowledge, can associate the features of a technology or aesthetic concept with the needs of customers in other markets.

Knowledge depth can also enhance the firm's ability to improve product quality. More in depth knowledge about a product can increase the firm's understanding about the mechanics and components of that product. Thus, the firm can gain an understanding about the strengths and weaknesses of the product, and be able to develop strategies to improve its quality.

Thus it can be hypothesized that in-depth knowledge increases the firm's innovation capabilities, product innovations, and quality improvement capability;

H2a: Knowledge depth has a positive effect on technological innovation capability.

H2b: Knowledge depth has a positive effect on aesthetic innovation capability.

H2c: Knowledge depth has a positive effect on market-based innovation capability.

H2d: Knowledge depth has a positive effect on quality improvement capability.

H2e: Knowledge depth has a positive effect on technological product innovation.

H2f: Knowledge depth has a positive effect on aesthetic product innovation.

H2g: Knowledge depth has a positive effect on market-based product innovation.

The deeper a firm's knowledge in certain fields, the greater is its ability to create innovations in these and related fields (Prabhu, Chandy, and Ellis 2005) and the findings of De Luca and Atuahene-Gima (2007) state that knowledge depth has a positive effect on product performance. Similar to these findings, it can be hypothesized that:

H2h: Knowledge depth has a positive effect on product performance.

Knowledge tacitnesss can be defined as the extent to which the knowledge is difficult to codify and communicate, intuitive, unarticulated, unobservable (Godfrey and Hill 1995; Lam 2000; Nonaka 1994). Tacit knowledge is closely related to higher performance than competitors because it makes the knowledge hard to replicate by the competitors (Teece and Pisano 1994). Another reason is that tacitness decreases the transferability of the knowledge by increasing the costs of transfer and by decreasing the speed which knowledge is transferred (Grant 1996b; Kogut and Zander 2003). The empirical findings indicate that there is a U-shaped relationship between the accumulation of tacit knowledge and team performance (Berman, Down, and Hill 2002).

Tacit knowledge has an important role in innovation (Senker 1995). However there is not a consensus about the effects of tacitness on innovation. Galunic and Rodan (1998) indicate that due to lower detection probability and higher costs of resource exchange, tacit knowledge

diminishes the resource recombinations that may result in a decrease in innovativeness. De Luca and Atuahene-Gima (2007) found that product innovation performance is not influenced either directly or indirectly by market knowledge tacitness.

On the other hand other scholars (Cavusgil, Calantone, and Zhao 2003) suggest that tacit knowledge contributes to the development of new knowledge and innovations. Nonaka and Takeuchi (1995) state that innovation emerges from the interaction between tacit knowledge and explicit knowledge. They also suggest that tacit operational knowledge about a product is often socialized; thereby it initiates improvement of an existing product or development of an innovation. Tacit knowledge is critical for the development of organizational capabilities (Teece, Pisano, and Shuen 1997).

Firms that can harness the tacit knowledge base are more likely to have greater new product development capabilities (Subramaniam and Venkatraman 2001). Consistent with these studies, tacit knowledge is expected to increase the innovation capabilities however the degree of its contribution may vary across the different innovation capabilities.

Technological knowledge is driven more by the explicit knowledge that can be communicated and built upon. Thus, the low transferability of tacit knowledge is not suitable for the communication and does not contribute to the generation of technological knowledge. Thus tacit knowledge is not expected to contribute to technological innovation capability and technological innovations. Aesthetic innovations on the other hand are mostly dependent upon tacit knowledge. For example the aesthetic features of the product depends more on the artistic tacit knowledge that is hard to transfer, while the technological features depends more upon the explicit knowledge about the hardware and software.

Market-based innovation capabilities enable the firm to develop products that considerably change the way customers think and they are mostly focused on new or emerging markets. The explicit knowledge about these types of products and markets are very limited. In these situations the firm depends more upon the lifetime experiences and the tacit knowledge of the employees.

Similar with the tech product innovation and the tech innovation capability, quality improvement capability is mostly driven by explicit knowledge due to its well-defined structure. The quality control and improvement systems are codified in a way that they can be clearly communicated to the people who operate them. Due its non-transferability and hardness to communicate, tacit knowledge is not expected to contribute to quality improvement capability. Thus; it can be hypothesized that;

H3a: Knowledge tacitness does not affect technological innovation capability.

H3b: Knowledge tacitness has a positive effect on aesthetic innovation capability.

H3c: Knowledge tacitness has a positive effect on market-based innovation capability.

H3d: Knowledge tacitness does not affect quality improvement capability.

H3e: Knowledge tacitness does not affect on technological product innovation.

H3f: Knowledge tacitness has a positive effect on aesthetic product innovation.

H3g: Knowledge tacitness has a positive effect on market-based product innovation.

The findings of De Luca and Atuahene-Gima (2007) do not suggest a significant relationship between knowledge tacitness and product performance. However, tacit knowledge makes the knowledge hard to replicate by the competitors (Teece and Pisano 1994), which may increase the product performance by decreasing possible competition. Thus, it can be hypothesized that;

H3g: Knowledge tacitness has a positive effect on product performance.

Knowledge specificity can be defined as the heavy customization of knowledge to one particular use with high context specificity and low transferability to other contexts (Galunic and Rodan 1998). Specific knowledge has the attributes of being possessed only by a very limited number of individuals and being expensive to transfer (Sampler 1998). The customization of specific knowledge occurs when organizational resources are applied to understanding patterns and rules particular to a specific context (Subramani and Venkatraman 2003).

Knowledge specificity may lead to routinization of firm activities (Galunic and Rodan 1998) that may result in a decrease in innovativeness. However knowledge specificity decreases the imitation of innovation (Sampler 1998) that increases the competitive advantage of the innovations. It can also enable to firm to make an in-depth analysis of its customer and competitors (De Luca and Atuahene-Gima 2007) and develop custom tailored innovations for specific contexts. These mixed effects can be explained by the differences in innovation capabilities.

Specific knowledge about the customers and competitors in an industry contributes to specialization in a certain type of technology. This context specific knowledge increases the firm's chance to lead the market in developing cutting edge technologies. Thus, knowledge specificity is expected to increase the development of technological innovation capability.

Specific market knowledge diminishes knowledge recombination, impairing timely and effective contextual use (Galunic and Rodan 1998). Due to the relatively short time span of aesthetic trends, timely response is crucial aesthetic related issues. Limited focus on a specific area does not contribute to the company's ability to detect aesthetic trends in the industry or in

other industries. For these reasons knowledge specificity is not expected to have an effect on aesthetic innovation capabilities.

Specific market knowledge increases the firm's motivation to stick to the existing markets. Due to the high rents and existing cash flow in the current market, the firm will be reluctant to expand its focus to new or emerging markets (Chandy and Tellis 2000). Market-based innovations on the other hand are about creating products to new and emerging markets (Zhou, Yim, and Tse 2005). Thus market specificity is not expected to have an effect on market-based innovation capabilities and market-based innovations.

An increase in specific knowledge about a product increases the understating of the firm about the idiosyncratic nature of that product. Thus a firm, by enhancing its specific knowledge, can find ways to improve the specific features of that product. It can also enhance the firm's ability to design and produce with lower defect rates. Thus it can be hypothesized that:

H4a: Knowledge specificity has a positive effect on technological innovation capability.

H4b: Knowledge specificity does not affect aesthetic innovation capability.

H4c: Knowledge specificity does not affect market-based innovation capability.

H4d: Knowledge specificity has a positive effect on quality improvement capability

H4e: Knowledge specificity has a positive effect on technological product innovation.

H4f: Knowledge specificity does not affect aesthetic product innovation.

H4g: Knowledge specificity does not affect market-based product innovation.

De Luca and Atuahene-Gima (2007) state that specific market knowledge enhances innovation performance because it ensures a long-term relationship with specific contexts (e.g., customer segment) that generates highly idiosyncratic insights for product innovation and protects the new products the firm develops from imitation. Their finding also support that

knowledge specificity has a positive effect on product performance. Thus, it can be hypothesized that:

H4h: Knowledge specificity has a positive effect on product performance.

Inter-Functional Cooperation and Innovation Capabilities

Inter-functional cooperation can be defined as the joint behavior among the functions of a firm toward some goal of common interest (Pinto, Pinto, and Prescott 1993). Cross-functional cooperation is a significant predictor of both perceived task and psychosocial project outcomes (Pinto, Pinto, and Prescott 1993) and NPD team members perceive a positive relationship between cross-functional cooperation and NPD performance (Song, Montoya-Weiss, and Schmidt 1997). Empirical results in the literature indicate that cross-functional cooperation can have a dramatic effect on the resulting success of a project, it has a differentiating effect between high cooperation and low cooperation teams (Pinto and Pinto 1990), and it effects the success of adopted innovations (Han, Kim, and Srivastava 1998).

Griffin and Hauser (1996) in their literature review indicate that there is a strong and consistent positive relationship between inter-functional cooperation and new product success that is common across a variety of methodologies, and it is seemingly applicable in both services and products and in both consumer and industrial market. Inter-functional cooperation increases the flow of information within the company, which is very important for the communication of the quality improvement processes. Cooperation also increases the unity among the employees, which may enhance unity of the quality standards that are applied to new products. Thus inter-functional cooperation is expected to contribute to the establishment of innovation capabilities, product innovations and quality improvement capability.

H5a: Inter-functional cooperation has a positive effect on technological innovation capability.

H5b: Inter-functional cooperation has a positive effect on aesthetic innovation capability.

H5c: Inter-functional cooperation has a positive effect on market-based innovation capability.

H5d: Inter-functional cooperation has a positive effect on quality improvement capability.

H5e: Inter-functional cooperation has a positive effect on technological product innovation.

H5f: Inter-functional cooperation has a positive effect on aesthetic product innovation.

H5g: Inter-functional cooperation has a positive effect on market-based product innovation.

Innovation Capabilities and Product Innovation

As stated in Essay1 Model1, technological innovation capabilities are expected to have the highest positive effect on technological innovations since they are one-to-one related. The market-based innovations are designed for new or emerging markets. Technological innovation capabilities may contribute to developing product innovations for the new and emerging markets. Thus technological innovation capabilities are expected to have a positive effect on market-based innovations. However this relationship is expected to be stronger between technological innovation capabilities and technological innovations due to the on-to-one fit. Aesthetic innovations are about how a product looks whereas technological innovations are about how a product performs. A laptop computer's performance is mainly based on its technological features rather than its shape or color. Thus technological innovation capabilities that enable the firm to

produce innovations about technological innovations are not expected have an effect on aesthetic innovations.

H6a: Technological innovation capabilities positively affect technological innovations.

H6b: Technological innovation capabilities positively affect market-based innovations.

H6c: Technological innovation capabilities do not affect aesthetic innovations.

Aesthetic innovation capabilities are expected to have a positive effect on aesthetic innovations due to their one-to-one match. Aesthetic innovation capabilities may contribute to developing product innovations for the new and emerging markets. Thus aesthetic innovation capabilities are expected to have a positive effect on market-based innovations. However this relationship is expected to be stronger between aesthetic innovation capabilities and aesthetic innovations due to the on-to-one fit. Due to the explained differences between aesthetic and technological innovations, aesthetic innovation capability is not expected to affect technological product innovations.

H7a: Aesthetic innovation capabilities positively affect aesthetic innovations.

H7b: Aesthetic innovation capabilities positively affect market-based innovations.

H7c: Aesthetic innovation capabilities do not affect technological innovations.

Market-based innovation capabilities are expected to have a positive effect on market-based innovations due to their one-to-one match. Market-based innovation capabilities enable the firm to develop product innovations for the new and emerging markets. These innovations may be aesthetic and/or technological. Thus market-based innovation capabilities may have a positive effect on aesthetic and technological innovations. However this relationship is expected to be stronger between market-based innovation capabilities and market-based innovations due to the on-to-one fit. Thus it can be hypothesized that;

H8a: Market-based innovation capabilities positively affect market-based innovations.

H8b: Market-based innovation capabilities positively affect market-based innovations.

H8c: Market-based innovation capabilities positively affect technological innovations.

Quality Improvement Capability and Product Innovations

Quality improvement capability can be defined as the firm's ability to improve the quality of the end products via process management practices (Bessant and Francis 1999). The process management practices are the quality improvement programs such as TQM and Six Sigma (Benner and Tushman 2003). The findings suggest that the (1) there is a fit between quality improvement culture and innovation culture (Gustafson and Hundt 1995; McAdam, Armstrong, and Kelly 1998) (2) there is a positive relationship between continuous improvement and innovation (McAdam, Armstrong, and Kelly 1998), and (3) adoption of quality improvement programs differentiates the innovative firms from others (Baldwin and Johnson 1996).

Thus it can be hypothesized that quality improvement capability has a positive effect product innovations.

H9a: Quality improvement Capability has a positive effect on technological product innovation.

H9b: Quality improvement Capability has a positive effect on aesthetic product innovation.

H9c: Quality improvement Capability has a positive effect on market-based product innovation.

The Mediation Effect of Innovation Capabilities

As discussed in the introduction, innovation capabilities transform organizational resources into new products. Knowledge is a resource that referred as a stock because it can be

accumulated and is considered as a source of firm performance (Dierickx and Cool 1989). On the other hand inter-functional cooperation is a process that involves several activities (Fisher, Maltz, and Jaworski 1997; Griffin and Hauser 1992; Lukas and Ferrell 2000). Both of these stocks and processes are parts of the firm's resources.

As discussed in hypotheses 1-5, knowledge dimensions and inter-functional cooperation is expected to have a positive effect on innovation capabilities and product innovation. As discussed in hypotheses 6-8 innovation capabilities is expected to have a positive effect on product innovations. Thus innovation capabilities are expected to mediate the relationship between knowledge dimensions and product innovations. Innovation capabilities are also expected to mediate the relationship between inter-functional cooperation and product innovations. Thus it can be hypothesized that the innovation capabilities mediate the relationship between market knowledge dimensions and product innovations and also the relationship between inter-functional cooperation and product innovations.

H10a: Technological innovation capability mediates the effect of market knowledge breadth on technological product Innovation.

H10b: Technological innovation capability mediates the effect of market knowledge depth on technological product Innovation

H10c: Technological innovation capability mediates the effect of market knowledge tacitness on technological product Innovation

H10d: Technological innovation capability mediates the effect of market knowledge specificity on technological product Innovation

H10e: Technological innovation capability mediates the effect of cooperation on technological product Innovation.

H11a: Aesthetic innovation capability mediates the effect of market knowledge breadth on aesthetic product Innovation.

H11b: Aesthetic innovation capability mediates the effect of market knowledge depth on aesthetic product Innovation

H11c: Aesthetic innovation capability mediates the effect of market knowledge tacitness on aesthetic product Innovation.

H11d: Aesthetic innovation capability mediates the effect of market knowledge specificity on aesthetic product Innovation.

H11e: Aesthetic innovation capability mediates the effect of cooperation on aesthetic product Innovation.

H12a: Market-based innovation capability mediates the effect of market knowledge breadth on market-based product Innovation

H12b: Market-based innovation capability mediates the effect of market knowledge depth on market-based product Innovation

H12c: Market-based innovation capability mediates the effect of market knowledge tacitness on market-based product Innovation

H12d: Market-based innovation capability mediates the effect of market knowledge specificity on market-based product Innovation.

H12e: Market-based innovation capability mediates the effect of cooperation on market-based product Innovation.

Product Innovations and Performance

As discussed in Essay1 Model 1, there is a vast amount of literature stating the positive relationship between product innovations and performance. Product innovations have been

shown to be determinants of firm performance (Booz and Booz 1982; Pinto, Pinto, and Prescott 1993; Wind and Mahajan 1997), profits (Sivadas and Dwyer 2000), and sales (Schmidt and Calantone 2002). Thus it can be hypothesized that product innovations have a positive effect on product performance.

H13a: Technological product innovation has a positive effect on product performance.

H13a: Aesthetic product innovation has a positive effect on product performance.

H13a: Market-based product innovation has a positive effect on product performance.

Model 2

The Consequences of Innovation Capabilities and The Quality Improvement Capability

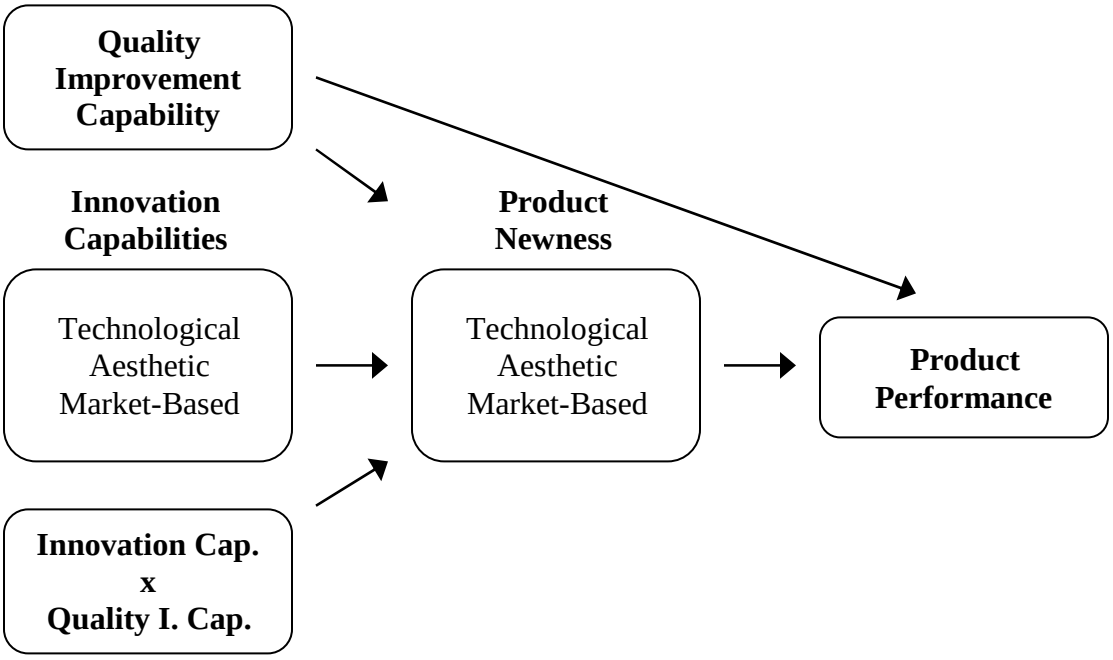
Conceptual Framework and Hypothesis Development

The following hypotheses cover the relationship of innovation capabilities, quality improvement capabilities and their interaction effect on product newness. The second part of the conceptual framework is represented in Figure 6 concerning these relationships.

Quality Improvement Capability and Product Newness

Product newness can be defined as the degree of the newness of a product innovation. Similar to conceptualization of Atuahene-Gima (1995), product newness includes the essential components of innovativeness (Garcia and Calantone 2002) that are newness to the customers, newness to the firm and newness to the industry.

Figure 6: Essay 2 Model 2 Conceptual Framework



There is an important distinction between product innovation and product newness. Product innovation types define whether a product has technological, aesthetic or market-based innovations. However product newness includes how new the innovation is. Since the innovations newness is not the same as product innovations, their antecedent's effects are expected to differ as well. This distinction is expected to be most apparent in quality improvement capability and its interaction with innovation capabilities.

The literature review about quality improvement programs indicate that there are mixed findings about the effect of quality improvement programs on product innovations (Prajogo and Sohal 2001). The positive effect of quality improvement capability on product innovation is discussed in Model 1.

Proajo and Sohal (2001) summarize negative effects of quality improvement on innovation by stating that quality improvement programs (1) create narrow mindedness, (2) lead

to imitation rather than radical innovation, (3) hinder creativity, and (4) their cost efficiency focus limits the capacity for innovation. The differentiating feature between the positive and negative effects in the literature is the difference between their degrees of innovativeness. Proajo and Sohal's (2001) suggestions are supported in the literature that quality improvement programs do not provide radical innovations (Harari 1993) but they lead to incremental innovations that sustain the benefits of radical innovations (Imai 1986; Wind and Mahajan 1997). Extensive focus on efficiency leads to incremental innovations (Levinthal and March 1993). This approach is path dependent where incremental innovations lead to more incremental innovations in the future (Cohen and Levinthal 1990; Gupta, Smith, and Shalley 2006; Teece, Pisano, and Shuen 1997).

The relationship between quality improvement and incremental innovations is also studied from an exploration vs. exploitation approach. Benner and Tushman (2003) argue that an increase in process management practices promotes incremental innovations and decreases radical innovations. Thus it can be hypothesized that quality improvement capability will have a negative effect on product newness.

H1a: Quality improvement Capability has a positive effect on technological product newness.

H1b: Quality improvement Capability has a negative effect on aesthetic product newness.

H1c: Quality improvement Capability has a negative effect on market-based product newness.

Even though quality improvement capability is expected to have a negative effect on product newness, it is expected to have a positive direct effect on product innovation. The positive effect of quality improvement practices on performance is well documented in the

literature (Hendricks and Singhal 1997; Hendricks and Singhal 2001). Thus it can be hypothesized that:

H1d: Quality improvement Capability has a positive effect on product performance.

Innovation Capabilities and Product Newness

The positive effect of innovation capabilities on product innovation is discussed in detail in hypotheses 7-9 in Model 1. A similar effect is expected for product newness. The reason is that product innovations may include different degrees of product newness. It may be true that there would be more similar products at a given time than new ones as the difference in number of incremental vs. radical products. The product innovations include both of these kinds. However product newness deals with the degree of newness. Thus a different effect may be expected for quality improvement capability that deals with incremental innovations. However innovation capabilities contribute to both of the innovation types so that their effect on product innovations and product newness will be similar. Thus, innovation capabilities are expected to have a positive effect on innovation capabilities similar to the hypotheses 8-9 in Model 1.

H2a: Technological innovation capabilities positively affect technological newness.

H2b: Technological innovation capabilities positively affect aesthetic newness.

H2c: Technological innovation capabilities do not affect market-based newness.

H3a: Aesthetic innovation capabilities positively affect technological newness.

H3b: Aesthetic innovation capabilities positively affect aesthetic newness.

H3c: Aesthetic innovation capabilities do not affect market-based newness.

H4a: Market-based innovation capabilities positively affect technological newness.

H4b: Market-based innovation capabilities positively affect aesthetic newness.

H4c: Market-based innovation capabilities positively affect market-based newness.

Innovation Capabilities and Quality Improvement Capabilities

As stated earlier, quality improvement capability, following the exploitation approach, has negative effects on product newness. Innovation capabilities on the other hand have positive effects on product newness. Since the hypothesized sign of these effects on product innovations are opposite, quality improvement capability and innovation capabilities are expected to have a negative interaction in their effect on product newness types. Thus, it can be hypothesized that:

H5a: Technological innovation capability and quality improvement capability have a negative interaction effect on technological product innovations.

H5b: Aesthetic innovation capability and quality improvement capability have a negative interaction effect on aesthetic product innovations

H5a: Market-based innovation capability and quality improvement capability have a negative interaction effect on market-based product innovations

Research Methodology

Empirical Setting

The empirical setting used in Essay 2 is similar to the one in Essay 1 with minor differences. The data is collected primarily from Consumer Electronics, Automobile, Home Appliances, PC and similar industries. These industries are chosen due to their (1) knowledge intensive innovation structures, (2) high degree of the inter-functional communication in new product development, and (3) intense competition both on the technological and aesthetic innovations. The further justification of using these industries can be found in Essay 1.

Sample

The constructs in the theoretical model are measured via primary survey data. The data is collected from U.S. firms that operate in industries where both aesthetic and technological innovations are important. The sample includes 304 mangers that have a responsibility in the development and/or launch of a new product. A national marketing research firm was commissioned to administer the survey. All respondents were informed about the confidentiality of their responses. The purpose of the study was explained before starting the survey. The respondents received compensation from the marketing research company for their time and effort.

Similar to the previous studies (Hultink et al. 2003) screening questions have been used to ensure the eligibility of the companies and the managers in those companies. These screening questions are listed in Essay 1 Sample.

Measures

The measures are adopted from the previous studies and are slightly modified where necessary. Measures are listed in the Appendix.

Cooperation measures are adopted from Li and Calantone (1998) and Moenaert and Souder (1990). Measurement items have 7-point scales ranging from "1- Not at all" to "7 – To a great extent".

Innovation Capabilities: Technological innovation capability and aesthetic innovation capabilities are measured with the items adopted from Calantone, Cavusgil, and Zhao (2002). Market innovation capability measures are based on the work of Zhou, Yim, and Tse (2005).

Market Knowledge Breadth measures focus on the broadness of the firm's knowledge about its customers and competitors. These measures are adopted from De Luca and Atuahene-

Gima (2007) and Zahra, Ireland, and Hitt (2000). Measurement items have 7-point scales ranging from “Narrow” to “Broad” and “Limited” to “Wide Ranging”.

Market Knowledge Depth measures focus on the advancement of the firm’s knowledge about its customers and competitors. These measures are adopted from De Luca and Atuahene-Gima (2007) and Zahra, Ireland, and Hitt (2000). Measurement items have 7-point scales ranging from “Shallow” to “Deep” and “Basic” to “Advanced”.

Market Knowledge Tacitness measures focus on the codifiability of the firm’s knowledge about its customers and competitors. These measures are adopted from De Luca and Atuahene-Gima (2007) and Szulanski (1996). Measurement items have 7-point scales ranging from “Strongly Agree” to “Strongly Disagree”.

Market Knowledge Specificity measures focus on the transferability and specificity of the firm’s knowledge about its customers and competitors. These measures are adopted from De Luca and Atuahene-Gima (2007). Measurement items have 7-point scales ranging from “Strongly Agree” to “Strongly Disagree”.

Quality Improvement measures are developed based on the works of Benner and Tushman (2003) and Beckman (2006). Measurement items have 7-point scales ranging from “Strongly Agree” to “Strongly Disagree”.

Product newness measures were adopted from the work of Garcia and Calantone (2002). Measurement items have 7-point scales ranging from “Not at all” to “To a great extent”.

Product Innovation**:** Technological innovation measures are adopted from Gatignon and Xuereb (1997). Aesthetic innovation measures are created according to the technological innovation measures of the previous studies (Gatignon and Xuereb 1997; Zhou, Yim, and Tse 2005). The market-based innovation measures are adopted from Christensen and Bower (1996),

Benner and Tushman (2003), and Zhou, Yim, and Tse (2005). 7 points scale were used to measure these constructs.

Product Performance: The survey measures about the innovations are at the product level so that the performances of the products were also measured in the survey. Product level performance data enables the more precise analysis at the product level where firm level performance suits well to the orientation and capabilities. Three items were used with a 7 points scale (ranging from "Much Worse" to "Much Better") were used to measure product performance.

Analysis and Findings

Data Analysis Strategy

Similar to Essay 1, in both models, measurement testing was performed using CFA in Lisrel. All of the items in the model are tested simultaneously. As stated by Fornell and Larcker (1981), convergent validity was established, as the average variance extracted for all constructs was greater than 0.50 (diagonals of Table 25 and Table 26) and discriminant validity was established, as the average variance extracted was greater than the squared correlation between constructs as seen in Table 25 and Table 26. Coefficient α values and composite reliabilities are also reported that are all greater than 0.70 as seen in Table 27 and Table 28 that includes the measurement model statistics.

Structural equation modeling with the maximum likelihood estimation method was used to test the hypotheses. In the first model, the mediating effect of innovation and quality improvement capabilities were tested following the procedure used in the literature (Baron and Kenny 1986; Zhou, Yim, and Tse 2005) using two models: Model 1 without the organizational capabilities, and Model 2 with the organizational capabilities as mediating variables.

The differences between parameters were tested in two steps: (1) checking the standardized parameters whether the hypothesized differences exist, (2) if some differences exist, checking whether these differences are statistically significant. The significance is tested by; (a) constraining the hypothesized parameters to be equal within a country, (b) executing an LM test to see whether freeing some of the constraints in a particular order will significantly improve model fit (Table 32 and Table 34).

Hypothesis 1: Knowledge Breadth

As Table 31 shows, knowledge breadth has a positive effect on technological innovation capability ($\beta = .20$, $p < 0.01$), aesthetic innovation capability ($\beta = .26$, $p < 0.01$) and market-based innovation capability ($\beta = .18$, $p < 0.01$), in support of H1a, H1b, and H1c. In addition to the innovation capabilities, knowledge breadth positively affects quality improvement innovation capability ($\beta = .16$, $p < 0.05$), which supports H1d.

Knowledge breadth positively affects all-three product innovation types. These effects can be observed in Table 30. These are technological product innovation ($\beta = .19$, $p < 0.01$), aesthetic product innovation ($\beta = .26$, $p < 0.01$), and market-based product innovation ($\beta = .18$, $p < 0.05$), in support of H1e, H1f, and H1g. As both Table 30 and Table 31 shows, knowledge breadth doesn't have a significant effect on product performance ($\beta = .01$, $p > 0.05$).

Hypothesis 2: Knowledge Depth

As Table 31 shows, knowledge depth has a positive effect on technological innovation capability ($\beta = .16$, $p < 0.05$), market-based innovation capability ($\beta = .18$ $p < 0.01$), and quality improvement innovation capability ($\beta = .20$, $p < 0.01$) but it does not affect aesthetic innovation capability ($\beta = .11$, $p > 0.05$). Thus hypotheses H2a, H2c, and H2d are supported.

Table 25: Squared Correlations and AVE's (Diagonals) - Essay 2 Model 1

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Cooperation	.896												
2	Knowledge Breadth	.181	.616											
3	Knowledge Depth	.276	.543	.609										
4	Knowledge Tacitness	.069	.034	.071	.748									
5	Knowledge Specificity	.242	.353	.392	.138	.766								
6	Technological Innovation Capability	.335	.275	.378	.079	.318	.798							
7	Aesthetic Innovation Capability	.393	.264	.421	.089	.269	.714	.781						
8	Market-Based Innovation Capability	.368	.249	.329	.107	.233	.711	.721	.786					
9	Quality Improvement Capability	.323	.307	.389	.057	.359	.651	.618	.671	.702				
10	Technological Product Innovation	.324	.240	.340	.081	.216	.667	.582	.627	.545	.757			
11	Aesthetic Product Innovation	.364	.231	.376	.127	.201	.476	.646	.564	.465	.599	.736		
12	Market Product Innovation	.352	.231	.327	.095	.166	.468	.585	.626	.476	.555	.658	.757	
13	Product Performance	.288	.255	.258	.098	.319	.391	.379	.402	.371	.393	.354	.310	.787

Table 26: Squared Correlations and AVE's (Diagonals) - Essay 2 Model 2

	Variable	1	2	3	4	5	6	7	8
1	Technological Innovation Capability	.804							
2	Aesthetic Innovation Capability	.714	.793						
3	Market-Based Innovation Capability	.711	.721	.786					
4	Quality improvement Capability	.651	.618	.671	.701				
5	Technological Product Newness	.366	.320	.365	.265	.734			
6	Aesthetic Product Newness	.254	.316	.297	.236	.604	.822		
7	Market-Based Product Newnenss	.334	.347	.406	.250	.602	.542	.798	
8	Product Performance	.391	.379	.402	.371	.300	.258	.285	.787

Table 27: Measurement Model - Essay 2 Model 1

Construct Name	Item	Loading	t-Value	Cronbach's α	Internal Composite Reliability	AVE
Cooperation	Coop1	0.93	21.35	0.963	0.963	0.896
	Coop2	0.94	21.86			
	Coop3	0.97	22.86			
Knowledge Breadth	Breadth1	0.78	15.16	0.764	0.763	0.616
	Breadth2	0.79	15.36			
Knowledge Depth	Depth1	0.75	14.72	0.756	0.757	0.609
	Depth2	0.81	16.1			
Knowledge Tacitness	Tacit1	0.8	16.26	0.896	0.899	0.748
	Tacit2	0.92	20.08			
	Tacit3	0.87	18.26			
Knowledge Specificity	Spec1	0.88	18.59	0.866	0.867	0.766
	Spec3	0.87	18.09			
Technological Innovation Capability	TecInC1	0.89	19.78	0.922	0.922	0.798
	TecInC2	0.88	19.41			
	TecInC3	0.91	20.39			
Aesthetic Innovation Capability	AestInC1	0.88	19.45	0.915	0.914	0.781
	AestInC2	0.91	20.51			
	AestInC3	0.86	18.74			
Market-Based Innovation Capability	MinC1	0.87	18.89	0.915	0.917	0.786
	MinC2	0.9	20.01			
	MinC3	0.89	19.76			
Quality Improvement Capability	QimC1	0.78	15.95	0.868	0.876	0.702
	QimC2	0.85	18.22			
	QimC3	0.88	18.98			
Technological Product Innovation	TecPrIn1	0.87	18.72	0.904	0.903	0.757
	TecPrIn2	0.88	19.37			
	TecPrIn3	0.86	18.58			
Aesthetic Product Innovation	AestPrIn1	0.89	19.51	0.891	0.893	0.736
	AestPrIn2	0.89	19.39			
	AestPrIn3	0.79	16.37			
Market-Based Product Innovation	MprIn1	0.87	18.67	0.903	0.903	0.757
	MprIn2	0.85	18.29			
	MprIn3	0.89	19.44			
Product Performance	ProdPerf1	0.89	19.44	0.915	0.917	0.787
	ProdPerf2	0.92	20.55			
	ProdPerf3	0.85	17.696			

Chi Square: 1123 P-value=0.00 RMSEA=0.062 CFI= 0.99

Table 28: Measurement Model - Essay 2 Model 2

Construct Name	Item	Loading	t-Value	Cronbach's α	Internal Composite Reliability	AVE
Technological Innovation Capability	TecInC1	0.89	19.65	0.922	0.925	0.804
	TecInC2	0.89	19.55			
	TecInC3	0.91	20.25			
Aesthetic Innovation Capability	AestInC1	0.89	19.47	0.915	0.92	0.793
	AestInC2	0.92	20.62			
	AestInC3	0.86	18.42			
Market-Based Innovation Capability	MinC1	0.88	19.2	0.915	0.917	0.786
	MinC2	0.89	19.78			
	MinC3	0.89	19.49			
Quality Improvement Capability	QimC1	0.79	16.18	0.868	0.876	0.701
	QimC2	0.85	18.13			
	QimC3	0.87	18.59			
Technological Newness	TecPrIn1	0.85	17.96	0.892	0.892	0.734
	TecPrIn2	0.83	17.52			
	TecPrIn3	0.89	19.36			
Aesthetic Newness	AestPrIn1	0.9	20.11	0.934	0.933	0.822
	AestPrIn2	0.89	19.77			
	AestPrIn3	0.93	21.11			
Market-Based Newness	MprIn1	0.88	19.26	0.92	0.922	0.798
	MprIn2	0.89	19.46			
	MprIn3	0.91	20.17			
Product Performance	ProdPerf1	0.89	19.42	0.915	0.917	0.787
	ProdPerf2	0.92	20.49			
	ProdPerf3	0.85	17.92			

Chi-Square = 783.13 (P = 0.0), (RMSEA) = 0.091, (CFI) = 0.98

The effect of knowledge depth on product innovations and product performance can be observed at Table 30. Similar to its effect on innovation capability types, knowledge depth has a positive effect on technological product innovation ($\beta = .12$, $p < 0.05$), market-based product innovation ($\beta = .17$, $p < 0.01$) but it has no effect on aesthetic product innovation *(*$\beta = .10$, $p > 0.05$) supporting hypotheses H2e and H2g. Contrary to knowledge breadth, knowledge depth has a significant positive effect on product performance ($\beta = .15$, $p < 0.05$) supporting H2h.

Hypothesis 3: Knowledge Tacitness

Knowledge tacitness positively affects aesthetic ($\beta = .09$, $p < 0.05$) and market based innovation capabilities ($\beta = .14$, $p < 0.01$) supporting H3b and H3c, but it has no effect on technological innovation capability ($\beta = .06$, $p > 0.05$) and quality improvement capability ($\beta = .001$, $p < 0.49$), supporting H3d and H3e (Table 31). As Table 30 shows, knowledge tacitness positively affects all the innovation capabilities that are technological ($\beta = .10$, $p < 0.05$), aesthetic ($\beta = .19$, $p < 0.01$) and market-based ($\beta = .15$, $p < 0.01$) supporting H3f and H3g. Similar to the knowledge breadth, knowledge tacitness does not have a significant effect on product performance ($\beta = .05$, $p > 0.05$).

Hypothesis 4: Knowledge Specificity

Knowledge specificity positively affects technological innovation capability ($\beta = .17$, $p < 0.01$) and quality improvement innovation capability ($\beta = .25$, $p < 0.01$) supporting H4a and H4d. However it doesn't have a significant effect on aesthetic ($\beta = .07$, $p < 0$) and market-based innovation capability ($\beta = .02$, $p > 0.05$) supporting H4b and H4c (Table 31).

Table 29: Correlations - Essay2 Model 1

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Cooperation	1											
2	Knowledge Breadth	.426*	1										
3	Knowledge Depth	.525*	.737*	1									
4	Knowledge Tacitness	.263*	.184*	.267*	1								
5	Knowledge Specificity	.492*	.594*	.626*	.371*	1							
6	Technological Innovation Capability	.579*	.524*	.615*	.281*	.564*	1						
7	Aesthetic Innovation Capability	.627*	.514*	.649*	.298*	.519*	.845*	1					
8	Market-Based Innovation Capability	.607*	.499*	.574*	.327*	.483*	.843*	.849*	1				
9	Quality Improvement Capability	.568*	.554*	.624*	.239*	.599*	.807*	.786*	.819*	1			
10	Technological Product Innovation	.569*	.490*	.583*	.285*	.465*	.817*	.763*	.792*	.738*	1		
11	Aesthetic Product Innovation	.603*	.481*	.613*	.356*	.448*	.690*	.804*	.751*	.682*	.774*	1	
12	Market Product Innovation	.593*	.481*	.572*	.309*	.408*	.684*	.765*	.791*	.690*	.745*	.811*	1
13	Product Performance	.537*	.505*	.508*	.313*	.565*	.625*	.616*	.634*	.609*	.627*	.595*	.557*

*significant at $p < 0.01$ two-tailed.

Table 30: Model 1 Results- Standardized Structural Equation Parameter Estimates, t-Values (Organizational Capabilities Excluded)

Independent variables	Technological Product Innovation		Aesthetic Product Innovation		Market-Based Product Innovation		Product Performance	
Knowledge Breadth	.19**	2.35	.26**	3.48	.18*	2.30	.01	.149
Knowledge Depth	.12*	1.65	.10	1.45	.17**	2.37	.15*	2.21
Knowledge Tacitness	.10*	2.14	.19**	4.18	.15**	3.22	.05	1.12
Knowledge Specificity	.06	.98	-.04	-.65	-.07	-1.12	.24**	4.29
Cooperation	.36**	6.71	.39**	7.72	.41**	7.89		
Technological Product Innovation							.29**	4.27
Aesthetic Product Innovation							.13	1.63
Market-Based Product Innovation							.05	.621
R^2	0.419		0.481		0.442		0.52	

Goodness-of-fit: 1739; p = .032; GFI = .997; CFI = .998; IFI = .998; RMSEA = .109
*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 31: Model 1 Results- Standardized Structural Equation Parameter Estimates, t-Values (Organizational Capabilities Included)

Independent variables	Tech In. Capability	Aesthetic Innovation Capability	Market-Based In. Capability	Quality Imp. Capability	Tech Product In.	Aesthetic Product In.	Market-Based Product In.	Product Performance
Breadth	.20** (2.79)	.26** (3.63)	.18** (2.46)	.16* (2.20)	.02 (.30)	.09 (1.59)	.02 (.39)	.05 (.15)
Depth	.16* (2.29)	.11 (1.60)	.18** (2.51)	.20** (2.94)	-.02 (-.37)	.01 (.25)	.06 (1.09)	.15* (2.21)
Tacitness	.06 (1.36)	.09* (2.11)	.14** (3.17)	.001 (.012)	.04 (1.04)	.12** (3.32)	.06* (1.74)	.05 (1.12)
Specificity	.17** (2.99)	.07 (1.19)	.02 (.38)	.25** (4.36)	-.06 (-1.19)	-.08 (-1.63)	-.10 (-1.99)	.24** (4.29)
Cooperation	.30** (6.01)	.38** (7.90)	.38** (7.58)	.27** (5.58)	.08* (1.93)	.12** (2.85)	.13** (2.96)	
R^2	0.500	0.520	0.486	0.518	0.715	0.693	0.678	0.520

Table 31 (cont'd)

Independent variables	Tech Product In.	Aesthetic Product In.	Market-Based Product In.	Product Performance
Tech Innovation Capability	.45** (6.65)	-.11 (-1.59)	-.13 (-1.81)	
Aesthetic Innovation Capability	.06 (.89)	.55** (7.79)	.32** (4.43)	
Market-Based Innovation Capability	.23** (3.25)	.18** (2.47)	.46** (6.06)	
Quality Improvement Capability	.12* (1.83)	.07 (1.13)	.08 (1.25)	
Tech Product Innovation				.29** (4.27)
Aesthetic Product Innovation				.13 (1.62)
Market-Based Product Innovation				.05 (.62)

Goodness-of-fit:3465 p = .060; GFI = .995; CFI = .998; IFI = .978; RMSEA = .061
*Significant at $p < 0.05$, **significant at $p < 0.01$ one-tailed.

Table 32: Univariate Increments - Essay2 Model 1

Constraints to Free	Chi-Square	Probability	Differrence
Specificity->ProdPerf = Depth->ProdPerf	.84	.36	No
Specificity->ProdPerf = TecPrIn->ProdPerf	1.19	.28	No
Depth->ProdPerf = TecPrIn->ProdPerf	.03	.86	No

Hypothesis 5: Inter-functional Cooperation

Cooperation has a positive effect on all of the innovation capabilities and product innovation types. Table 31 summarizes the positive effect of inter-functional cooperation on technological ($\beta = .30$, $p < 0.01$), aesthetic ($\beta = .38$, $p < 0.01$), and market-based innovation capabilities ($\beta = .38$, $p < 0.01$), and the quality improvement capability ($\beta = .27$, $p < 0.01$) supporting H5a, H5b, H5c, and H5d. Table 30 shows that cooperation positively affects technological ($\beta = .36$, $p < 0.01$), aesthetic $\beta = .39$, $p < 0.01$) and market-based product innovations ($\beta = .41$, $p < 0.01$) supporting H5e, H5f, and H5h.

As shown in Table 30, unlike other knowledge dimensions, knowledge specificity doesn't have a significant effect on any of the product innovation types, including aesthetic product innovation ($\beta = -.04$, $p > 0.05$) and market-based product innovation ($\beta = -.07$, $p > 0.05$), supporting H4f and H4g. However, similar to knowledge depth, it positively affects product performance ($\beta = .24$, $p < 0.01$), supporting H4h.

H6: Technological Innovation Capability

Technological innovation capability has a positive significant effect on technological product innovation ($\beta = .45$, $p < 0.01$, one-tailed), supporting H6a. However it does not have a significant effect on aesthetic product innovation ($\beta = -.11$, $p > 0.05$, two tailed), supporting H6b and market-based product innovation ($\beta = -.13$, $p > 0.05$, two-tailed). One tailed t-test was used for the positive effects since those relationships were hypothesized to be positive. For the negative effects, two-tailed t-test was used since they were not hypothesized to be negative.

H7: Aesthetic Innovation Capability

Aesthetic innovation capability has a positive effect on aesthetic product innovation ($\beta = .55$, $p < 0.01$), and market-based product innovation ($\beta = .32$, $p < 0.01$), supporting H7b and H7c, but it does not have a significant effect on technological product innovation ($\beta = .06$, $p > 0.05$), supporting H7a.

H8: Market-based Innovation Capability

Market-based innovation capability has a positive effect on all-three product innovation types, that are technological product innovation ($\beta = .23$, $p < 0.01$), aesthetic product innovation ($\beta = .18$, $p < 0.01$), and market-based product innovation ($\beta = .46$, $p < 0.01$). These results support hypotheses H8a, 8b and H8c.

H9: Quality Improvement Capability

Quality improvement capability has a significant positive effect on technological product innovation ($\beta = .12$, $p < 0.05$), supporting H9a. However it doesn't have a significant effect on aesthetic product innovation ($\beta = .07$, $p > 0.05$), and market-based product innovation ($\beta = .08$, $p > 0.05$).

H10: Mediation Effect of Technological Innovation Capability

The mediating effect of innovation and quality improvement capabilities were tested following the procedure used in the literature (Baron and Kenny 1986; Zhou, Yim, and Tse 2005) using two models: Model 1 without the organizational capabilities, and Model 2 with the organizational capabilities as mediating variables.

Knowledge breadth has a significant effect on technological product innovation in the absence of technological innovation capability ($\beta = .19$, $p < 0.01$). This effect becomes non-significant when technological innovation capability mediates this relationship ($\beta = .09$, $p > 0.05$). Knowledge breadth also has a significant effect on technological innovation capability ($\beta = .20$, $p < 0.01$). Thus, technological innovation capability fully mediates the effect of market knowledge breadth on technological product innovation, supporting H10a.

Knowledge depth has a significant effect on technological product innovation in the absence of technological innovation capability ($\beta = .12$, $p < 0.05$). This effect becomes non-significant when technological innovation capability mediates this relationship ($\beta = -.02$, $p > 0.05$). Knowledge breadth also has a significant effect on technological innovation capability ($\beta = .16$, $p < 0.05$). Thus, technological innovation capability fully mediates the effect of market knowledge depth on technological product innovation, supporting H10b.

Technological innovation capability does not mediate the relationship between knowledge tacitness and technological product innovation because knowledge tacitness does not have a positive effect on technological innovation capability ($\beta = .06$, $p > 0.05$).

Technological innovation capability does not mediate the relationship between knowledge specificity and technological product innovation because knowledge specificity does not have a positive effect on technological product innovation in the absence of technological innovation capability ($\beta = .06$, $p > 0.05$).

Inter-functional cooperation has a significant effect on technological product innovation in the absence of technological innovation capability ($\beta = .36$, $p < 0.01$). This effect is still significant when technological innovation capability mediates this relationship ($\beta = .27$, $p < 0.01$). Cooperation also has a significant effect on technological innovation capability ($\beta = .30$, $p < 0.01$). Thus, technological innovation capability partially mediates the effect of inter-functional cooperation on technological product innovation, partially supporting H10e.

H11: Mediation Effect of Aesthetic Innovation Capability

Knowledge breadth has a significant effect on aesthetic product innovation in the absence of aesthetic innovation capability ($\beta = .26$, $p < 0.01$). This effect becomes non-significant when aesthetic innovation capability mediates this relationship ($\beta = .09$, $p > 0.05$). Knowledge breadth also has a significant effect on aesthetic innovation capability ($\beta = .26$, $p < 0.01$). Thus, aesthetic innovation capability fully mediates the effect of market knowledge breadth on aesthetic product innovation, supporting H11a.

Aesthetic innovation capability does not mediate the relationship between knowledge depth and aesthetic product innovation because knowledge depth does not have a positive effect

on aesthetic product innovation in the absence of aesthetic innovation capability (β = .10, p > 0.05).

Knowledge tacitness has a significant effect on aesthetic product innovation in the absence of aesthetic innovation capability (β = .19, p < 0.01). This effect is still significant when aesthetic innovation capability mediates this relationship (β = .12, p < 0.01). Knowledge tacitness also has a significant effect on aesthetic innovation capability (β = .09, p < 0.05). Thus, aesthetic innovation capability partially mediates the effect of market knowledge depth on aesthetic product innovation, partially supporting H11c.

Aesthetic innovation capability does not mediate the relationship between knowledge specificity and aesthetic product innovation because knowledge specificity does not have a positive effect on aesthetic product innovation in the absence of aesthetic innovation capability (β = -.04, p > 0.05).

Inter-functional cooperation has a significant effect on aesthetic product innovation in the absence of aesthetic innovation capability (β = .39, p < 0.01). This effect is still significant when aesthetic innovation capability mediates this relationship (β = .12, p < 0.01). Cooperation also has a significant effect on aesthetic innovation capability (β = .38, p < 0.01). Thus, aesthetic innovation capability partially mediates the effect of inter-functional cooperation on aesthetic product innovation, partially supporting H11e.

H12: Mediation Effect of Market-Based Innovation Capability

Knowledge breadth has a significant effect on market-based product innovation in the absence of market-based innovation capability (β = .18, p < 0.01). This effect becomes non-significant when market-based innovation capability mediates this relationship (β = .02, p < 0.05). Knowledge breadth also has a significant effect on market-based innovation capability (β

= .18, p < 0.01). Thus, market-based innovation capability fully mediates the effect of knowledge breadth on market-based product innovation, supporting H12a.

Knowledge depth has a significant effect on market-based product innovation in the absence of market-based innovation capability (β = .17, p < 0.01). This effect becomes non-significant when market-based innovation capability mediates this relationship (β = .06, p < 0.01). Knowledge depth also has a significant effect on market-based innovation capability (β = .18, p < 0.01). Thus, market-based innovation capability fully mediates the effect of knowledge depth on market-based product innovation, supporting H12b.

Knowledge tacitness has a significant effect on market-based product innovation in the absence of market-based innovation capability (β = .15, p < 0.01). This effect is still significant when market-based innovation capability mediates this relationship (β = .06, p < 0.05). Knowledge tacitness also has a significant effect on market-based innovation capability (β = .14, p < 0.01). Thus, market-based innovation capability partially mediates the effect of knowledge tacitness on market-based product innovation, partially supporting H12c.

Market-based innovation capability does not mediate the relationship between knowledge specificity and market-based product innovation because knowledge specificity does not have a positive effect on market-based product innovation in the absence of market-based innovation capability (β = -.07, p >0.05).

Inter-functional cooperation has a significant effect on market-based product innovation in the absence of market-based innovation capability (β = .41, *p* < 0.01). This effect is still significant when market-based innovation capability mediates this relationship (β = .13, *p* < 0.01). Cooperation also has a significant effect on market-based innovation capability (β = .13, *p*

< 0.01). Thus, market-based innovation capability partially mediates the effect of inter-functional cooperation on market-based product innovation, partially supporting H12e.

H13: Product Innovation Types

Technological product innovation has a positive effect on product performance ($\beta = .29$, $p < 0.01$), supporting H13a. However, aesthetic ($\beta = .13$, $p > 0.05$) and market-based product innovation ($\beta = .05$, $p > 0.05$) doesn't have a significant effect on product performance.

Discussion

The findings contribute to the marketing literature by explaining the relationship between market knowledge dimensions, innovation capabilities, product innovations and product performance. This study explains the different effects of market knowledge dimensions on innovation capability and product innovation types. The findings also suggest that innovation capabilities meditate the relationship between market knowledge dimensions and product innovations. Some of these mediations are full while the others are partial.

The findings suggest that all of the innovation capability types mediate the relationship between knowledge breadth and product innovations. Both technological innovation capability and market-based innovation capability individually mediate the relationship between knowledge depth and product innovations. Both aesthetic innovation capability and market-based innovation capability partially mediate the relationship between knowledge tacitness and innovation capabilities. All of the innovation capabilities mediate the relationship between cooperation and product innovations. These findings extend the marketing literature by demonstrating the mediating role of innovation capabilities on the relationship between market knowledge dimensions and product innovations.

The findings also reveal the different effects of market knowledge dimensions on innovation capabilities. As hypothesized, the findings indicate a clear distinction between the effects of knowledge specificity and knowledge tacitness. Knowledge specificity has positive significant effects only on technological innovation capabilities and quality improvement capabilities whereas knowledge tacitness has positive significant effects only on aesthetic and market innovation capabilities.

Specific knowledge is highly customized that loses its value outside a particular context. Technological innovation and quality improvement capabilities are positively effected by very specialized knowledge that is used in developing next generation microchips or fixing the defects in a complex computer program. On the other hand, specific knowledge does not contribute to aesthetic innovation capability since aesthetic innovations are influenced by trends in several different contexts. Specific market knowledge increases the firm's motivation to stick to the existing markets. The null effect of specific knowledge on market-based innovation capability confirms the findings of Chandy and Tellis (2000) stating that specific intellectual investments of a firm do not contribute to its focus on new or emerging markets.

Findings about tacitness supports the hypotheses that technological innovation capability and quality improvement capability are driven by the explicit knowledge that can be communicated, codified and built upon. While developing a new laptop computer, this type of explicit knowledge suits better to its hardware development (technological innovation), as well as decreasing defect rates of its hardware production (quality improvement).

Table 33: Hypotheses Overview - Essay2 Model 2

Hypothesis	Predicted Effect	Direction	Supported
H1a	Breadth -> TecInC	Positive	Yes
H1b	Breadth -> AestInC	Positive	Yes
H1c	Breadth -> MInC	Positive	Yes
H1d	Breadth -> QImp	Positive	Yes
H1e	Breadth -> TecPrIn	Positive	Yes
H1f	Breadth -> AestPrIn	Positive	Yes
H1g	Breadth -> MPrIn	Positive	Yes
H1h	Breadth -> ProdPerf	Positive	No
H2a	Depth -> TecInC	Positive	Yes
H2b	Depth -> AestInC	Positive	No
H2c	Depth -> MInC	Positive	Yes
H2d	Depth -> QImp	Positive	Yes
H2e	Depth -> TecPrIn	Positive	Yes
H2f	Depth -> AestPrIn	Positive	No
H2g	Depth -> MPrIn	Positive	Yes
H2h	Depth -> ProdPerf	Positive	Yes
H3a	Tacitness -> TecInC	Null	Yes
H3b	Tacitness -> AestInC	Positive	Yes
H3c	Tacitness -> MInC	Positive	Yes
H3d	Tacitness -> QImp	Null	Yes
H3e	Tacitness -> TecPrIn	Null	No
H3f	Tacitness -> AestPrIn	Positive	Yes
H3g	Tacitness -> MPrIn	Positive	Yes
H3h	Tacitness -> ProdPerf	Positive	No
H4a	Specificity -> TecInC	Positive	Yes
H4b	Specificity -> AestInC	Null	Yes
H4c	Specificity -> MInC	Null	Yes
H4d	Specificity -> QImp	Positive	Yes
H4e	Specificity -> TecPrIn	Positive	No
H4f	Specificity -> AestPrIn	Null	Yes
H4g	Specificity -> MPrIn	Null	Yes
H4h	Specificity -> ProdPerf	Positive	Yes
H5a	Cooperation -> TecInC	Positive	Yes
H5b	Cooperation -> AestInC	Positive	Yes
H5c	Cooperation -> MInC	Positive	Yes
H5d	Cooperation -> QImp	Positive	Yes
H5e	Cooperation -> TecPrIn	Positive	Yes
H5f	Cooperation -> AestPrIn	Positive	Yes
H5g	Cooperation -> MPrIn	Positive	Yes

Table 33 (cont'd)

Hypothesis	Predicted Effect	Direction	Supported
H6a	TecInC -> TecPrIn	Positive	Yes
H6b	TecInC -> AestPrIn	Null	Yes
H6c	TecInC -> MPrIn	Positive	No
H7a	AestInC -> TecPrIn	Null	Yes
H7b	AestInC -> AestPrIn	Positive	Yes
H7c	AestInC -> MPrIn	Positive	Yes
H8a	MInC -> TecPrIn	Positive	Yes
H8b	MInC -> AestPrIn	Positive	Yes
H8c	MInC -> MPrIn	Positive	Yes
H9a	QImp -> TecPrIn	Positive	Yes
H9b	QImp -> AestPrIn	Positive	No
H9c	QImp -> MPrIn	Positive	No
H10a	TechInC mediates Breadth -> TecPrIn	Positive	Yes (Fully)
H10b	TechInC mediates Depth -> TecPrIn	Positive	Yes (Fully)
H10c	TechInC mediates Tacitness -> TecPrIn	Positive	No
H10d	TechInC mediates Specificity -> TecPrIn	Positive	No
H10e	TechInC mediates Cooperation -> TecPrIn	Positive	Yes (Partially)
H11a	AestInC mediates Breadth -> AestPrIn	Positive	Yes (Fully)
H11b	AestInC mediates Depth -> AestPrIn	Positive	No
H11c	AestInC mediates Tacitness -> AestPrIn	Positive	Yes (Partially)
H11d	AestInC mediates Specificity -> AestPrIn	Positive	No
H11e	AestInC mediates Cooperation -> AestPrIn	Positive	Yes (Partially)
H12a	MInc mediates Breadth -> MPrIn	Positive	Yes (Fully)
H12b	MInc mediates Depth -> MPrIn	Positive	Yes (Fully)
H12c	MInc mediates Tacitness -> MPrIn	Positive	Yes (Partially)
H12d	MInc mediates Specificity -> MPrIn	Positive	No
H12e	MInc mediates Cooperation -> MPrIn	Positive	Yes (Partially)
H13a	TecPrIn -> PrPerf	Positive	Yes
H13b	AestPrIn -> PrPerf	Positive	No
H13c	MPrIn -> PrPerf	Positive	No

On the other hand, designing the shape of the laptop and the graphical designs on its cover (aesthetic innovation) depends more on the artistic capabilities that is driven by non-codifiable tacit knowledge. Capability to create a laptop for a new market (market innovation capability) requires thinking outside the box where non-codified tacit knowledge can provide substantial benefits.

The results support the hypothesis that both knowledge depth and knowledge breath contribute to innovation capabilities. The only exception is the null effect of knowledge depth on aesthetic innovation capability. The findings about the effects of market knowledge dimensions on innovation capabilities contribute to the marketing, knowledge based view, and innovation literatures by (1) differentiating the effects of knowledge specificity and knowledge tacitness on innovation capabilities, and (2) demonstrating the necessity of knowledge depth and knowledge breadth on innovation capabilities. Results also show that market knowledge dimensions have different effects on product innovation types. As hypothesized, knowledge specificity does not contribute to market-based product innovations and aesthetic product innovations. These results are parallel with the null effects of knowledge specificity on aesthetic innovation capability and market based innovation capability. Contrary to the expectations, knowledge specificity does not have an effect on technological product innovation despite its positive effect on technological innovation capability.

Consistent with their effect on innovation capabilities, knowledge breadth and tacitness have positive effects on all product innovation types. The exception is the null effect of knowledge depth on aesthetic product innovation that is similar to its null effect on aesthetic innovation capability. Similarly, consistent with its effect on innovation capabilities, tacit knowledge has positive effects on aesthetic and market-based innovation. Contrary to

expectations, tacit knowledge has a positive effect on technological innovation despite its null effect on technological innovation capability. The results indicate that even tough technological innovations mostly rely on codified knowledge, they also contain a type of knowledge that cannot be strictly codified and communicated, but can be gained by experience. This study contributes to the marketing, knowledge based view and innovation literatures by, (1) differentiating the effects of market knowledge dimensions on different innovation types and, (2) indicating that the effects of market knowledge dimensions are mostly consistent in their effects on innovation capabilities and product innovations.

The significant positive effects of knowledge specificity and knowledge depth and the null effect of tacitness on product performance support the findings in the literature (De Luca and Atuahene-Gima 2007), however the non-significant effect of knowledge breadth on performance contradicts with these results. These findings contribute to marketing and knowledge based view by testing market knowledge dimensions', (1) direct effects on performance, and (2) their indirect effects on performance through product innovations.

The non-significant univatiate estimates in Table 32 indicates that the effect of knowledge specificity, knowledge depth, and technological product innovation on product performance are statistically not different. These findings contribute to innovation and marketing literature by indicating that knowledge specificity and knowledge depth are as important as technological product innovations on their positive effect on product performance.

Inter-functional cooperation has a positive effect on all of the innovation capability and product innovation types. These results support the findings in the literature about the positive relationship between cooperation and innovation (Griffin and Hauser 1996; Han, Kim, and Srivastava 1998; Song, Montoya-Weiss, and Schmidt 1997).

Managerial Implications

Importance of knowledge and inter-departmental cooperation is well known among the practitioners. However this study indicates that the knowledge dimensions have different effects on innovation capability types, product innovations and product performance. By demonstrating the effects of market knowledge dimension and inter-functional cooperation, these results provide important guidelines for the practitioners on how to increase (1) product performance, (2) product innovations, and (3) innovation capabilities. For example to strengthen aesthetic innovation capability, knowledge tacitness and knowledge breadth are important however for improving technological innovation capability, knowledge specificity, knowledge breadth, and knowledge depth are the significant contributors.

The results indicate that, to increase product performance, managers would be better off by enhancing knowledge specificity, knowledge depth and technological innovations. It is important to note that, statistically they are similarly important for enhancing product performance. However managers should not neglect obtaining and facilitating tacit and broad knowledge. The reason is that these knowledge types positively effect technological product innovations that increase product innovation. Thus, even though knowledge breadth and knowledge tacitness do not have direct effects on product performance, they contribute to its antecedents.

It is important to note that inter-functional cooperation enhances all of the capabilities and product innovation types tested in this study. Thus, it would be highly beneficial for the managers to facilitate cooperation in their organizations. The managers should pay attention to knowledge breadth since, similar with the effects of cooperation, it enhances all of the capabilities and product innovation types tested in this study. Another market knowledge

dimension with wide ranging effects is the knowledge depth. It enhances all of the capabilities and product innovation types except aesthetic innovation capability and aesthetic product innovation. Thus, managers who are willing to enhance their firms' aesthetic innovation capabilities and aesthetic innovations should focus their efforts on obtaining broad and tacit knowledge.

Managers can benefit from investing in the right type of market knowledge to enhance the innovation capability types. There is a striking difference between the effects of tacit knowledge and specific knowledge. Managers who are willing to enhance their firms' quality improvement capability and technological innovation capability would benefit from investing in specific knowledge rather than tacit knowledge. On the other hand, to enhance aesthetic innovation capability and market-based innovation capability, the managers can benefit more from investing in tacit knowledge rather than specific knowledge.

Hypothesis 1-4: Innovation Capabilities & Quality Improvement Capability

Quality improvement capability has a negative effect on market-based newness ($\beta = -.16$, $p < 0.05$), and a positive effect on product performance ($\beta = .42$, $p < 0.01$) supporting H1c and H1d, but it doesn't have a significant effect on technological newness ($\beta = -07$, $p > 0.05$) and aesthetic newness ($\beta = .03$, $p > 0.05$).

As shown in Table 35, technological innovation capability has a positive effect on technological newness ($\beta = .36$, $p < 0.01$), supporting H2a, but it doesn't have a significant effect on aesthetic newness ($\beta = -.01$, $p > 0.05$), supporting H2b, or market-based newness ($\beta = .13$, $p > 0.05$). Aesthetic innovation capability has a positive effect on aesthetic newness ($\beta = .35$, $p < 0.01$), and on market-based newness ($\beta = .16$, $p < 0.05$), supporting H3b and H3c, but it doesn't have a significant effect on technological newness ($\beta = .06$, $p > 0.05$) supporting H3a.

Table 34: Univariate Increments - Essay2 Model 2

Constraints to Free	Chi-Square	Probability	Difference
TecInCap ->TecNewness= TecInCap ->AestNewness	3.598	.058	No
TecInCap ->TecNewness= TecInCap ->MktNewness	.001	.977	No
TecInCap ->TecNewness=TecInCap ->QImpICap	6.71	.01	Yes
AestInCap ->AestNewness= TecInCap ->AestNewness	9.851	.002	Yes
AestInCap ->AestNewness= MktInCap ->AestNewness	6.335	.012	Yes
AestInCap ->AestNewness= QImpCap ->AestNewness	5.63	.018	Yes
MktInCap ->MktNewness= TecInCap ->MktNewness	6.464	.011	Yes
MktInCap ->MktNewness= AestInCap ->MktNewness	2.155	.142	No
MktInCap ->MktNewness= QimpCap ->MktNewness	4.451	.035	Yes
QimpCap ->ProdPerf = TecNewness ->ProdPerf	6.318	.012	Yes
QimpCap ->ProdPerf = AestNewness ->ProdPerf	17.268	0	Yes
QimpCap ->ProdPerf = MktNewness ->ProdPerf	22.764	0	Yes
TecNewness ->ProdPerf= AestNewness ->ProdPerf	4.279	.039	Yes
TecNewness ->ProdPerf= MktNewness ->ProdPerf	.076	.783	No
AestNewness ->ProdPerf= MktNewness ->ProdPerf	.284	.594	No

Table 35: Model 2 Results - Standardized Structural Equation Parameter Estimates, t-Values

Model A (Without Interactions)

Independent variables	**Technological Newness**	**Aesthetic Newness**	**Market-Based Newness**	**Product Performance**
Main Effects				
Technological Innovation Capability	.36** (3.45)	-.01 (-.12)	.13 (1.41)	
Aesthetic Innovation Capability	.06 (.63)	.35** (3.50)	.16* (1.71)	
Market-Based Innovation Capability	.33** (3.30)	.23* (2.21)	.52** (5.30)	
Quality Improvement Capability	-.07 (-.86)	.03 (.30)	-.16* (-1.92)	.42** (8.26)
Technological Newness				.17* (2.13)
Aesthetic Newness				.07 (.95)
Market-Based Newness				.15* (2.04)
R^2	0.423	0.333	0.399	0.458

Goodness-of-fit: 13.03; p = .004; GFI = .990; CFI = .995; IFI = .996; RMSEA = .105
*Significant at $p < 0.05$, **significant at $p < 0.01$ two-tailed.

Table 35 (cont'd)

Model B (With Interactions)				
Independent variables	**Technological Newness**	**Aesthetic Newness**	**Market-Based Newness**	**Product Performance**
Interactions (with Quality Improvement Capability)				
QIC X TIC	- .15** (-2.89)			
QIC X AIC		- .15** (-2.71)		
QIC X MIC			- .14** (-2.71)	
Main Effects				
Technological Innovation Capability	.32** (3.33)	-.04 (-.35)	.11 (1.18)	
Aesthetic Innovation Capability	.08 (.87)	.39** (3.85)	.19* (2.07)	
Market-Based Innovation Capability	.30** (3.07)	.22* (2.14)	.50** (5.10)	
Quality Improvement Capability	-.15* (-1.71)	- .06 (-.64)	- .24** (-2.72)	.42** (8.25)
Technological Newness				.17* (2.14)
Aesthetic Newness				.07 (.95)
Market-Based Newness				.15* (2.05)
R^2	0.414	0.348	0.437	0.458

Goodness-of-fit: 22.65 p = .03; GFI = .987; CFI = .997; IFI = .997; RMSEA = .054

*Significant at $p < 0.05$, **significant at $p < 0.01$ one-tailed

Table 36: Correlations - Essay 2 Model 2

	Variable	1	2	3	4	5	6	7
1	Technological Innovation Capability	1						
2	Aesthetic Innovation Capability	.845*	1					
3	Market-Based Innovation Capability	.843*	.849*	1				
4	Quality improvement Capability	.807*	.786*	.819*	1			
5	Technological Product Newness	.605*	.566*	.604*	.515*	1		
6	Aesthetic Product Newness	.504*	.562*	.545*	.486*	.777*	1	
7	Market-Based Product Newness	.578*	.589*	.637*	.500*	.776*	.736*	1
8	Product Performance	.625*	.616*	.634*	.609*	.548*	.508*	.534*

*significant at $p < 0.01$ two-tailed

Market-based innovation capability has a positive effect on market-based newness ($\beta = .52$, $p < 0.01$), technological newness ($\beta = .33$, $p < 0.01$), and aesthetic newness ($\beta = .23$, $p < 0.05$), supporting H4a, H4b, and H4c.

Hypothesis 5: Interactions Between Quality Improvement Capability and Product Newness Types

The interactions between quality improvement capability and all of the product newness types, that are the interaction between quality improvement capability and (1) technological innovation capability ($\beta = -.15$, $p < 0.01$), (2) aesthetic newness ($\beta = -.15$, $p < 0.01$), and (3) market-based newness ($\beta = -.14$, $p < 0.01$), have a negative effect on technological newness, supporting H5a, H5b, and H5c.

Hypothesis 6: Product Newness Types

Technological newness ($\beta = .17$, $p < 0.05$) and market-based newness ($\beta = .15$, $p < 0.05$) have positive effects on product performance, supporting H6a and H6c, but aesthetic newness ($\beta = .07$, $p > 0.05$) doesn't have a significant effect on product performance.

Table 37: Hypotheses Overview Essay 2 Model 2

Hypothesis	Predicted Effect	Direction	Supported
H1a	QImpICap ->TecNewness	Negative	No
H1b	QImpICap ->AestNewness	Negative	No
H1c	QImpICap ->MktNewness	Negative	Yes
H1d	QImpICap ->ProdPerf	Positive	Yes
H2a	TecInCap ->TecNewness	Positive	Yes
H2b	TecInCap ->AestNewness	Null	Yes
H2c	TecInCap ->MktNewness	Positive	No
H3a	AestInCap ->TecNewness	Null	Yes
H3b	AestInCap ->AestNewness	Positive	Yes
H3c	AestInCap ->MktNewness	Positive	Yes
H4a	MktInCap ->TecNewness	Positive	Yes
H4b	MktInCap ->AestNewness	Positive	Yes
H4c	MktInCap ->MktNewness	Positive	Yes
H5a	QImpCap X TecInCap ->TecNewness	Negative	Yes
H5b	QImpCap X AestInCap ->AestNewness	Negative	Yes
H5c	QImpCap X MktInCap ->MktNewness	Negative	Yes
H6a	TecNewness ->ProdPerf	Positive	Yes
H6b	AestNewness ->ProdPerf	Positive	No
H6c	MktNewness ->ProdPerf	Positive	Yes

Discussion

This study provides an important distinction between the effects of exploration and exploitation related capabilities and tests the interactions between quality improvement (exploitation) capability and innovation (exploration) capabilities. Innovation capabilities have positive effects on their respective product newness types. In other words tech innovation capability has a positive effect on tech newness, as do aesthetic innovation capability on

aesthetic newness and market-based innovation capability on market-based newness. On the other hand quality improvement capability has a negative effect on market-based newness. These findings support the argument of Benner and Tushman (2003) that process management practices that are related to exploitation negatively effect innovations that require new knowledge and create departures from existing skills.

An important finding is the negative interaction between explorative and exploitative capabilities. Even though the explorative innovation capabilities have positive effects on their respective product newness types, their interactions with exploitative quality improvement capability have negative effects on their respective product newness types. For example, technological innovation capability has a positive effect on technological newness but its interaction with quality improvement capability has a negative effect on technological newness. These findings contribute to the RBV and innovation literatures by (1) demonstrating the negative interaction between exploitative and explorative capabilities, and (2) differentiating the effects of these capabilities on product newness types.

Technological newness and market-based newness positively effect product performance. It is particularly important since developing innovations with a combination of newness to (1) the customers, (2) the organizations, and/or to (3) the industry is very risky. The univariate increments in Table 34 indicate that the technological newness and market-based newness have similar positive effects. Contrary to the expectations, aesthetic newness does not have a positive effect on product performance. It is important to note that, unlike the product innovation types that all have a positive effect on product performance (tested in Essay 1), not all of the product newness types have positive effects on product performance. These findings contribute to the innovation literature differentiating the effects of product newness types on product performance.

The results reveal a difference between the effects of innovation capabilities. Market-based innovation capability appears to be very important not only for market-based newness but also for technological newness and aesthetic newness. As seen in Table 34, its effect on technological newness is as high as the effect of technological innovation capability. It appears that the capability to develop innovations for new and emerging markets stimulates creativity to produce radically new technological and aesthetic products. It makes sense because the new markets can be served with technological and aesthetic products. On the other hand, technological innovation capability affects only technological newness. This indicates the specialized nature of the innovation capability. As the results in Essay1 Model 1 indicate, technological innovation capability has strong connections with specialized knowledge that is strictly context dependent and loses its value in other areas such as aesthetics. Thus, the specialized nature of technological innovation capability may be the reason of its effect on only technological innovations. On the other hand, the effects of aesthetic innovation capability are more wide ranging, increasing both to aesthetic and market-based product newness. These findings contribute to the RBV and innovation literature by (1) introducing different types of product newness types, and (2) differentiating the effects of innovation capability types on product newness types.

Managerial Implications

This study has important implications for practitioners since it provides guidelines on how to strengthen product newness types and product performance. It would be beneficial for the managers to know which of the product newness types increase product performance. Technological product newness and aesthetic newness have a positive effect on product performance. Thus managers can gain from facilitating these product newness types. On the

other hand aesthetic newness do not have a significant effect on product performance. The managers need to make a clear distinction between aesthetic product innovation and aesthetic product newness since the former increase product performance and the latter does not.

Since the technological and market-based product newness have positive effects on product performance, it would be beneficial for the managers to know their contributors. Innovation capabilities differ in their effects on product newness types. Technological innovation capability contributes only to technological product newness; on the other hand market-based innovation capability contributes to all-three product newness types. Aesthetic innovation capability contributes to market-based product newness as much as market-based innovation capability and it is the highest contributor of aesthetic product newness.

The negative interaction between innovation capabilities and quality improvement capability indicates that managers need to balance their emphasis on these capabilities. Additionally, quality improvement capability has a negative effect on market-based product newness. However these findings shouldn't lead the managers to neglect quality improvement capability since, as Table 34 indicates, it has a higher effect on product performance than the product newness types.

Essay 2 – Conclusions

The two studies of Essay 2 contribute to the marketing literature by (1) explaining the relationship between market knowledge dimensions, innovation capabilities, product innovation and product performance, and by (2) providing an important distinction between the effects of exploration and exploitation capabilities and demonstrating the negative interactions between these capabilities.

The findings in the first study indicate that market knowledge dimensions have different effects of on innovation capability and product innovation types. The innovation capabilities meditate the relationship between market knowledge dimensions and product innovations and also the relationship between cooperation and product innovations. Inter-functional cooperation plays an important role in the innovation process since it has a positive effect on all of the innovation capability and product innovation types.

The first study extend the marketing, knowledge based view, and innovation literatures by (a) demonstrating the mediating role of innovation capabilities on the relationship between market knowledge dimensions and product innovations, (b) differentiating the effects of knowledge specificity and knowledge tacitness on innovation capabilities, (c) demonstrating the necessity of knowledge depth and knowledge breadth on innovation capabilities (d) differentiating the effects of market knowledge dimensions on different product innovation types, and (e) demonstrating the direct and indirect effects of market knowledge dimensions' on product performance.

The findings of the second study about capabilities indicate that innovation (exploration) capabilities have positive effects on their respective product newness types but quality improvement (exploitation) capability has a negative effect on market-based newness. There is a negative interaction between innovation capabilities and quality improvement capability on their effect on product innovation types. Additionally, quality improvement capability has a positive effect on product performance. Findings about product newness indicate that technological newness and market-based newness positively effect product performance.

The second study extends the resource-based view and innovation literatures by (a) introducing different types of product newness types, (b) differentiating the effects of

exploration capabilities and exploitation capabilities on product newness types, (c) demonstrating the negative interaction between exploitative and explorative capabilities, (d) differentiating the effects of product newness types on product performance, and (e) differentiating the effects of innovation capability types on product newness types.

Limitations and Future Research

This study has several limitations. The first limitation is that the theoretical framework and the results indicate relationships but not necessarily causality. The reason is that structural equation modeling does not provide causation among the constructs unless the data is collected in different times. Testing the Essay 2 models with a time series data can extend this study in several ways. First of all it can establish the causality. The times series data can answer several research questions such as; (1) “Do the effects of product newness types on product performance change over time?”, (2) “Do the effects of market knowledge dimensions on innovation capabilities, product innovations and product performance change in time?”, and (3) “Do companies lose their ability to develop really new products over time?”.

The second limitation of the study is its respondents. Even though the survey of this study was conducted in several different companies on managers from different hierarchy levels, there might still be a degree of bias in their responses. This study can be extended to include consumers input about the products. Especially the aesthetic, technological and market-based newness of the products can be measured both by the consumers and managers to test whether discrepancies exist. It is particularly important since the managers may perceive the newness of a technology to be low but customers can perceive the same technology as highly new or even too new simply because they do not fully understand how it works.

The third limitation is the sample selection process. The filter questions included firms that produce products that, to some degree, posses both technological and aesthetic features. The degree of technological or aesthetic features varies however this sample does not contain purely technological or purely aesthetic products. Collecting data from these types of industries can reveal the differences in the performance of aesthetic, technological and market-based innovations performances in different industries. Additionally, examining the effect of product newness on product performance across industries can show which industries are more receptive to product newness than others. The importance of knowledge types on innovations and product performance may vary across industries. For example, specific knowledge may be more important in highly technological industries whereas tacit knowledge may be more valuable in aesthetic design intense industries.

The fourth limitation of the study is the single country data collection. The sample includes companies from the U.S.. However the effects of product newness may vary across countries. Possible moderating constructs could be the economic and cultural differences. Some of the cultures may facilitate codified knowledge whereas some may facilitate tacit knowledge.

Lastly, two of the knowledge breadth and knowledge depth and one of the knowledge specificity measures had to be dropped due to the discriminant validity issues. This indicates a need to develop better measures for market knowledge dimensions.

APPENDIX

APPENDIX

Survey Items

Strategic Orientation

- **Customer Orientation** (Narver and Slater 1990)
    1. Our firm has a strong focus on customer commitment.
    2. Our firm has a strong focus on creating customer value.
    3. Our firm has a strong focus on understanding customer needs.
- **Competitor Orientation** (Narver and Slater 1990)
    1. In our firm, sales people have a strong focus on sharing competitor information.
    2. Our firm has a strong focus on rapidly to competitor's actions.
    3. Top managers in our firm are strongly focused on discussing competitor's strategies.
- **Technological Orientation** (Gatignon and Xuereb 1997; Zhou, Yim, and Tse 2005)

  Please indicate your company's extent of involvement in the following activities.
    1. Our company has a strong focus on sophisticated technologies that can be used to develop new products.
    2. Our company is interested in state of the art technologies that are needed to produce innovative products.
    3. Technological innovation knowledge obtained through research within the company and/or outside of the company is readily accepted in our organization.
- **Aesthetic Orientation** (Gatignon and Xuereb 1997; Zhou, Yim, and Tse 2005)

  Please indicate your company's extent of involvement in the following activities.
    1. Our company has a strong focus on aesthetic trends and innovations that can be used in its new product development process.

2. Our company is interested in knowledge that is needed to create aesthetic trends/innovations.
3. Aesthetic innovation knowledge obtained through research within the company and/or outside of the company is readily accepted in our organization.

Market Knowledge Competence

- **Customer Knowledge Process** (Li and Calantone 1998)

  In our new product development program:

1. We have the ability to learn the current and potential needs about new products.
2. We have the ability to integrate customer information into new products.
3. We are capable of using customers to test and evaluate new products.

- **Competitor Knowledge Process** (Li and Calantone 1998)

  In our new product development program:

1. We have the ability to search and collect information about our competitors' products and strategies.
2. We have the ability to integrate the information about competitors' products in our product design.
3. We are capable of understanding competitors' strategies.

Innovation Capability

- **Technological Innovation Capability** (Calantone, Cavusgil, and Zhao 2002)

1. Our company is capable of turning new technological ideas into actual products.
2. Our company has the ability and resources to be the first to market technologically new products.
3. Our company has the ability to introduce products that have state of the art technology.

- **Aesthetic Innovation Capability** (Calantone, Cavusgil, and Zhao 2002)
    1. Our company is capable of turning new aesthetic design ideas into actual products.
    2. Our company has the ability and resources to be the first to market aesthetically new products
    3. Our company has the ability to set the aesthetic trends in the market.
- **Market Innovation Capability** (Benner and Tushman 2003; Christensen and Bower 1996; Zhou, Yim, and Tse 2005)
    1. Our company has the ability to introduce products for new and/or emerging markets.
    2. Our company is capable of introducing products to new customer sets who are different from our existing customers.
    3. Our company has the ability to introduce a product that addresses an opportunity in a new market that is different from our current market.

Product Innovation

- **Technological Innovation** (Gatignon and Xuereb 1997)
    1. Our product incorporates a large body of new technological knowledge.
    2. Our product's technology is highly innovative, replacing a previous one.
    3. Our product's technology is highly innovative; that is, different from our main competitors' products.
- **Aesthetic Innovation** (Eisenman 2006; Gatignon and Xuereb 1997)
    1. Our product's aesthetic design is highly innovative, replacing the previous one.
    2. Our product incorporates a large body of new aesthetic knowledge.
    3. Aesthetically, our product is similar to our main competitors' products. (reverse coded)

- **Market-based Innovation** (Benner and Tushman 2003; Christensen and Bower 1996; Zhou, Yim, and Tse 2005)

    1. Our product concept is targeted to new and/or emerging markets.
    2. Our product is designed for new customer sets who are different from our existing customers.
    3. Our product is designed for addressing an opportunity in a market that is different from our current market.

General Product Performance (Garcia and Calantone 2002)

Our product is superior to competitors' in terms of

1. Sales that it generates.
2. Profits that it generates.
3. Value that it provides to the customer that is the amount of quality for its price (quality/price).

General Firm Performance

Please provide your opinion about your company's performance compared to your major competitors.

1. Sales growth in the past two years
2. Return on investment
3. Profit level
4. Market share

Inter-functional Cooperation (Li and Calantone 1998; Moenaert and Souder 1990)

Considering the New Product Development team that consists of Marketing, R &D or Aesthetic Designers:

1. Cooperate fully to achieve new product development goals.
2. Cooperate fully in generating and screening new ideas for new products.
3. Fully cooperate in establishing goals and priorities for our new product strategies.

Market Knowledge Dimensions

- **Market Knowledge Breadth** (De Luca and Atuahene-Gima 2007; Zahra, Ireland, and Hitt 2000)

  Compared to major competitors, our firm's knowledge of

  1. Competitors' strategies is narrow vs. broad.
  2. Competitors' strategies is limited vs. wide ranging.
  3. Our customers is narrow vs. broad.
  4. Our customers is limited vs. wide ranging.

- **Market Knowledge Depth** (De Luca and Atuahene-Gima 2007; Zahra, Ireland, and Hitt 2000)

  Compared to our major competitors, our firm's knowledge about

  1. Competitors' strategies is shallow vs. deep.
  2. Competitors' strategies is basic vs. advanced. .
  3. This firm's customers is shallow vs. deep.
  4. This firm's customers is basic vs. advanced.

- **Market Knowledge Tacitness** (De Luca and Atuahene-Gima 2007; Szulanski 1996)

  Our firm's market knowledge is difficult to

  1. Comprehensively document in manuals or reports.
  2. Comprehensively understand from written documents.
  3. Precisely communicate through written documents.

- **Market Knowledge Specificity** (De Luca and Atuahene-Gima 2007)

  Please indicate your agreement with each of the following statements with respect to your firm's market knowledge

  1. Our knowledge of customers and competitors is quite specific to our kind of business.
  2. It will be very difficult for an employee to transfer market knowledge acquired in our firm to other business environments.
  3. Our market knowledge and skills are tailored to meet the specific conditions of our business.

Quality Improvement Capability (Beckman 2006; Benner and Tushman 2003)

1. Our firm has the ability to improve the quality of existing products via using quality improvement programs (e.g. TQM, Six Sigma).
2. Our firm has the ability to develop general modifications or enhancements to existing products.
3. Our firm has the ability to improve product quality goals.

Product Newness Types (Garcia and Calantone 2002)

- **Technological Newness** (Garcia and Calantone 2002)

  Technologically, what is the level of newness of the particular product for

  1. Your firm
  2. Your competitors
  3. Your customers

- **Aesthetic Newness** (Garcia and Calantone 2002)

  Aesthetically, what is the level of newness of the particular product for

  1. Your firm

2. Your competitors
3. Your customers

- **Market Based Newness** (Garcia and Calantone 2002)

  If your product is aimed at a new or an emerging market, what is the level of newness of your product for

1. Your firm
2. Your competitors in that new market
3. The customers in that new market

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