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THE KNOWLEDGE-BASED VIEW FRAMEWORK: CAPABILITY OF KNOWLEDGE INTEGRATION LEADS TO CAPABILITY OF INNOVATION OR IMITATION

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Abstract

The central argument of this text is that, in the face of today's knowledge intensified global business competition, knowledge-based view (KBV) framework is more constructive and instructive than that of resource-based view (RBV) framework, in explaining the mechanism of how firms (both innovators or imitators) can establish and sustain competitive capabilities and advantages. Case study (Amazon) combined with a two-staged survey methods are employed to analyze and compare Japanese, Korean and Chinese firms in IT-related industries. The results are congruent implicitly or explicitly that, knowledge-based resource (intangible asset) is more decisive than that of tangible resource in stimulating firms (both market-leaders and market-followers) to pursue an entrepreneurial oriented strategy, and to gain first-mover advantages. The concepts of knowledge integration and tacit knowledge are defined respectively, and used to rationalize that, establishing a knowledge-based human resource management (HRM) system is critical to facilitate firms' capabilities of communicating and learning, to codify the integrated tacit knowledge into explicit instructions to guide organizational routines, to transform the codified knowledge into the innovations of product architecture, and to enhance the knowledge-based dynamic capabilities and advantages. Theoretically, this study concludes that, both innovators (market-leaders) and Shanzhai imitators (market-followers) are knowledge-driven. Although such a conclusion seems a bit of farfetched, but provides a direction for future researchers to empirically either verify or falsify.

Keywords: Knowledge Integration, Tacit Knowledge, Knowledge-based View, Human Resource Management, Geo-economic, Dynamic Capability, Innovation, Imitation, Shanzhai

INTRODUCTION

Purpose and Theoretical Framework of This Study

Traditional theories have been too relying on resource-based view (RBV) framework and too endeavoring to emphasize the role of developing and accumulating tangible resources (financial, raw materials, labors), in explaining the mechanism of how firms can become entrepreneurial oriented and preemptive in market competition. The role of knowledge (both tacit and explicit), widely referred as intangible resources, in terms of brand construction, entrepreneurial development, competitive capabilities and advantages, has not be given sufficient attention in the existing literature. Even though, there has been a prevalent prejudice stipulating that, it is the Shanzhai-based imitation rather than innovation that has made China the 'World Factory', the 'World 2nd Economy', and the 'Winner' of competition against those innovation oriented Western economies. China has been sarcastically mocked as a country of imitation, a country without its own proprietary technological innovation. It is argued that, such an inherited prejudice is resulted from the disrespect or ignorance of the fact that, the success of 'Chintrepreneurship' or the way of Chinese entrepreneurship is also resulted from an imitative-innovation process (Zhao, 2016; 2017; 2019); and that, such a prejudice, on the one hand, exposes a cognitive incompleteness of previous theory; on the other hand, provides an opportunity for this study to build theoretical argument to rationalize from the framework of knowledge-based view (KBV) that, the success of entrepreneurial stars emerged from those emerging economies (like China) has also been achieved through a process of knowledge-driven mechanism, in promoting the development of OEM and order-fulfillment. In response to such an existing prejudice and an imperative need to upgrade the existing framework, the author of this text argues that, it is the KBV rather than RBV, to guide and instruct firms to gain necessary resources, to develop and accumulate their dynamic capabilities necessary for market-leaders (innovators) to sustain their leadership, and necessary for market-followers (imitators) to catch-up and win the competition.

KBV is geo-economically differentiated that, the competitive capabilities of developed country firms may not be competitive in a developing market. The general failure of MNCs in China in the past 40 years is an ironed proof (Zhao, 2013; 2014; 2016; 2017; 2019). Knowledge-based capability may be considered as a geo-economically oriented measurement, internally determined by firms' ability of knowledge learning, and externally determined by environmental conditions, hosting and confining firms' business operations and competitions. To this end, first-movers, innovators and market-leaders may be categorized as geo-economic synonyms. Amazon is a first-mover worldwide, challenged by the threat of imitation worldwide; Alibaba is an imitator to the global market but simultaneously a first-mover in China, challenged

by the threat of imitation countrywide. Therefore, KBV framework is proposed as a more conductive and instructive framework than that of RBV framework in rationalizing the mechanism of dynamic capabilities and advantages, fitting with today's dynamically changing environment (See Figure 1).

Figure 1: Theoretical Diagram of Knowledge-based Dynamic Capabilities and Advantages

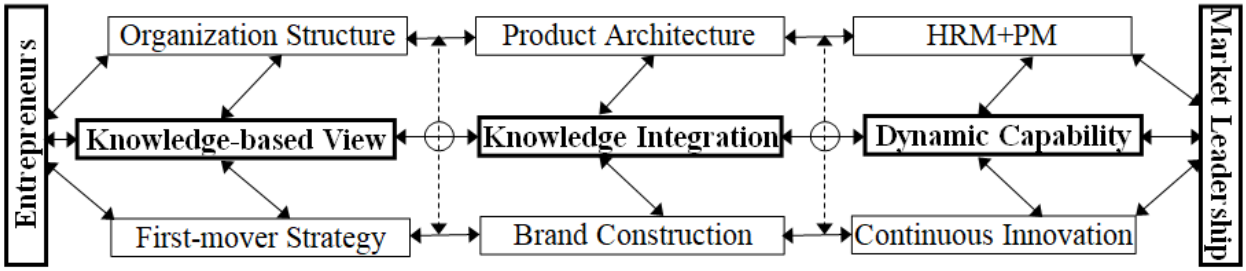


Figure 1 illustrates the core argument of this text that, KBV framework serves to guide firms (both market-leaders and market-followers) to establish an effective human resource management (HRM), which in turn, stimulates firms' motivation of continuous innovations of product architecture, facilitates firms to gain dynamic capability and competitive advantage(s) required for brand construction and market reputation. To fulfill the research purpose, this text firstly chooses Amazon as a case study to explain the characteristics and effects of knowledge-based first-mover advantage in e-commerce industry, which is renowned as an iconic contributor to the growth of the increasingly modernized economy. Secondly, this text chooses manufacturing firms from three countries (Japan, Korea and China) to examine how competitive advantages correlate with knowledge-based product architecture innovations and HRM practices. Lastly, this text theorizes that, KBV is more effective than that of RBV in guiding the development of firms' dynamic capabilities.

CASE STUDY: What can be Learnt from Amazon.com as the first-mover of E-commerce?

Data collection is from two sources, of which, the first is from 100 articles published in 12 different specialized periodicals mainly including *Forbes, Business Week, The Economist, Advertising Age* and *Wall Street Journal*; 200 articles from newspapers were also examined. The second source is from a myriad of Web postings of Amazon.com. The first source is relatively reliable since the periodicals do not have any particularly vested interest in Amazon; the second source is suspicious of potential tendency of bias. Hence, a cross-check procedure was adopted to corroborate the data validity, reliability and accuracy.

Why Amazon.com?

The word of 'savage' rather than 'intense' may better describe the competition of e-commerce market. Up to date, an effective method has not been established to help e-commerce first-movers to protect their knowledge-based ideas, technology and business models from the threats of imitations, and therefore, creating and sustaining first-movers' competitive advantages have been an industry-wide challenge. Traditional theories seem to be far from sufficient to explain the dynamism, the uncertainties, the opportunism or even the disequilibrium of e-commerce behaviors, making the industry featured with 'cannibalism', and globally characterized as the combination of 'high-risk, low entry-barrier, rampant imitation'. A very recently emerged example is Ubert, an e-service company initially imitated from but rapidly outperformed Craglist. To date, except for anecdotal evidences, little knowledge has been established to practically serve the commercial end, especially in terms of how first-movers can develop and sustain their advantages. Using Amazon as a case, this study is to fulfill such a cognitive gap.

Literature on First-movers' Capabilities and Advantages

Despite the mainstream of argument posits that, the dominance of market belong to those first-movers, however, most of previously conducted research on first-movers' advantages and disadvantages have concentrated on brick-and-mortar firms; and that, not many people understand the fact that, those internet-based pioneers such as Amazon and eBay among others, are mostly relying on their supply-chain partners and surreal stock market capitalization, rather than on the advantages generated from their business operations (Metcalfe, 2000). Seven factors may be distilled from previous literature and characterized as critical factors affecting first-movers' capabilities and advantages as well as disadvantages (See Table 1):

Table 1: Seven Critical Factors Affecting First-movers' Capabilities, Advantages and Disadvantages

1st	*Imitation*: Increasingly accrued evidences suggest that, in an emerging industry like e-commerce characterized as weak IPR, technological interdependence, market uncertainties, swift movement of information and rapid rate of innovation and so forth, the unpredictable risks of first-movers seem significantly higher than that of risks of imitators or late-movers (Bolton, 1993). Being a first-mover does not ensure its market share expansion and/or long-term rewards (Cahill, 1996; Kerin, *et al.*, 1992). First-movers in e-commerce may not be able to escape from being imitated, outperformed and eclipsed by late-movers, as soon as the market becomes matured (Golder & Tellis, 1993; Shankar, *et al.,* 1998).
2nd	*Time and Durability*: There exists a time order of entry-effect stipulating that, first-movers' advantages and market shares are inclined to diminish along with the time-sequenced late-entrants to the market (Galor,

	1985). First-movers' advantages is likely to be generated from the impacts of endogenous business processes, leading to an initial market asymmetry in conjunction with a rapid change of exogenous environment, forcing some incumbents to choose conservative and become risk phobia; meanwhile, providing opportunities for newly emerged late-movers become able to expand their market-share, enjoy highly priced mark-ups, reap off an abnormal profit, and shorten the durability of first-movers advantages (Makadok, 1998).
3rd	*Discourse Power*: Some scholars offered explanations about the occurrence of first-movers' advantages, elucidating that, the diminishing unit production costs is a widely cited reason in facilitating first-movers to achieve cost advantages, and to build market entry barriers (Lieberman & Montgomery, 1988). Other explanations focused on first-movers' advantages gained through preemptively defining the industrial standards and capturing the power of discourse, which in turn, facilitates first-movers to frame the prototype of market rules and regulations, to force late-comers to follow (Cahill, 1996; Kerin, et al., 1992), to strengthen the entry barrier (Golder & Tellis, 1993; Carpenter & Nakamoto, 1994), to raise the costs of consumers switch, and to lock-in or prevent them from switching over (Cady, 1985).
4th	*Risk and Uncertainty*: To those industries with high degree of uncertainties, the diffusion of knowledge may trigger unavoidable leakages, turning first-movers into the targets of imitations (Gilbert & Newbery, 1982; Mansfield, et al., 1981), and resulting in first-movers' advantages diminished (Wernerfelt & Karnani, 1987).
5th	*The Management of Knowledge*: Followers can learn from first-movers' mistakes especially from their products' design and value attributes (Carpenter & Nakamoto, 1994; Carpenter, et al., 1988), and therefore, when a follower becomes able to improve its product design, then, consumer-switch is likely to happen at the cost of first-movers' advantages.
6th	*Inertia*: In the face of risks and uncertainties, some first-movers may choose to be conservative and wait until the risks or uncertainties are resolved, in order to ensure the expected ROI (Golder & Tellis, 1993). Alternatively, some first-movers may choose to rely on what they are familiar with in terms of knowledge, technology and daily routines inherited over years, leading to a typical symptom referred as organizational inertia or incumbents' syndrome characterized as resisting to risks or changes resulted from market asymmetry, loathing to sacrifice the previously invested financial and human capitals and continuing to invest in the already obsolete technologies, equipment and/or product lines (Lieberman & Montgomery, 1988); and eventually incurring a diminished effect of first-movers' advantages (Bolton, 1993).
7th	*Geo-economic*: The country-specific political-economic system determines the first-movers' capabilities and advantages. The failures of Google, Yahoo, MSN in China, only proved themselves as too arrogant and ignorant to understand the intrinsic mechanism of China politically dominated economic system, not able to adapt into the peculiar complexities and uncertainties that has connived the systematically rampant imitation in China. One after another e-commerce stars emerged from China such as Alibaba only proved itself to be a successful imitator (Shanzhai) rather than a first-mover (Zhao, 2013; 2014; 2016; 2017; 2019a; 2019b).

Table 1 indicates that, first-movers' advantages and disadvantages are substantially determined by their respective prowess of knowledge and technology capabilities. Imitation is unavoidable, but the duration from the point of innovation to the point of being imitated may be prolonged, and the longer durability the greater benefit of innovation. To this end, Amazon may be viewed as an exemplar of both developing and sustaining knowledge-based first-movers' advantages.

Continuing Innovations and Multiple 'Firsts' Providing Amazon with First-mover's Advantages

As the first online book retailer and distributor, Amazon.com shook the foundation of historically inherited brick-and-mortar business model (Fortune, 1997; Machlis, 1998; Munk, 1999), becoming the first ever, an iconic brand and synonymous of globally recognized e-commerce (Economist, 2000), being the first described as a 'beguilingly attractive' e-business model (Fortune, 1997), symbolically driving the brick-and-mortar warehouses retired, and the capital-intensive inventory transferred to other parties (Business Week, 1999). Being the creator and the patented beneficiary of multiple '***Firsts***', Amazon has been reputed as an industrial leader with glorious heritage of innovation (PC Week, 1999). Since 1995, Amazon has emerged as the ***first*** company initiating an online book retailing service model; the ***first*** company enabling consumers to experience online book search and order (Postrel, 1996); the ***first*** company launching 'one-click' model to streamline the customer information, including credit card numbers, an innovative model rapidly imitated by firms across industries; the ***first*** company executing the collaborative-filtering technology to assemble first-hand information, to analyze customers' buying habits and purchase history, to capture and enhance customers' preferences, to predict and recommend what customers want, resulting in 25% as its return rate of purchase, considerably lower than the 30% of the industry average, and consequently, enabling Amazon to become the ***first*** company in e-commerce to get lowest deals from publishers (suppliers). Amazon is also the ***first*** company offering customers an e-mail-based alert and order tracking system (Hof, et al., 1998); and the ***first*** company introducing two ways of stimulating customers' purchasing desires and decisions. Through its acquisition of Junglee Corp in August 1998, Amazon became able to provide a comparison-shopping program, allowing customers to find and allocate products beyond the scope of Amazon's products categories; through its reciprocal affiliation program, Amazon became able to provide a commission-based website referral program to attract participants from affiliated websites, and therefore, expand its customer-base (Warner, 1999).

Being an initiator of multiple '***Firsts***' enabled Amazon to have achieved a series of notable first-mover advantages, such as brand construction, turning Amazon into a globally trusted brand (Barrett, 1999a; 1999b; *Economist*, 2000; Hof & Hemelstein, 1999; Reid, 1998).

According to Mr. Jeff Bezos, founder and CEO, Amazon spends approximately 40% of its revenue on brand construction (Margolis, 1999), enabling Amazon to become a customer-centric company (*Business Week*, 1999). Amazon has tripled its marketing expenses in between 1998 and 1999, seeking to capitalize its brand, diversify its business, and turn Amazon into a 'proto-typicality' or a best place to purchase and search for any products or services online. Therefore, being the initiator of multiple '*Firsts*' enabled Amazon to achieve strategic diversification and customer-relationship (Golder & Tellis, 1993; Carpenter & Nakamoto, 1994); to control the industrial standards and discourse power (Wileman, 1999); to increase customers' switching cost, making customers reluctant to switch to other online vendors (Enders & Jelassi, 1999), increasing customers' repeated purchases surpassing industry's average (Machlis, 1998); to expand market share, and to force its competitors and imitators to play the game of catching-up.

Patenting Innovation in a Timely Manner Providing Amazon First-mover's Advantages

Just by being an innovator alone is not enough for Amazon to sustain its first-mover advantages; patenting innovation in a timely manner is a necessary and sufficient condition to ensure Amazon to stay ahead of competition, and to sustain its pioneer position in e-commerce (Deck, 1999). A similar and typical example is Silicon Valley, known as an icon of dot-com, grabbing a myriad of first-mover advantages not by delivering the merchandizes to consumers, but by filing various dubious patents and gaining various royalties (Dugan, 2000). To this end, who is the beneficiary of first-mover's advantages is not purely decided by who is the first to market, instead, it is decided by who is the first to get the innovation patented (Trippe, 2000). The sooner an innovation is patented, the earlier the innovator starts being protected from imitators' threats, and achieving and enjoying the benefits of first-mover advantages.

It is argued that, without having its multiple 'Firsts' (innovations) patented in a timely manner, Amazon would not have been able to achieve and sustain its success (Dugan, 2000). Being the initiator of multiple '*firsts*' makes Amazon not only the target of imitators (followers) and/or rivals, for example, Barnes and Noble has been imitating and competing with Amazon. In the meantime, Amazon has also been accused as an imitator, copying the front-page design of eToy.com website to promote its online toy retailing (Armstrong, 1999). In October 1988, Wal-Mart filed a lawsuit alleging Amazon for violating the trademark patent, stealing the insiders' knowledge of Wal-Mart's data warehousing, distribution, and merchandise management systems (Gannon, 1998). Regardless the truth of 'who imitates who', the law only protects the one who has the 'innovation' patented first.

Three Knowledge Management Strategies Determining Amazon First-mover's Advantages

Given the dynamism of e-commerce, patenting innovation in a timely manner is the fundamental strategy for innovators (first-movers) to withstand or offset the threat of the speed of imitations, which would otherwise leave no time for innovators to build a threshold. It is not an unusual case that, by the time an innovation is patented, it already becomes outdated or being imitated. When priceline.com launched its 'reverse auction' model for cheapest air tickets, hotel rooms and rental cars, it was imitated only months later. To this end, this text argues that, how Amazon has successfully maintained its global leadership position, may be largely attributed to its three proactive and preventative knowledge management strategies, aka: speed of patenting, continuous innovation, and brand construction (See Table 2):

Table 2: Three Proactive and Preventative Strategies Driving Amazon to Stay Ahead of Late Movers

1st	*Speed of Patenting Strategy:* helps and ensures Amazon to prevent or prolong the time-duration of being eroded or jolted by imitators, and consequently, maintains its status quo as an industrial leader.
2nd	*Continuous Innovation Strategy:* enables Amazon to stay abreast and maintain its first-mover capabilities and advantages, to remain ahead of its major competitor (i.e. Barnes & Noble), a company with stronger financial and human resources, and to force other followers playing the game of catching-up.
3rd	*Brand Strategy:* provides Amazon with competitive capabilities and advantages to increase the costs of customers' switching-out, and attract customers to switch-in from competitors.

Implications Drawn from the Case of Amazon: Knowledge Management is the Key

Although most of Amazon's previous advantages have been eclipsed by imitators or followers, however, the three strategies listed in Table 2 has enabled Amazon to have earned and maintained competitive advantages within a long period of time. First-mover capabilities and advantages are not only knowledge and technology (innovation) determined, but also geo-economically determined within a time-frame. E-commerce stars emerged in China are considered first-movers in China market, but considered Shanzhai imitators or later-movers in global market. In an age of rapidly globalized IT-system, in conjunction with the increased availability and mobility of workforce, it is difficult (if not impossible) for firms to avoid knowledge leakage; therefore, the capability of continuous innovation seems to be an effective solution for first-movers to stay ahead of competitors, imitators or followers. To this end, the marrow of Amazon case is to articulate and emphasize that, the knowledge-based view framework is more appropriate in guiding and facilitating both innovators (first-movers) and imitators (followers) to develop their respective innovation-based capabilities and advantages, than that of the traditionally inherited resource-based view framework. For this reason, the next section is

subjected to discuss how product architecture, organizations of product development and HRM practices, are correlated and attributed to the development of knowledge-based organizational capability and advantages.

PRODUCT ARCHITECTURE, ORGANIZATION OF PRODUCT DEVELOPMENT, AND HRM PRACTICES

By establishing three hypotheses, and by adopting a two-staged survey (questionnaire and phone interview), this study has analyzed endogenous and exogenous factors, and found that, the choice of product architecture, the choice of product development organization, and the choice of HRM practices (i.e. project-team development, employees' skill-development, and firms' knowledge management), are correlated, but differentiated from each other among the three country firms (Japan, Korea and China). Implications drawn from the findings help interpret how knowledge management has affected the developmental mechanisms of innovators (Japanese and Korean firms), and imitators (Chinese firms).

Why Comparing Firms from Japan, Korea and China?

The rise of Asian Tigers during the 80s of last century, the rapidly emerged China and India economies at the beginning of this century, together, they make south-east Asia not only the hub of cheap-price based manufacturers, but also the center of high-tech assemblers and R&Ds. This is especially the case in mobile phone industry, household electronics industry, and software and information technology industry. These sectors are featured as knowledge and technology intensive. Firms in Japan are standing at the frontal line leading global high-tech development; firms in Korea such as Samsung, LG are becoming the major competitors in global electronic market; Tartar (India) and Huawei (China) are also emerging stars of innovations. The successful catching-ups of these firms may be codified as a neo-classical model, providing a post-modern transformational roadmap to enlighten other developing country firms' catch-up. By adopting knowledge-based framework, this study is motivated to interpret how Shanzhai imitation-oriented catching-up pattern of China firms can be differentiated from Japanese and Korean firms.

How Can Previous Findings Help Establish and Rationalize the Three Hypotheses in This Study?

Existing literature has been focusing on individual firm's success, like how Toyota Production System (TPS) has been developed, and becoming global manufacturing model. There seems lack of systematic research on the mechanism and transformational pattern of how developing

country firms have been collectively catching up; how they can be differentiated from those developed country firms in terms of HRM practices, knowledge and technology transfer, choice of product architecture, and organization of project-team dedicated to product development, and how project-managers (PMs) can be country-specific in terms of their authority or decision-power required to coordinate the process of product development.

Product Development and Organizational Capability

Product development is defined as a process of incorporating activities, from forming ideas and designing parts, through manufacturing and assembling, to marketing the finished products into the hands of end-users (Fujimoto, 2002), or, a process of problem solving activities, from organizing project-team to defining PMs' conducts (Clark & Fujimoto, 1991). It is argued that, the capability of technology on both firm and industry level is a key measure, determining the advancement of product development (Clark & Fujimoto, 1991; Fujimoto & Nobeoka, 2006). However, little knowledge has been established to date on the measure of cross-industries organizational capability in relation to product architecture, product development and HRM practices (Aoshima, 2005; Baldwin & Clark, 2000; Fujimoto & Yasumoto, 2000; Kishi & Fujimoto; 2010; Ulrich, 1995). It is suggested that, in between the choice of product architecture and the choice of HRM practices, there seems to have a complimentary relationship (Aoshima, 2005; Baldwin & Clark, 2000; Fine, 1998; Langlois & Robertson, 1992; Sanchez & Mahoney, 1996).

Product Architecture and Strategic Choices from the Perspective of Knowledge Management

Product architecture and its dynamic transition have been the focal point of previous argument. Some scholars insisted on the trend shifting from integral model to the modular model (Baldwin & Clark 2000). Others argued the opposite direction of the trend, from modular to integral (Fine, 1998). Major factors that cause the directional transition include (1) changes in functions that a product is to fulfill (Henderson & Clark, 2000), and (2) changes in technology applied in product development (Christensen, 1997). However, literature provides limited discussions on the mechanism of how firms create new product architectures, and how industrial and institutional constraints influence them in doing so. Most of previous findings to date mainly focus on examining the change of product architecture as a result of technological capability change over time, overlooking the fact that, the choice of product architecture is also determined by firms' strategic choices (Fukuzawa 2008). In other words, whether the transition of product architecture is the result of endogenous change of internal knowledge management, or the result of exogenous change of external knowledge environment, is still unclear.

Product Architecture and HRM Practices from the Perspective of Knowledge Management

The role of engineers is recognized as the 'knowledge engine' driving the dynamic mechanism of product R&Ds, therefore, conventionally standardized HRM routines may be too stagnant to stimulate engineers' motivation and potential value (Peltz & Andrews, 1966), nor to incentivize their commitment to innovation (Allen, 1977; Kornhauser, 1962). In the face of today's dynamically changing business environment featured by either the frequency or rhythm of knowledge and technology upgrading, or the pace of obsolescence, one of the most challenging issues to firms' HRM is to ensure the organizational 'knowledge engine' maintained and upgraded up to date.

Conventionally in China for example, R&Ds are strictly categorized as the responsibility of state-owned institutions (aka: research institutes), completely isolated from industries (a copy of former Soviet Union' social system). Beginning in 1990s, as economic reformation deepened, facing the increasingly intensified global competition for organizational intellectual capital, knowledge development and management started becoming the top priority of HRM, resulting in a mushroomed emergence of a large number of enterprises-based R&D-centers or labs, and forcing firms' HRM departments to deal with three frequently encountered challenges in order to fit with the transition from traditionally labor-intensive oriented competitions, to the presently knowledge-based competitions (See Table 3):

Table 3: Three Frequently Encountered Challenges Affecting Firms' HRM and Knowledge Management

1st	The prevalence of talents mobility has been a channel of knowledge leakage, jeopardizing firms' HRM development of knowledge-based capability and competitiveness (Imano, 1997). The organization of cross-functional departments' project-team is proposed as an effective solution to sustain firms' innovation capabilities (Aoshima, 2005).
2nd	A none-knowledge-based HRM system is obstructive to engineers' innovativeness and labor resource productivities (Nakata & Soken, 2009). Creating a knowledge-based incentive HRM system is recommended as an effective and efficient solution (Fukutani, 2008; Ohara, 2009).
3rd	Seniority-based compensation and promotion system has been criticized as the root-cause of talents mobility in both developed and developing markets (Ishikawa & Ishida, 2002; Miyamoto, 2009; Nagano, 2002). Assigning engineers to universities or research institutes to upgrade or refresh their knowledge and skills, and providing them with a promise of promotion, is proposed as an effective and efficient HRM solution to cope with the increasingly intensified conflict, between the traditional seniority-based promotion system and the emerging performance-based compensation and promotion system (Fukutani, 2008).

Theoretical Framework and Three Hypotheses

The relationship between product architecture, organization of product development and HRM practices should have been, but not yet, given enough attention in the existing literature. Firstly, product architecture has been treated as a derivative from exogenous change (product market change), ignoring the fact that, it should also be treated as an endogenous factor determined by firms' strategic choices. Secondly, the development of product architecture should be related to firms' HRM practices in terms of both within-functional department and cross-functional department project-team organization. Thirdly, product architecture, organization of product development, and HRM practices should be considered as complementary rather than isolated to each other, accordingly, three hypotheses are:

Hypothesis 1: Firms' strategic choice of product architecture correlates with the level of industrial technology and the intensity of product market competition.

Hypothesis 2: Firms' strategic choice of product architecture correlates with the organization of product development, marketing strategy, and customer-relationship strategy.

Hypothesis 3: The relationship among the product architecture, the organization of product development, and the HRM practices, is complimentary.

METHODOLOGY

A two-staged survey method is employed in this study to compare companies selected from private-sectors of three countries (Japan, Korea and China), and to examine the effect of knowledge management. Mobile phones, liquid crystal televisions (TVs), and software and IT are selected as the three industries. The sample firms were drawn from an online list of companies by industry and by countries, and required to have a formally established HRM department, a previous experience of product development, and maximum of 200 employees (in order to be qualified as SMEs). 25 firms were randomly selected from each of the three industries respectively. The first-stage survey is conducted by sending out a questionnaire through emails to the heads of HRM and product development departments of those selected firms in between February 1st and May 1st 2014. By explaining the research purpose, this study received a relatively decent rate of response from Japanese and Korean firms (41% and 33% respectively), and a low rate of response from Chinese firms (9%). The second-stage survey is conducted through a follow-up phone-interview with each of those HRM and product development heads in between August 15th and October 15th, 2014. The two-staged surveys were focused on two questions:

Q-1: Comparing to the overall labor-hours consumed up until mass production commenced, what is approximately the percentage of labor-hours consumed for the design of modular architecture product versus the design of integral architecture product respectively? Answers to this question help estimate each firm's technological capability of product architecture development.

Q-2: Comparing to the industrial standards applied, what is approximately the percentage of your company's own proprietary interface standards applied in the process of product development? Answers to this question help evaluate each firm's technological interface platforms, as of within-firm based platform versus that of cross-firms based platform of product architecture development.

It is assumed in this text that, when 'modular architecture' is the choice of product development, it indicates that, the firm chooses a 'closed' design interface platform, and pursues a simple (e.g. one-to-one) relationship between a particular function and a particular component; when 'integral architecture' is the choice, then, it indicates that, the firm chooses an 'open' design interface platform (beyond a particular firm), and pursues a multi-related or complicated relationship between particular functions and components. In line with this general assumption, the two-staged survey provides this study with sources of information, namely, the head of HRM and the head of product development. A cross-check procedure was conducted to examine data validity. An immediate result prior to further analysis is that, the heads of Chinese firms' HRM departments do not hold as strong authority as the heads of those Japanese and Korean firms, confirming that, Chinese firms were still at the primitive stage of business management, and that, non-family members do not possess the real authority (Zhao, 2016; 2017; 2019a; 2019b).

RESEARCH FINDINGS

Results from Comparing Mobile Phone Firms across the Three Countries

Mobile phone firms selected from Japan are labeled as *JMPs*, Korea as *KMPs*, and China as *CMPs*. All firms have a clear footprint of pursuing diversification as their product development strategy. *JMPs* is mostly integral architecture oriented, indicating an internally advanced technological capability and externally intensified market competition; product development and sales are mostly focused on and adapted to domestic telecommunication-carriers. *KMPs* demonstrates a mix of integral and modular architectures. To high-end market, integral architecture is the main approach to product development, focusing on the speed and succession of product upgrade through the application of cutting-edge technology, targeting at global market competition; to low-end market, modular architecture is the main approach,

focusing on the volume and price of production. As to *CMPs*, modularization dominates the industrial phenomenon of product architecture, revealing an inferior level of technological capability. The results of three hypotheses for mobile phone firms may be summarized as shown in Table 4.

Table 4: Results of Three Hypotheses Drawn from Mobile Phone Industries of the Three Countries

H1	*Hypothesis 1* is supported. Product architecture correlates with the level of industrial technology and the intensity of market competition. Japanese market is comparatively intensified, and therefore, integral architecture dominates the mainstream of product design.
H2	*Hypothesis 2* is supported. Product architecture is correlated with product development strategy, marketing strategy and customer-relationship strategy. Cross-functional project team is common. PMs of *KMPs* and *CMPs* are end-user oriented, holding greater authority or decision power than PMs of *JMPs*. In comparison, *JMPs* focus on product-customization to satisfy the requirement of telecommunication carriers.
H3	*Hypothesis 3* is largely supported. The complimentary relationship among product architecture, organization of product development, and HRM practices is roughly confirmed. However, *CMPs* deserve to be exclusively discussed. Interviewees of *CMPs* revealed their emphasis on performance but de-emphasis on skills when evaluating employees' job promotion and pay increase. Interviewees of *JMPs* and *KMPs* explained their strong incentives to encourage employees' long-term commitment to develop and accumulate their skills. To this end, *CMPs* do not support the complementary relationship as much as *JMPs* and *KMPs* do.

Results from Comparing Liquid Crystal Televisions Firms across the Three Countries

Firms selected from Japan are labeled as *JTVs*, Korea as *KTVs*, and China as *CTVs*. All firms have a clear footprint of pursuing diversification as their product development strategy. *JTVs* and *KTVs* may be qualified as technological prowess in liquid crystal and plasma televisions industry, holding a large global market share respectively. As for *CTVs*, they may be considered as the fast growing liquid crystal TVs imitators. The results of three hypotheses may be summarized as shown in Table 5:

Table 5: Results of Three Hypotheses Drawn from Liquid Crystal TVs Industries of the Three Countries

H1	*Hypothesis 1* is supported. There is a clear industrial pattern of product architecture. *CTVs* are mostly modular-oriented and involved in assembling those parts and components with low technological threshold at the low-end of value-chain. *JTVs* and *KTVs* are primarily involved in integrated-design of those high-end parts and components, indicating that, product architecture correlates with firms' technological capabilities.
H2	*Hypothesis 2* is supported. Product architecture is correlated with product development strategy, marketing strategy and customer-relationship strategy. Cross-functional project team is an organizational routine of

	product development. There appears a clear pattern that, the more integral the product architecture, the higher authority the PMs posess.
H3	*Hypothesis 3* is largely supported. The complementary relationship among the product architecture, the organizational structure of product development, and the HRM practices, is confirmed. To *JTVs* and *KTVs*, product development is integral architecture oriented, and organizational tacit knowledge and employees' technological skills are the measures of their employees' capabilities and performances. As for *CTVs*, their HRMs rely on a job grading system rather than technological skills to evaluate their employees.

Results from Comparing Software and IT Firms across the Three Countries

Firms selected from Japan are labeled as *JITs*, Korea as *KITs* and China as *CITs*. All firms were involved in software and IT development. The results of three hypotheses may be summarized as shown in Table 6:

Table 6: Results of Three Hypotheses Drawn from Software and IT Industries of the Three Countries

H1	*Hypothesis 1* is supported. Product architecture is dominated by modular design, consisting of operating system, middleware and applications, relying on a process flow from manufacturers, assemblers, installers, system developers, to customer service providers.
H2	*Hypothesis 2* is supported. Modular-based product architecture correlates with firms' strategic choices of product development, requiring a high degree of autonomy and a less adjustment of interfaces. PMs of *JITs* and *KITs* tend to be aligned with the process flow of product development, holding stronger authority than the PMs of *CITs*, indicating a need for *CITs* to reduce barriers and to enhance cross-functional collaborations.
H3	*Hypothesis 3* is largely supported. The complimentary relationship among the product architecture, the organization of product development and the HRM practices, is confirmed. The rapidly increased demand for engineers and skilled workers in the industry is the most challenging issue to the development of HRM. The combination of off-the-job and online trainings is an industry-wide HRM practice to enhance the cross-functional project-teams' capabilities of knowledge acquisition and accumulation. The combination of monetary reward and job promotion is a widely adopted HRM system to incentive the development of organizational capabilities and performances. The combination of skill-grading and job-grading is the mostly applied measures to evaluate employees' expertise and skills.

Implications Drawn from the Results of the Three Hypotheses: Knowledge Management is the Key

The three hypotheses are basically confirmed across-industries and across-countries. Internally, firms' strategic choices of product architecture correlate with their management resources, organizational design, marketing strategy, employees' accumulated skills, and consumers' preferences. Externally, firms' strategic choices of product architecture correlate with the

intensity of industrial technology threshold and market competition. Mobile phones and liquid crystal TVs industries tend to rely on cross-functional project team organization and integral architecture in product development. Software and IT industry tend to rely on within-department project team organization and modular architecture in product development. Such a clearly differentiated pattern between manufacturing and service industries may be best explained from the perspectives of products' functions and users' experiences. Mobile phones and liquid crystal TVs are function-oriented products, requiring as much endeavors as possible to develop as diversified and integrated functions as possible; therefore, cross-functional department project-team seems to best serve the purpose. Software-IT system is primarily service- and performance- oriented, requiring as much easier installation, application and upgrading as possible. Hence, within-department project-team organization is preferable, and modular architecture of product design is critically compulsory, in order to ensure the compatibility required to link multi-parties across platforms or interfaces. Comparatively, Japanese and Korean firms tend to pursue integral architecture complementary to the cross-functional project-based product development; Chinese firms tend to pursue modular architecture complementary to the within-functional project-based product development (Aoshima, 2005; Nobeoka, 2006). Based upon these findings, three implications may be drawn as listed in Table 7:

Table 7: Three Implications Drawn from the Survey Results

1st	The first implication is that, the choice of product architecture (modular or integral) is more determined by firms' endogenous factors such as market strategies, technological capabilities and available and usable resources, than by firms' exogenous factors, such as industrial characteristics and market conditions. Integral-based architecture is mostly likely to be innovation-oriented (Japanese and Korean firms); modular-based architecture is mostly likely to be imitation-oriented (Chinese firms).
2nd	The second implication is that, the choice of product architecture is correlated with firms' engineers' status. Japanese and Korean firms possess high percentage of tenured engineers; therefore, they are more likely to pursue the seniority-based system to strengthen their sense of ownership, responsibilities and/or loyalties, than that of imitation-oriented, cost-saving and profit-making performances of Chinese firms.
3rd	The third implication is that, firms should commit their HRM strategies to cross-disciplinary knowledge and technology transfer via organizational routine of communication without extra costs to firms. Reducing organizational rigidity to encourage PMs to be as much versatile, flexible, adjustable and preemptive as possible, to enhance project-teams' front-loading problem solving abilities, to establish, institutionalize and prioritize a skill-based performance measurement, and to improve firms' competitive capabilities.

Table 7 illustrates the results of the three hypotheses. It is worth to note that, interviewees' opinions may be considered anecdotal, and not qualified as an authentic proof, nevertheless,

some hints drawn from interviews may deserve future researchers' attention to an imperative need to reform the traditionally inherited management theories and practices. One of the prevailing opinions from interviewees is that, the seniority-based compensation and promotion system is no longer a 'fit' with today's knowledge-based competition. Instead, the combination of monetary-reward and promotion is becoming an incentive HRM practice to retain engineers and skilled workers, and to stimulate their desires of enhancing knowledge-and-skill based performances. Another prevailing opinion is that, knowledge-based competition requires PMs to possess as much versatility and decision-power as possible in order to coordinate cross-functional departments (internal) and cross-firms (external) collaborations and to shoulder excessive tasks beyond normal responsibility of department heads. For instance, PMs of Japanese and Korean firms are comparatively more knowledge-driven, more inventory control and order-fulfillment oriented, and therefore, more eager to pursue 'make-to-order' type of manufacturing and inventory systems, than those PMs of Chinese firms that still obsessed with the conventional concept of 'make-to-stock'. The third prevailing opinion revealed from interviewees is that, cross-department or even cross-firms collaborations is increasingly becoming a standardized norm of HRM practices, and serving as an effective solution to overcome the defects resulting from the nepotism-oriented HRM practices, hindering the development of knowledge-based dynamic and competitive capabilities on both organizational and individual level.

KNOWLEDGE-BASED VIEW (KBV): Knowledge Integration vs. Dynamic Capability

The rhythm of technological innovations has been driving the evolution from the conventionally inherited resource-based competition to the increasingly intensified and diversified knowledge-based dynamic competition. The capability of knowledge integration has been gradually becoming as a key driver, stimulating the development of organizational capabilities and competitive advantages through the promotion of product architecture innovation and value creation. Intangible resource has been playing a more critical role in today's competition than tangible ones in the past. Tacit knowledge has been becoming a more decisive factor, forcing organizations not only to develop and accumulate their capabilities of knowledge integration, but also to codify and transform their tacit knowledge into explicit instructions to establish and guide organizational daily routines of gaining competitive advantages. In the face of such an increasingly knowledge-based competition, KBV framework is becoming more instructional to facilitate both innovators (market leaders) and imitators (market followers) to develop and accumulate their respective competitive capabilities, than that of conventionally inherited RBV

framework. This section endeavors to rationalize the construct of KBV that, the capability of knowledge integration determines firms' dynamic and competitive capabilities.

Theoretical Evolution from Resource-based Competition to Knowledge-based Competition

RBV may be considered and described as an outdated framework stereotyped by the resource-conduct-performance school of industrial economics associated with neoclassical microeconomics and market competition – has completed its historical mission, and should be either retired or upgraded in order to fit with today's knowledge-dominated competition characterized in Austrian school of economics stipulated by Schumpeterian concept that, competition is a process of creative-destruction (Schumpeter, 1934). Such a cross-century cognitive evolution may be epitomized as a result of theoretical evolution of strategic management (Jacobsen, 1992).

Since the beginning of the 1980s, business strategy has been relying on financial, material, labor, and market structure kind of resource-based monopoly rent to create market advantages (Porter, 1980). During that economic period, the impact of the RBV framework on value creation may be interpreted from three perspectives. Firstly, in a situation when firms' internal management is in a state of flux, when monopoly rents quickly succumb to the emerging sources of competition, and when monopoly power is no longer the source for firms to yield profit-making advantages, then, Ricardian rents (returns from resources input over the output of opportunity costs) appear to be the primary source of profit earning (Rumelt, 1991). Secondly, in a situation when firms' external market is in a state of flux, when firms' internal resources appear to be a more stable support for strategy formulation than the external resources such as traditionally pursued customer-relationship oriented marketing strategy (Levitt, 1960), then, the supply-side rather than the demand-side strategy becomes the fundamental contributor to the development of organizational capabilities, competences and advantages (Porter, 1991; 1992; Prahalad & Hamel, 1990). Thirdly, in a situation when competitive conditions becomes more determined by external (market) resources than by internal (firm) strategies (Barney 1986), then, it incurs a series of situations characterized as hyper-competition (D'Aveni, 1994); and when competition for scarce resource is defined as idiosyncratic, or as not easy to be transferred or replicated (Grant 1991), then, organizational tacit or integrated knowledge becomes the key to determine firms' strategic competencies (Quinn, 1992).

Theoretical Construct of KBV: Knowledge Integration, Organizational Capability, Value Creation

KBV is defined in this text as a framework that, the capability of tacit knowledge development determines and differentiates firms' competitive capabilities in terms of their respective product architecture design, manufacturing process, and value-creation. Tacit knowledge is individual-based, acquired and stored by talented individuals; therefore, the development of tacit knowledge may be interpreted as an accumulative process of individual specialization, and/or a process of transforming knowledge input into value-added product output. It is argued in this text that, when tacit knowledge functions as a critical resource of input, it enables firms to overcome the barriers or constraints such as the threat of imitations. In other words, the marrow of KBV framework is to guide firms to establish an appropriate propinquity of knowledge-based competitive environment, to stimulate and incentivize individuals to develop, integrate and transform knowledge into product development, and to facilitate the development of firms' capability of knowledge integration both within- and cross- firms of the entire supply chain (Demsetz, 1991). Therefore, this paper is to justify *why* and *how* the tacit knowledge or integrated knowledge must be recognized as a critical contributor determining firms' dynamic capabilities.

Definition of Knowledge Integration

Given the aforementioned theoretical construct, knowledge integration is defined in this text, theoretically as the combination of knowledge acquisition and application, practically as firms' capabilities of developing, applying and transforming knowledge from intangible resource into a tangible process of profit-making. Such a definition serves to emphasize two theoretical assumptions, of which, the primary assumption may be articulated as: in the face of today's dynamic competition, profitability is more likely to be associated with internal knowledge-based capabilities rather than with external or market conditions described as generic-strategy in the books; and the secondary assumption is that: knowledge-based capabilities can be derived from either firms' proprietary knowledge or imitated knowledge from others.

Knowledge Integration: Combination of Knowledge Acquisition and Application

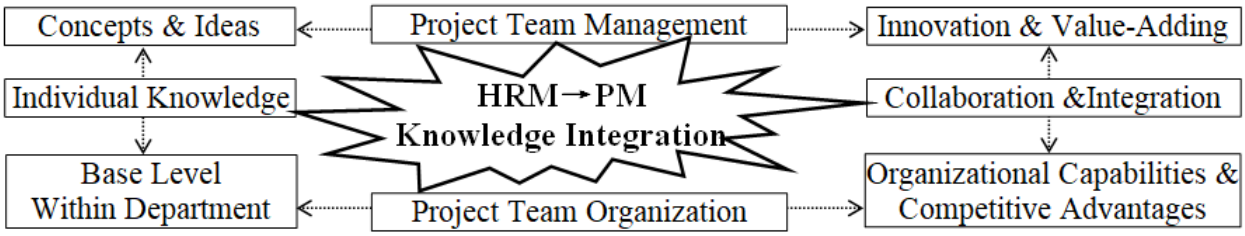
Knowledge learning ability has been recognized as organizational capability of acquiring, processing, storing, and applying knowledge (Argyris & Schon, 1978; Levitt & March, 1988; Starbuck 1992). Knowledge acquisition is interpreted as the results of two dimensional knowledge transfers, namely, the transfer from tacit to explicit and vice-versa, and the transfer from individuals to organizations (Nonaka, 1994). To this end, knowledge integration engages in

two processes, one is involved in knowledge acquisition, requiring individuals to be able to absorb and assimilate knowledge (Demsetz, 1991); while, the other process is involved in knowledge application, requiring engineers and skilled workers to be able to apply knowledge into the process of profit creation (Spender, 1992). It is argued that, knowledge integration correlates with the process of product architecture development (Nonaka, 1990; Clark & Fujimoto, 1991; Wheelwright & Clark, 1992). Also argued is that, product architectural innovations are mostly resulted from reconfiguring the existing knowledge (Henderson & Clark, 1990; Henderson & Cockburn, 1995). Therefore, firms' synthetic capabilities of generating new combinations of knowledge acquisition and application, and transforming knowledge into innovations and value creations is defined as firms' combinative capabilities to gain competitive advantages (Kogut & Zander, 1992).

Knowledge Application: Combination of Organizational Architecture and Product Architecture

The combination and alignment of organizational architecture with product architecture is a pre-condition for firms to apply the integrated knowledge into the process of product innovations (Clark & Fujimoto, 1991). Conventional management theory has concentrated on the development of explicit knowledge, which does not involve much of integration because of its inherent communicability and its ease of being codified, disseminated, absorbed, assimilated, stored, and retrieved (Rockart & Short, 1989). In contrast, tacit knowledge involves an organizational routine of knowledge communication and integration, from individually specialized knowledge, to project-based collaborations, and then, to organizational capability of value transformation, from intangible to tangible (Clark & Fujimoto, 1991). It is argued that, only when firms become able to cultivate cross-functional communications and collaborations, can they become able to gain capabilities of knowledge integration (Smith, 1996), and competitive advantage (Richardson, 1996). Also argued is that, the function of HRM should be aligned to encourage the knowledge-based organization of project-team, to overcome organizational barriers or constraints, to stimulate cross-functional collaborations and knowledge communication (Imai, et al., 1985); and that, if without top-management commitment, especially in terms of strategic budgeting and planning, then, PMs would not be empowered to lead knowledge communication, collaboration and integration (Clark & Fujimoto, 1991), and consequently, the apex of knowledge integration would not be as maximally developed as expected. Therefore, the knowledge integration may be diagramed as shown in Figure 2:

Figure 2: Knowledge Integration, Value-Adding, Development of Organizational Capability



Source: Note: Constructed based upon Clark & Fujimoto, 1991

Creating and Institutionalizing an Automated System to Develop and Transfer Tacit Knowledge

As shown in Figure 2, organizational communication system must be established and institutionalized in order to ensure the dissemination or diffusion of tacit knowledge via both professional specialists (engineers) and non-specialists such as management staffs or front-line-workers (Demsetz, 1991). In case of franchised system, what has been franchised is a standardized operations process in conjunction with an automated management system to facilitate the transfer of the imbedded tacit knowledge. The design of such an automated process is required to be replicable in operation and stringent in outcome, so that it can be franchised at different locations by different franchisees, and maintained in the same format under the same brand. Normally, the higher degree of complexity the system flow is designed, the greater the reliance on knowledge integration is required. This is how McDonald's could have established its global network system; and how British Airways could have established its aircraft maintenance facilities in 67 locations worldwide, just to name a few.

Codifying the Tacit Knowledge into the Explicit Instructions for Organizational Routines

Codifying or converting the tacit knowledge into the explicit instructions to guide organizational management and operation routines is the key to build the mechanism of knowledge integration. The dissemination of tacit knowledge can be executed through an automated process of sequential and interactive of activities without involving a formally organized knowledge communication. Regardless of a surgical-team in a hospital, or a project-team in a manufacturing factory, the team members must rely on a well-established organizational system to coordinate and ensure their collaborations and communications, so that the tacit knowledge can be efficiently shared and transformed into the explicit guidelines or signals of repeated patterns and interactions of activities (Pentland, 1992).

The Challenges of Sustaining the Competitive Advantages Generated from Knowledge Integration

The potentials of knowledge integration is not limited to the rents earned from tacit knowledge, which is argued as a decisive intangible resource enabling firms to prevent product development and innovation from being imitated, and to protect the value of proprietary knowledge from being depreciated (Levin, et al., 1987). Knowledge integration is also argued as an effective mechanism to generate competitive resources such as patents, copyrights, trade secrets and so forth, appropriate to the process of value-creation, and contributive to the development of dynamic capability and competitive advantage (Zhao, 2016; 2017). Given these characteristics and considering today's increasingly intensified knowledge and technology environment, this text argues that, obtaining the capability of knowledge integration is decisive for firms, both market-leaders (innovators) and market-followers (imitators), to gain and sustain the knowledge-based dynamic and competitive advantages.

Understanding the Dynamic Nature of Knowledge Creation and Integration

The dynamic nature of knowledge determines the dynamic pattern of knowledge-based competition. It is argued that, although the integrated (tacit) knowledge is not as easy to be imitated as explicit knowledge; however, an undeniable reality is that, the moment when a new knowledge is created, it triggers an unavoidable opportunity of imitation, one way or another, just a matter of time (Zhao, 2013; 2014; 2016; 2017). To this end, the substantial meaning of sustaining the competitive capabilities and advantages generated from knowledge integration is to prolong its durability of profit-making, and to prevent it from being immediately and relentlessly imitated or eroded.

Knowledge creation reflects the results of dynamic process of cognition, and the capability of knowledge creation is determined and measured by the distance or degree-of-newness between the newly discovered and the existing knowledge (Zhao, 2016; 2017). It is argued that, the capability of reconfiguring the existing knowledge and integrating it into a new way of product development is not only an effective way to measure firms' capabilities of innovations (Henderson, 1995), but also an efficient way to incentivize firms to pursue cross-functional and cross-organizational boundaries' communications and collaborations (Abernathy & Clark, 1985), to make integrated-decisions, and to facilitate firms to gain the knowledge-based competitive advantages, (Henderson & Clark, 1990; Henderson & Cockburn, 1995). To this end, firms' capabilities of knowledge integration refer to the capabilities of codifying and transforming their tacit knowledge into explicit form to guide and enhance the development of their organizational capability of innovations (Baden-Fuller & Stopford, 1994; Buaron, 1981;

Richardson, 1996). Following this line of logic, it is argued that, understanding the dynamic nature of knowledge creation and integration serve to rationalize why firms may generate varied outcomes by implementing the same management system (e.g. Lean), mainly because they may have applied differentiated tacit knowledge and experiences accumulated over time, resulting in respectively differentiated capabilities of value transformation (Volberda, 1996).

Promoting Communication to Facilitate Knowledge Creation and Integration

Establishing and institutionalizing an organizational routine to promote cross-departments, cross-firms and cross-industries communications is not only an effective approach to stimulating individual engineers to learn and exchange knowledge and skills, but also a pre-condition for firms to pursue their knowledge creation and integration (Demsetz, 1991), and to enhance their capabilities of cost-saving development of tacit knowledge and collectively shared behavioral norms (Garfinkel, 1967; Zucker, 1987). Communication is accordingly argued as an efficient approach to overcoming the barriers resulting from organizational boundaries that impede firms' capabilities of knowledge development (creation, integration and transfer), both internally (cross-departments) and externally (cross-firms and cross-industries), and therefore, only when knowledge is communicated, can the value of knowledge be transferred and transformed from intangible-input into the tangible-output such as market value of products/services (Richardson, 1996). Also argued is that, tacit knowledge is the marrow of knowledge-product value transformation, more robust to withstand the threat of imitation than that of explicit knowledge (Hanssen-Bauer & Snow, 1996). For example, in fashion design, even though the CAD system can be installed to fulfill a large scale of design job, however, the flair of stylish design as a typical form of tacit knowledge cannot be easily imitated through the conventional model of learning.

Aligning Organizational Culture and Structure to Promote Knowledge Creation and Integration

Organizational culture and structure are critical factors influencing firms' capabilities of knowledge integration and product innovation. Organizational culture should be aligned to cultivate and accommodate knowledge integration (Liebeskind, et al., 1996). Having cross-boundaries communication established as an organizational culture is argued as an effective approach to aligning knowledge creation and integration with firms' strategic goals (Nelson & Winter, 1982). Having organizational structure designed and maintained to encourage and facilitate cross-boundaries communication is the key for firms to pursue effective knowledge acquisition and application (Simon, 1973). It is criticized that, vertical layers of organizational setting is too time-sequencing and too time consuming to support knowledge integration; and

suggested that, decomposing organizational hierarchies is an efficient solution to promote simultaneity of multi-process of knowledge development (Clark & Fujimoto, 1991; Williamson, 1981).

CONCLUSION AND DISCUSSION

This text provides evidences and proves that, to fit with the increasingly intensified, globalized and IT-dominated business environment, the KBV is a more cogent and systematic framework in theory, and a more constructive and instructive framework in practice, than that of the conventionally inherited RBV framework. Knowledge integration is rationalized in this text as a predominant force and resource to lead firms, both market-leaders (innovators) and market-followers (imitators), to enhance the capability of product innovation and brand construction, to harness the market uncertainties, to stimulate the development of organizational dynamic capabilities and competitive advantages, and to facilitate the transformation from first-movers to market leaderships (See Figure 1). It is confirmed from the case of Amazon that, relying on the combination of continuous innovation, speed of patenting innovation and brand construction, Amazon has successfully established its tacit knowledge and integrated it into its developmental process of innovative capability and first-mover advantages. Also confirmed from the test of three hypotheses is that, the choices product architectures, the choices of product development (e.g. project-team organization), the choices of knowledge management, are all correlated with HRM practices, and differentiated from country to country (e.g. Japan, Korea and China).

Tacit knowledge is argued in this text as the result of knowledge integration (acquisition and application), determined by organizational capabilities of knowledge learning and communication, and measured by organizational capabilities of transforming tacit knowledge into explicit knowledge (instructions), which in turn, serves to guide organizational routines, and to facilitate firms' innovative capabilities of organizational and product architectures (See Figure 2). Therefore, the conclusion of this text may be rephrased that, competition is essentially and ultimately determined by firms' capability of developing organizational proprietary or tacit knowledge (See Table 7). Such a conclusion seems a bit of farfetched, much of the KBV framework remains to be empirically verified and systemized.

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