International Journal of Economics, Commerce and Management
United Kingdom ISSN 2348 0386 Vol. VII, Issue 5, May 2019

http://ijecm.co.uk/

CHARMS OF 'FRUGAL+SHANZHAI' (A): AN EXTENSION OF INNOVATION FRAMEWORK

Jiangning Zhao

Professor of Management, College of Business Administration, Catholic University of Korea,
43 Jibong-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, 420-743, South Korea
zjning@hotmail.com

Abstract

By an extensive review of innovation literature combined with observations, surveys and interviews with 150 CEOs of domestic companies in China, the objective of this article is set to make a contribution to the theoretical evolution of innovation development. Traditionally, the concepts and theories of innovation have been centered by pursuing technological newness, and competing for resource-based capabilities and advantages. The framework of disruptive and open source based innovations opened an avenue for a paradigm-shift from technology-centered to managerial-oriented innovations. Nonetheless, the genetically twined relationship between innovation and imitation has remained undiscovered, resulting in the topic of imitation consistently debated and obsessed in academia arena. In response, the framework of 'Frugal techniques + Imitation = Shanzhai' is proposed in this text as an original framework to interpret the path-dependent nature of knowledge and technology, to rationalize the ecologically structured 'cat and mouse' kind of predatory game between imitators and innovators, and to highlight the significance that, it is the management system rather than technology itself transforming human wisdom and other resources into values, and driving the evolutionary course of innovations. Such a framework serves to rationalize the pervasive application of Shanzhai imitation especially in those emerging or developing economies (like China), given their weaknesses both technologically and managerially. Although pending for research verification, this article puts forward a hypothesis that, innovators and imitators are mutually indispensable contributors provided that they are constructive in transforming knowledge and

technology into business values, economically, socially and environmentally. Otherwise both are wastefully meaningless.

Keywords: Degree of Newness, Disruptive Innovation, Open-Source-Based Innovation, Frugal Innovation, Shanzhai Imitative Innovation, Value Creation, Capabilities, Advantages

INTRODUCTION

The concept of 'Innovation' is defined as the new ways of doing things, both technologically and managerially, driving the evolutionary course of social, economical and cultural development, while the concept of 'Imitation'[1] is defined as the source of causing the Innovators' Dilemma, and devouring the fruits of innovations (Christensen, 1997). Well established firms keep seeking ways of innovations in order to remain at the upper-stream of supply-chain and value-chain, leaving those startups and followers at the mid- and lower- stream of supply-chain and value-chain. Such a 'cat and mouse' kind of relationship between innovators and imitators has been used to outline the dominant mainstream of innovation literature, which has not changed much during the past decade or so, except the continuously extended discussions on either 'how innovators can keep leading', or, 'how imitators can catch up'. Such a historically inherited and stereotyped mindset seems to become the ruling principle of academia game in exploring and disclosing the dynamism and mechanism of profit maximization. Facing such an embarrassed academic challenge, there comes a group of scholars advocating the legitimacy of imitation, arguing that, both innovation and imitation are civilized ways of profit-making, and the two compete against each other based upon their pathways of gaining and sustaining their respective capabilities and advantages, as well as their respective speed of delivering products/services to market places (Anthony et al., 2008; Assink, 2006; Chittoor et al., 2009; Cooper & Edgett, 2008; Husig et al., 2005; Kale & Little, 2007; Kim, 1997; Lawson & Samson, 2001; Pil & Cohen, 2006; Shenkar, 2010; Stieglitz & Heine, 2007; Zeng, 2007; Zeschky et al., 2011; Zhao, 2008; 2012; Zhao & Zhang, 2016; 2017).

The increasingly globalized and information-dominated business environment lead to the increasingly opened sources of knowledge and technologies, especially when the modular technology innovation came into business application, enabling imitators to discount innovators' expected ROIs of R&Ds easier and faster than ever (Amara et al., 2009; Ariffin & Figueiredo, 2006; Blalock & Veloso, 2007; Chesbrough, 2003; Dodgson et al., 2005; Doloreux & Shearmur,

[1] The term 'Imitation' used in this text is only relevant to imitative activities via collaborations such as licensing, contracting, partnering, allying, or patent purchasing. Illegal activities are not in the interest of this text.

2010; Fifarek & Veloso, 2010; Freel, 2006; Lee & Veloso, 2008; Muscioa, 2006; Penin et al., 2011; Rothwell, 1992; Tapscott, 2008; Tapscott & Ticoll, 2003; Tapscott & Williams, 2006; Tether, 2004; Vaccaro et al., 2010; Vence & Trigo, 2009; Vemuri & Bertone, 2004). The increasingly open-ended global supply-chain along with the increasingly broadened inter-firms' communications and collaborations have been described as the sources of information leakage, knowledge spillover, and technological transfer channels to expedite the speed of imitations. The term 'Innovators' Dilemma' has thereby become a fashioned vocabulary in innovation literature, depicting the relationship between innovators and imitators, competing against each other both technologically and managerially, in terms of cost, quality and speed of delivering products/services to their respectively targeted market places (Abernathy & Utterback, 1978; Boudreau, 2007; Bozdogan et al., 1998; Bureth & Penin, 2007; Ettlie et al., 1984; Galunic & Eisenhardt, 2001; Henderson & Clark, 1990; Hoetker, 2006; Lee & Veloso, 2008; Tether, 2004; Vence & Trigo, 2009; Wolter & Veloso, 2008). However, it is argued in this text that, just by legitimizing the contributive position of imitation is far from understanding the dynamic mechanism of business ecology. Instead, recognizing and complying with the commonalities may be an ecological way to link innovators with imitators, so that, a new paradigm of value-chain can be established on both local and global levels.

Objectives and Contributions of This Article to the Construct of Innovation Literature

Despite a fraction of existing literature has been endeavored to promote the idea that, imitation is the key stimulating the rise of 'Asian Tigers' as well as the 'golden BRICS', and shaking the foundation of traditionally believed dichotomy of 'West lead and East follow', and therefore, it is time to re-balance the increasingly globalized economic pattern (Cappelli et al., 2010; Chen & Miller, 2010; Freeman & Soete, 2009; Stieglitz & Heine, 2007; Zeschky et al., 2011). Imitation itself is defined as not only an inevitable and non-problematic way of knowledge learning, but also a stepping stone for innovation (Boudreau, 2007; Kim, 1997; 1998; Wang, 2009; Zeng, 2007). Nonetheless, the mainstream of existing literature has been entangled in discussing the conflicts between innovation and imitation. What seems to be missing throughout the cognitive evolution, knowingly or unknowingly, is that, both innovation and imitation are genetically twined and bundled up by the same principle of the frugal way of value-creation (*frugal innovation*), which has been consistently carried out in practice as the marrow, determining the genetic transformation of individual business from imitation to innovation. Unfortunately however, the term '*frugal innovation*' has not been formally established as a terminology in the theory of innovation yet.

To fill such a cognitive and theoretical gap, the primary objective of this text is set to trace the evolutionary path of innovation literature, to examine, analyze and interpret the dynamism and mechanism of innovation and imitation, as well as their respective functions and impacts on business performances including but not limited to: facilitating business entities, large and small, to gain, accumulate and sustain competitive capabilities and advantages; stimulating SMEs and developing country firms to catch up and transform from imitators to innovators. The secondary objective is, by presuming and rationalizing *frugal innovation* as the essential principle guiding the evolutionary course of innovation and imitation over time, to establish an extension of the existing theories, to explain that, *frugal innovation* has been serving as the nexus to logically link the role of imitation through the evolutionary path: from innovation concept and typology, to knowledge management (i.e. knowledge leakage and spillover, technology transfer and diffusion), and then, to innovation model construction.

Methodological Issues Involved in This Literature Review

Case studies, field investigations, interviews (both formally and informally) with CEOs, senior managers and technicians separately to cross-check the consistencies, and in-depth desk review of existing literature, these procedures are synthesized as a cross-examination approach in this literature review, in order to explore the path of theoretical development on the framework of innovations. Such a comprehensive and exploratory approach is highly recommended as an effective method to distill and extend the novelty from previously accomplished theoretical findings (Yin, 2009). Such an approach has been repeatedly applied in the previous studies on the mechanism of creating technological capabilities and accumulating competitive advantages (Dutrénit, 2000; Figueiredo, 2001). By benchmarking and cross-checking the results of case studies, interviews and literature review simultaneously conducted in this study, it appears to have generated some findings that would otherwise not be identified and uncovered, especially in the aspects of innovation-decision strategies and operations between firms in China and firms in Western countries. A frequently encountered challenge in this study is when multiple explanations, not only different but often opposite in standpoints, are drawn from the same employee being questioned repeatedly by the same questions after a time-interval. Although frustrating, it reflects the impact of cultural differences on organizational management between China (maintaining an absolute top-down management model) and those Western countries (pursuing democratic mechanism of decision-process).

The combinative method applied in this study is instrumental to overcoming the weakness or bias resulting from single source of data, while enhancing the cognitive validity and reliability in discovering and unfolding the richness and regularities of human behaviors, which

according to some sociologists, are most likely resulted from those historically inherited and deeply imbedded, disciplined and diversified ideological deviations from one society to another (Altrichter et al., 2008; Cohen & Manion, 2000; O'Donoghue & Punch, 2003). Although empirical verification is needed to examine and evaluate the causal mechanism that results in the distance between the expected decision goals and the actual outcomes derived from the impacts of political, social, economical, legal and cultural disparities. Such a behavioral theory may help calibrate and guide the direction of globalization in a fair mode. Motivated and inspired by these methodological hints, and in order to avoid or reduce potential biases resulting from political factors (i.e. policies and regulations in favoring of SOEs), 150 POEs or startups different in size and across industries were selected and investigated during the field-research period (04/2006-07/2012), focusing on how these startups in an emerging economy like China have managed to apply the combined approaches, namely, the Shanzhai imitation and the frugal innovation as their catching-up model, to firstly disrupt the existing-but-previously-unserved low-end market, and then, to incrementally penetrate into the mid- and upper- level of market-chain already occupied by those incumbents.

TRADITIONAL CONCEPTS AND THEORIES ON INNOVATION: PURSUING NEWNESS VS. RESOURCE-BASED VIEW

The concept of newness and the resource-based view are considered as the heritage and/or extension of Schumpeterian framework of innovation, from which, innovation starts to evolve from technologically-oriented to managerially-oriented (Kanter, 1989; Lawson & Samson, 2001), representing a cognitive leapfrog from the mechanic application of technologies to the transformation of ideas, knowledge and resources into value-creation processes. Such a cognitive transition has been used to explain how firms with insufficient internal capabilities, still can take advantage of external resources to build their capabilities and pursue their innovations.

The Newness and The Degree of Newness: Decisions on Radical or Incremental Changes

Newness has been defined as the main characteristic of innovation (Blythe, 1999; European-Commission, 2005; Janszen, 2000; Johannessen et al., 2001; Van de Ven, 1986). Newness is used to describe the novelty of 'new ideas, technologies and their applications in changing products, services, processes, marketing approaches, organizational structures and external relations' (European-Commission, 2005; Janszen, 2000). The degree of newness has been defined as "new to what and how new" (Johannessen et al., 2001, p.20), the degree is to measure and differentiate incremental innovations from radical innovations (Blythe, 1999). As to the concept of process innovation, it is explained as "the processes of development and

implementation of new ideas" (Van de Ven, 1986, p. 591). Only when a new idea is developed and ventured into business operations, can an innovation process be considered as a start and expected to generate a synergy to create competitive advantages (Kanter, 1989).

A Resource-based View: Decisions on Innovation Capabilities Development

The resource-based view management framework assumes that, firms' consumable resources determine their innovation capabilities and competitive advantages (Barney, 1991; Teece et al., 1997; Collis & Montgomery, 1995). Therefore, innovation capability can be measured by firms' abilities to absorb, assimilate and transform available resources into a process of creating a perceivable and noticeable novelty comparing with the previously existed products/services (Lawson & Samson, 2001), or, a process of creating a set of organizational novelty to inspire innovation strategies (Burgelman et al., 2004). Aligning with this line of theory, a bunch of scholars argued that, given their technological weakness, developing country firms may opt to explore and leverage externally available resources (e.g. knowledge, technology, and market access channels) to build and accumulate their innovation capabilities by the means such as contracting or licensing arrangements (Hamel & Prahalad, 1994; Hobday, 1995a; 1995b; Kim, 1998; Mathews, 2005; 2006; Prahalad, 2005). Developing country firms may enhance their internal capabilities via stochastic processes of identifying problems, finding solutions, and providing customer satisfactions (Thomke & Fujimoto, 2000; Thomke, 2001; Zhao & White, 2010).

The Late-Comers Innovation Capabilities in the Age of Digital Technology

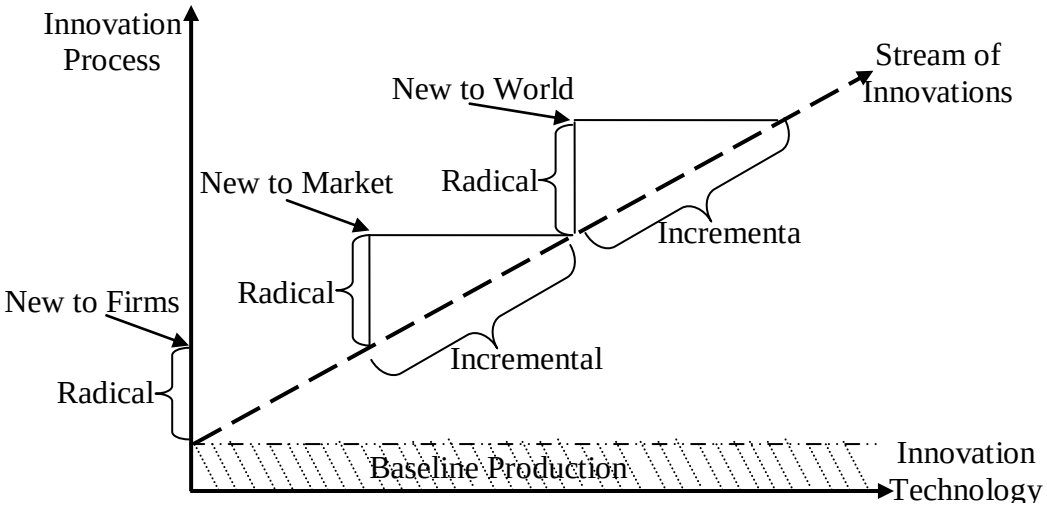
Developing country firms compose the mainstream of late-comers, generally characterized as lacking the technological capabilities required for original innovation (Dutrénit, 2000; Shenkar, 2010; Zeschky et al., 2011). Previous studies reveal two schools of argument on late-comers' innovation capabilities. The first school emphasizes the external conditions, namely, the industrial knowledge and technology intensity that determine the easiness of knowledge sharing and technology transferring within supply-chains (Bell & Pavitt, 1992; Lall, 1992; Lee & Veloso, 2008; Vence & Trigo, 2009). The second school argues that firms' internal capability of imitating external knowledge and technologies is the key channel for late-comers or developing country firms to develop their innovation capabilities and competitive advantages (Dutrénit, 2004; Figueiredo, 2001; Luo et al., 2011; Shenkar, 2010; Wang, 2009; Zeschky et al., 2011; Zhao, 2012).

It has been increasingly argued that, the advanced development and application of digital technology has played critical roles for 'late-comers' to build their innovation capabilities and gain competitive advantages (Hagel & Brown, 2005). Digital technologies help firms to not only reduce trials and errors by visualizing the results of architecture designs and engineering simulations, but also enhance problem-solving abilities (Thomke, 2001; 2003; 2006; Thomke & Fujimoto, 2000). The CAD (computer aided design) system for example, has been rapidly and widely adopted by those developing country firms to simulate their products' architectural design, and facilitate their products' modular assemblings (Liu, 2005; Jin & von Zedwitz, 2008; Zeng, 2007). This explains why the application of digital technology is termed as "*Enlightened Experimentation: The New Imperative for Innovation*" (Thomke, 2001, p.1), allowing firms to think-and-play with the designs of prototypes cheaply and quickly (Dodgson et al., 2005). This explains why the application of digital technology is termed as a front-loading problems-solving and stage skipping tool for developing country firms to reduce risks of investment, and to expedite the speed of catch-up processes (Zhao, 2008; 2012).

Technological Approaches and Their Path-Dependent Attributes to Management Decisions

Technologically, innovation has been categorized into four types (Incremental, Radical, Architectural, and Modular), representing the technological decisions in products design and manufacturing (Abernathy & Utterback, 1978; Cooper, 1997; Ettlie et al., 1984; Filippini & Nalini, 1998; Tushman et al., 1997). The choices of technological approaches are path-dependent, determined by not only firms' goals in pursuing the degree of newness or the degree of technological changes of their products physical components, interfaces or linkages, and even the changes of concepts (Ettlie, 1988; 2000; Henderson & Clark, 1990), but also firms' internal technological capabilities associated with external resources availabilities (Chesbrough & Teece, 1996; Child & Faulkner, 1998; Jolly, 1998). It is proposed that, a company with historic trajectory of market-oriented innovation is prone to pursue the synergy of managerial and technological innovations (Ettlie, 1988). To this type of companies, managerial and technological innovations are intrinsically paired hand-in-hand, mutually indispensable to each other in the development of their competitive advantages (Ettlie, 2000). In light of this argument, some scholars suggested that, the route to sustain innovation capabilities and competitive advantages is neither through a one-time-application of technology, nor through a one-time-application of innovative ideas, but through a persistently institutionalized and sustained capability of maintaining a stream of innovations over time (Tushman et al., 1997), see Figure 1:

Figure 1: The Path-Dependent Route of Innovation Development



Note: Some ideas are borrowed from Ettlie, 2000 and Tushman et al., 1997

Figure 1 maps out the path-dependent roadmap of innovation development, indicating that, innovation is linearly correlated with firms' strategic decisions of applying and integrating technologies into the process of creating novelty or degree of newness (Redding, 2002; Rycroft & Kash, 2002). However, it is criticized that, the path-dependent framework overlooks some vital factors such as technology-life-cycle and potential threats of imitation activities, these factors are termed as the root-cause of Innovators' Dilemma, severely discounting and/or undercutting the ROIs of innovators (Christensen, 1997).

Radical vs. Incremental Innovations: Decisions on Technological Newness and Advantages

Of the four types of technological innovations, radical and incremental innovations are firms' technological choices depending on firms' strategic decisions of pursuing different degree of technological newness and competitive advantages. It is indicated that, firms pursuing higher degree of newness are structurally centralized-organizations and strategically aggressive in technological advancement and risk taking, and prone to adopt radical innovation approaches and intensive in-house R&Ds to develop new products sharply contrasted with the existing ones (Tushman et al., 1997); firms pursuing lower-degree of newness are structurally decentralized-organizations and strategically conservative, and tend to apply incremental approaches to enhancing/improving their R&D-capabilities over time (Cooper, 1997; Lindsay, 2000). It is also suggested that, firms pursing radical innovations are technology-driven, depending largely on their technological capabilities, indicating that, the higher degree of newness firms pursue, the higher threshold to prevent/protect firms' innovations from being immediately imitated; while,

firms pursing incremental innovations are market-driven, depending largely on economies of scale and market size, the greater the market size, the higher chances of success (Abernathy & Utterback, 1978; Ettlie et al., 1984).

Architectural vs. Modular Innovations: Decisions on Market Competitiveness

Architectural innovation is categorized as technologically incremented changes, focusing on how the newly-designed products' architectural appearances can be integrated into finished products while leaving the core concepts of components intact, so that the innovated products can compete and outperform those existing ones. Furthermore, since the architectural change is mostly embedded inside the design of components, therefore, it is difficult for imitators to duplicate, at least, not within a short term (Henderson & Clark, 1990). In comparison, modular innovation is often involved in technologically radical changes of components' concepts while leaving products' architectures unchanged. Despite modular innovation pursues the simplification of manufacturing process and reduction of costs, however, it provides the easiness for imitators to duplicate, once the innovative recipe is leaked, resulting in the destructive impacts on innovators' ROIs from R&Ds and investment (Henderson & Clark, 1990). The rapid development of China Shanzhai industries may be used to support this theory.

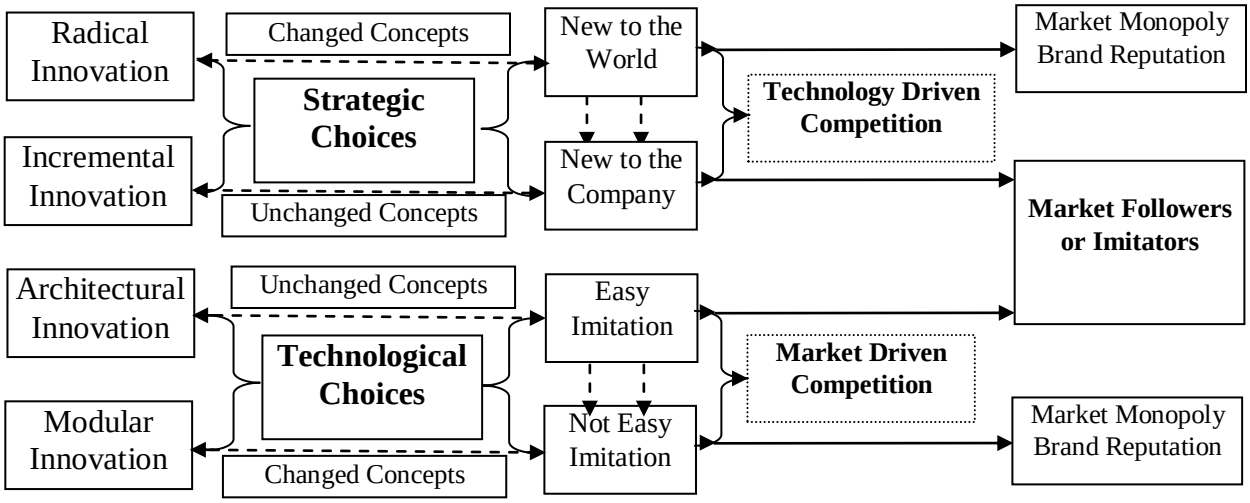
Architectural and modular innovations are technological choices depending on firms' strategic decisions of gaining market-driven competitive advantages, which are normally associated with the paces of technological changes and market demand. When the market demands is at the high-rate of increasing, firms may choose architectural and incremental changes as their innovation solutions to sustain their market reputation; when the market demands is at the low-rate of increasing; firms may choose modular and radical changes as their innovation solutions to promote and drive their market competitiveness (Tidd, 1997). Aligned with this line of argument, it is suggested that, the industrial intensity of technological competition is in correlation with firms' strategic decisions on technological choices. Firms in an industry with high-rate of technological intensity (ex.: software industry) tends to be more risk-sensitive, concentrating on the speed of product-upgrades through incremental and architectural changes; firms in an industry with low-rate of technological intensity ex.: food industry) tends to be more risk-taking, concentrating on the product-diversification through radical and modular changes (Pisano, 1997).

Innovation vs. Imitation: Determined by Knowledge Management and Value Creation

The degree of newness, normally measured by 'new-to-the-company, new-to-the-market, and new-to-the-world', is used to judge firms' strategic decisions and predicts their risk-taking

propensities associated with their respective R&D portfolios. However in practice, it is wastefully meaningless, unless the executed strategic decisions lead to value-creation from consumer perspective (Ford & Saren, 1996). It is indicated implicitly that, the capability of integrating knowledge and technology into production process is sometimes more value-creating than the invention of new knowledge and technology. To this end, the ability of technological configuration is the key to determine firms' collaborative capabilities of value-creation, emphasizing the efficient coordination or interaction between/among firms especially in the process of assembling the heterogeneous pieces (Bureth & Penin, 2007). When the knowledge-control is too tight, the knowledge sharing among firms may be blocked; when the knowledge-control is loose, an untraceable knowledge-leak may occur, triggering imitations (See Figure 2).

Figure 2: Managerial Implications of Innovations vs. Imitations



Note: Some ideas are borrowed from Bureth and Penin, 2007; Christensen, 1997; Ford and Saren, 1996.

DISRUPTIVE INNOVATION: PARADIGM SHIFT FROM TECHNOLOGY TO MANAGEMENT INNOVATION

The increasingly accelerated trend of globalization in conjunction with the rises of Asia Tigers, Africa Lions and BRICS, leads to an increasingly emerging trend of new innovation phenomena emerged from those fast growing emerging economies, giving rise to the concept and theoretical framework of 'Disruptive Innovation' initiated by Bower and Christensen (1995), and refined two years later by Christensen himself in his efforts to establish the framework of 'Innovator's Dilemma', in order to explain why many of those well-established business leaders failed to design/deliver affordable products/services suitable for customers at the bottom of pyramid with limited purchasing power (Christensen, 1997).

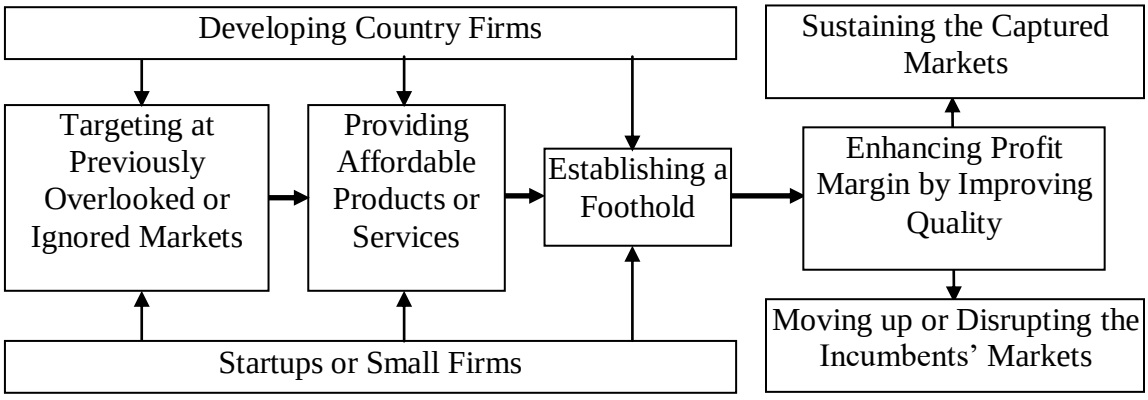
The Implications and Significance of the 'Disruptive Innovation' Framework

An in-depth look into Christensen and his colleagues eight-years (1995-2003) theoretical endeavors in the construction of 'Disruptive Innovation' framework, one may notice that, they have experienced an evolving path of cognizing the fact that, technology itself is neither disruptive nor sustainable; instead, it is the business models that transforms the ideas, technologies and available resources into value-creation processes (Christensen & Raynor, 2003; Loutfy & Belkhir, 2001).

Disruptive Innovation: The Dual-Market-Orientation Model

In explaining the market behaviors of disruptive innovations, Christensen and Raynor (2003) contend that disruptive innovation has two market orientations. Of which, the first is the 'low-end market disruption', targeting at consumers who cannot afford the price paid by consumers at the high-end market. Therefore, the disruptor(s) focus initially on producing good-enough (quality and functionality) product(s) to serve these least profitable consumers, who are not affordable to the premium. Once a foothold is gained in this market segment, the disruptor(s) start to increase profit margin by improving products' quality or functionality step-by-step, to solicit customers willing to pay a little more. Gradually, disruptor(s) permeate into and squeezes those established firms out of their markets. The second is the 'new-market disruption', targeting at consumers in a market segment that is previously not being served by existing products or services in the industry (Christensen & Raynor, 2003). Based upon Christensen's framework, the disruptive innovation model may be illustrated as Figure 3:

Figure 3: Christensen's Disruptive Innovation Model



Note: This figure reflects a summary of Christensen, 1995; 1997; Christensen & Raynor, 2003.

Disruptive Innovation: Explaining Why Established Firms Failed to Compete

In analyzing why established firms have often failed when challenged by disruptive innovations, Christensen explained that, established firms with strong R&D-based innovation capability,

given their investment and expectation of ROI, tend to ignore those low-end markets susceptible to price (Christensen, 1997). Christensen provided three reasons: the first is that, established firms strategically decide and chose not to compete for low-end markets since they are not profitable enough to pay off the costs of innovations, such a strategy provides opportunities for disruptors (late entrants/startups) to survive and grow; the second reason is that, competing for low-end markets may consume organizational unique strength and scare resources, and may distract organizational attention to compete with other market leaders; the third reason is related to institutional environment that, low-end markets and down-graded or simplified technologies (disruptive features) may defame established firms' reputations.

In examining why established firms are generally not competitive when challenged by disruptive innovations, an empirical study proposed six factors inhibiting established firms from exercising their technological capabilities and advantages to defeat disruptors. the six factors may be summarized as (1) the inability to unlearn their obsolete mental models, (2) the unwillingness to abandon their previously succeeded business routines, (3) the risk-averse organizational culture, (4) the reluctance to change their innovation mechanism, (5) the lack of adequate follow-through competencies and (6) the inability to change their internal infrastructures adaptive to external environment (Assink, 2006). Despite the great contribution of disruptive innovation to the theoretical development of management, two weaknesses still remain to be discussed (See Table 1):

Table 1: The Two Weaknesses of Disruptive Innovation Framework

1st Weakness	According to Christensen's definition, disruptive innovations rely on straightforward technologies to tweak or simplify the architecture of existing but off-the-shelf components or products, only appealing to emerging and developing markets, and providing little value to the mainstream of established markets (Christensen, 1997, p.15). Such definition is weak in the scope of generalizability, given the fact that, successful disruptive innovations are not rare in developed markets as well. For example, IKEA and DELL are outstanding disruptive innovators by the means of product customization to satisfy customers' budgets (Jonsson & Gustavsson, 2008; Rudberg, 2004; Rudberg & West, 2008). In a sharp contrast to Christensen's definition, IKEA and DELL started by disrupting the developed markets first and developing markets afterwards, leading to their respective global market expansion.
2nd Weakness	The concept of lower-end-market or new-market defined in the study of (Christensen & Raynor, 2003) seems to be redundant or overlapping or vague on the measurements of 'how-low, how-new, and to whom'. It is obvious that, low-end market price in U.S. or U.K. is considered luxury in China and African countries.

Given the weaknesses of disruptive innovation framework, what is needed is to think outside of Christensen's box, to adjust, modify and make it an effective business model not only for developing country firms or startups to catch up; but also for incumbents to disarm the disruptive threats and sustain their competitive advantages (Anthony et al., 2008). It is suggested that, Christensen's disruptive model is universally applicable, regardless of startups or incumbents, as far as a firm sticks to cost-saving technologies (ex.: architectural and modular) and price-cut strategies, to consistently produce and provide good-enough quality and price-to-performance (functions and features) of products and services, then, the success becomes achievable (Luo et al., 2011; Liu, 2005). Unfortunately, a neglected question seems to be inevitable that, once the incumbents compete with developing country firms and/or startups by applying Christensen's disruptive model, what would be the chances for developing country firms and/or startups to win? It is argued that, the success of Christensen's disruptive model is vitally determined by the two external factors, namely, the government policies and the size of market. The results of interviewing with 150 Chinese Domestic Firms' CEOs (04/2006-07/2012) provided a unanimous opinion that understanding and taking advantage of government policies in a timely manner is vital for any firms to survive in China; and the size of market rather than the unit profit margin is the key for firms to grow in China, indicating that, integrating these two external factors into Christensen's disruptive model may be constructively necessary.

Innovation vs. Imitation: Determined by Disruptive Power and Path-dependent Ties

Following the theoretical breakthrough 'Disruptive Innovation' framework, there appears to have a noticeable paradigm shift from traditionally technology-centered innovations, to management-oriented innovations, emphasizing and rationalizing that, what really matters is the profit-making business models, rather than the sophisticated technology itself (Chesbrough, 2003). 'Imitation' becomes, for the first time, a form of innovation adopted by those developing country firms or late-comers to disrupt the already existed market pattern of competition. Imitation and innovation are, directly and indirectly, cognized and positioned as equivalent or shoulder-to-shoulder drivers in transforming available resources (internal and external) into market values. Such a paradigm shift explains why many disruptive innovations are not the results of cutting-edge technologies (Christensen & Raynor, 2003); instead, they are often the results of novel applications of existing technologies and/or off-the-shelf components through an innovative process of think-play-do (Dodgson et al., 2005). Such a paradigm shift represents a cognitive change on the role of imitation in the process of value-creation, suggesting that, as far as those late-comers manage to come up with ideas of imitating the existed technologies to create new market values, then, this imitation should be considered an innovation, and generally, the earlier

the imitation is adopted, the higher possibility of profit-making may be achieved (Markides & Geroski, 2005). Such a paradigm shift opens a theoretical battlefield, arguing that, idea-sharing, cost-sharing and market-sharing are the major drivers and/or motivators for firms to pursue innovations; emphasizing and stipulating that, inter-firms collaboration facilitates the establishment of 'group owners' platform, which in turn, provides a greater power than individually independent firms; insinuating that, an open source based innovation platform is not only the key for developing country firms or late-comers to pursue their innovations, but also the key for incumbents to prevent their innovation properties from being immediately imitated (Damanpour & Golalakrishnan, 1998; Kim, 1997; Jolly, 1998; Redding, 2002; Rycroft & Kash, 2002).

OPEN SOURCE BASED INNOVATION：THE SOLUTION FOR INNOVATORS' DILEMMA

The conceptual development of 'Open Source Based Innovation' can be dated long before the invention of computers, and has been integrated into the theoretical development of management ever since. 'Open Source' is described as an 'Eclipsed Platform' for firms to share resources within a collaborated or networked group of business entities (Penin et al., 2011). Accordingly, 'Open Innovation' is deemed as an extension of innovation theory in promoting the idea of sharing of knowledge and technology through some open-ended channels (ex.: outsourcing, licensing, partnering, allying, or even spinoffs), and enhancing firms' capabilities of developing and optimizing resources (Chesbrough, 2003; Chesbrough et al., 2006). It is suggested that, 'Open Innovation' would not be achievable if without the support of 'Open Source' platform, and this is particularly true in an innovation intensive industry (ex.: software industry), wherein, an open source (ex.: a wizard or a free piece of software) may act as an agitator of innovation, triggering an upgrade of the entire industry (Vemuri & Bertone, 2004).

The bifurcation between 'Open Innovation' and 'Closed Innovation' rests at the managerial control over organizational intangible resources, namely, knowledge, information and technology (Janszen, 2000). The 'Open Innovation' focuses on collaborating and sharing resources in order to promote the freedom of generating innovative ideas and facilitating the innovative process of value creation (Tapscott & Ticoll, 2003; Tapscott & Williams, 2006). In contrast, the 'Closed Innovation' concentrates on the control over the ownership of innovations, striving for development and enhancement of in-house R&D capabilities as firms' secret weapons of competition, which is unfortunately often challenged by the potential threats such as the knowledge leakage resulting from the increasingly mobilized skilled workers, and the scarcity of venture capitals and other external resources resulting from the increasingly intensified market competitions (Chesbrough, 2003). Given these weaknesses of 'Closed

Innovation', it is argued that, innovation should not be narrowly treated as firms' proprietary asset; instead, it should be carried out in a collaborative manner both internally and externally, and only then, the value of innovation can be maximized (Zhao, 2008; 2012; Zhao & White, 2010; Zhao & Zhang, 2016; 2017).

Open Source Based Innovation : Shortening Innovators Technology-Life-Cycle

Empirical evidences show that an open source based innovation functions and serves as a strategic platform providing opportunities for startups, late-comers and developing country firms to imitate (learn, absorb and assimilate knowledge, technologies and experiences from innovators), so that they can shorten the lead time, reduce the costs, and lower the price, and consequently, build and accumulate technological capabilities and competitive advantages of their own (Ariffin & Figueiredo, 2006; Wu et al., 2009). To this end, it is argued that, the increasingly expedited pace of technology development, the increasingly intensified technological competition, and especially the increasingly globalized information system, the dynamism of these environmental factors makes the traditionally-inherited 'close-door or in-house R&D' no-longer the best-practice for firms to gain competitive advantages, makes the trend of open-ended innovation model is inevitable, makes the trend of shortened technology-life-cycle is inevitable (Zhao, 2008; 2012; 2013; 2014; 2016; Zhao & White, 2010; Zhao & Zhang, 2016; 2017).

Open Source Based Innovation : Inter-Firms and Supply-Chain Collaboration and Innovation

The increasingly globalized 'open source based innovation model' challenges the traditional framework of 'close-door and in-house innovation model', and highlights the importance of Inter-firms' collaboration, especially in terms of knowledge and technology sharing and transferring within an already established supply-chain (Boudreau, 2007; Bozdogan et al., 1998; Tether, 2004; Vence & Trigo, 2009).

Inter-Firms' Knowledge Management Determines Innovators' ROIs

On the firm level, the efficiency and effectiveness of inter-firms knowledge management (the control of knowledge sharing and technology transferring) are determinants of innovators' performances, especially their ROIs. Empirical evidences show that, an intensive control of knowledge sharing and technology transferring among collaborative firms can generate a positive impact on innovators' performances such as the speed of new products development

(Vaccaro et al., 2010); and that, the market value of innovation is critically determined by the speed and scope of technology diffusion, normally, the higher value generated from the technology, the faster and wider diffusion of that technology (Fifarek & Veloso, 2010).

On the supply-chain level, it is argued that, coordinating the collaborated innovations among supply-chain partners is the most critical complementary asset, directly or indirectly, one way or another, influencing the capability of supply-chain to gain and sustain its competitive advantage (Stieglitz & Heine, 2007). Innovations perform the best only when supply-chain partners' abilities and skills can be organically coordinated the collaborated (Bozdogan et al., 1998), and the earlier the coordination is established, the earlier the advantages and competitiveness can be exploited (Lee & Veloso, 2008). It is suggested that, knowledge sharing and technology transferring from suppliers (upstream) to assemblers (downstream) are associated with technological applications at different stages of product-life-cycle, generally, architectural technology suits best for design stage, and modular technology best for manufacturing stage (Galunic & Eisenhardt, 2001). Whether the innovation assets (knowledge and technology) can be efficiently and effectively transferred is determined by whether an efficient and effective management system can be established throughout a supply-chain, to control 'WWH: when, where and how' should the innovation assets be transferred from the upstream (suppliers or MNCs) to the downstream (assemblers or developing country firms), so that the risk of being immediately imitated can be minimized. For example, 'when, where and which of those supply-chain partners should be chosen and authorized to adopt the innovation assets' is more sensitive than 'how the innovation assets should be transferred or distributed' (Boudreau, 2007). This is particularly the case in developing countries such as China, where the legal environment is not mature enough to protect IPR (intellectual property right), resulting in the rapid boom of Shanzhai industry at the expense of developed country firms' innovation efforts (Luo et al., 2011), and providing costly lessons from those MNCs aggressive diffusion of innovation assets without a well-prepared preventative strategy to deal with the rampant imitations in China. To this end, it is argued that, when multiple partners are involved in sharing heterogeneous pieces of one innovation asset, establishing a strategic control over the scope and degree of openness (i.e. to whom and to what extent the innovation asset should be shared), is critically challenging, and if not handled properly, the sunk cost of innovators' R&Ds and their expected ROIs are inevitably at risk (Zhao, 2017).

On the industry level, industrial regulations and policies determine the pattern of knowledge sharing among collaborative firms (Lee & Veloso, 2008). Firms' innovation performances are strictly bounded with the dynamism of industrial environment (Amara et al., 2009; Doloreux & Shearmur, 2010; Muscioa, 2006; Rothwell, 1992). Accordingly, firms may

choose different innovation approaches in order to achieve competitive advantages (Muscioa, 2006). The intensity of knowledge and technology has become an important industrial indicator in measuring the differentiated firms' innovation performances between manufacturing and service industries (Freel, 2006; Vence & Trigo, 2009). Evidences with a sample of more than three thousands companies from 15 advanced European Countries, confirm that firms in service industry tend to focus on softer aspects of innovation activities based upon employees' skills and inter-firms collaborative practices; in contrast, firms in manufacturing industry tend to emphasize on hard aspects of innovation activities driven by IT-related technologies and digital design technologies (Tether, 2004). Additionally, firms within a knowledge and technology intensive industry tend to build close-tie of network relationship with each other (Rothwell, 1992), and compete on innovation skills and abilities such as digital applications in products' design (Doloreux & Shearmur, 2010; Tapscott, 2008; Zhao, 2012). As a compliment to these findings, some scholars suggest that, firms within a technology intensive industry are likely to employ modular designs (Hoetker, 2006), and such a design technique is likely to trigger a vertical integration strategy (Wolter & Veloso, 2008). Furthermore, it is found that, firms within an import-intensive industry averagely maintain higher productivity growth than firms in other industries, because the imported products may be used as the sources of innovation technology transfer. Firms may apply reversed-engineering techniques to decode the innovators' technologies embedded in the imported products, and then apply them into their own product development (Blalock & Veloso, 2007).

Developing Country Firms' Innovation Strategies, Capabilities and Performances

Empirical evidences proved that, market-driven strategic models do not support developing country firms to pursue their catching-up processes, instead, a technological imitation approach should be taken as a catching-up strategy for them to achieve competitive advantages (Zhou et al., 2005). Due to their insufficient in-house R&D capabilities, imitation has been characterized in the mainstream of existing literature as the major channel for startups, late-comers and developing country firms to survive, grow and compete with advanced country firms, at least at their early stage of catching-up process through the application of technological imitation models (Boudreau, 2007; Bozdogan et al., 1998; Galunic & Eisenhardt, 2001; Kim, 1997; Lee & Veloso, 2008; Pil & Cohen, 2006;). Therefore, Developing country firms, first and foremost, need to identify and locate the target product(s) characterized with features including but not limited to: (1) potential market demand (Dutrénit, 2000; 2004), (2) easy-to-learn technology through reversed-engineering processes (Figueiredo, 2001; Wang, 2009; Zeng, 2007), and (3) availability of architectural/modular techniques facilitative to product design. Only when these

features are identified and located, can developing country firms use them as the sources of imitation as a start to catch up (Luo et al., 2011; Shenkar, 2010; Zeschky et al., 2011). Evidences drawn from a longitudinal analysis (1980-2002) on China Telecom-Equipment Industry (four domestic firms: Huawei电子, ZTE中兴通讯, DTT大唐电信, and GDT京东电商), also showed that, it is the capability of adopting the imitation strategy (not innovation) at their early stage of entrepreneurship, driving and facilitating these Shanzhai firms to evolve from imitators (copycats) to industry leaders, both domestically and internationally (Fan, 2006).

Measures of developing country firms' innovation performances have been aggregated over time by scholars from various perspectives, including but not limited to: organizational vision, mission and capabilities in terms of creating ideas and opportunities, developing knowledge and technology, and managing resources (Husig et al., 2005; Lawson & Samson 2001). More measures from the perspective of product innovation have been proposed such as the available sources of technologies for imitation, and market size of customers at the low-end markets (Cooper & Edgett, 2008). Abilities and skills of digital technology application in product design have been increasingly evaluated as one of the key factors in measuring firms' innovation capabilities and performances, especially in solving problems at an early stage of product development (Vaccaro et al., 2011; Tapscott, 2008; Zhao, 2012). From an inductive perspective, previous researches provide a three-dimensional measuring system to evaluate firms' innovation capabilities and performances (See Table 2):

Table 2: Three-Dimensional Measures to Evaluate Firms' Innovation Capabilities and Performances

Measures	**Developed Country Firms**	**Developing Country Firms**
Know-how Skills and Abilities	Sufficient Technological Resources to Support Know-how Skills and Abilities	Sufficient Technological Resources and Weak Know-how Skills and Abilities
Products/Services Development	Competitive In-house R&Ds for Product/Services Innovations	Weak In-house R&Ds, Relying on Imitations to Kick off Products/Services Development
Marketing Capabilities	Relying on Technology-Strength to Improve Quality and to Compete for Markets	Relying on Low-Cost and Low-Price to Compete for Markets

Innovation vs. Imitation: The Natural Twins of Causes and Solutions for Innovators' Dilemma

Although 'closed-door or in-house R&D-capability' has been traditionally believed and pursued as innovators' competitive capability and advantage to reap off the most part of industrial profits, and as innovators' strategic asset to build thresholds/barriers to prevent the entry of new

competitors; however, the increasingly open-ended innovation model has been nurturing and fertilizing more and more startups, late-comers and developing country firms, while witnessing many incumbents' falling down. In the analysis of this emerging or transitional business phenomena, it is highlighted that, innovators often failed to achieve their expected ROIs, mostly because they have failed to adapt themselves into the increasingly open-ended business environment, and that, innovators have been too concentrated on their technological capabilities, too proud of their leading positions, and too ignorant to the potential threats of imitators, to understand the fact that, startups, late-comers and developing country firms, they are not the 'do as told' type of slaveries, instead, they are, by nature, wanting to grow as well. Most importantly, when innovation is not feasible, but imitation is doable (sharing knowledge and technology through licensing, joint venturing, allying or partnering), then, the question of 'why not do it' becomes more practically meaningful than the question of 'why do it'. A ubiquitously understood common sense of business is that, the proto-innovation requires a great deal of time, money, and effort, however, the marginal cost of imitation is significantly low, therefore, 'why not'? For example, in telecomm industry, Motorola, Nokia as well as other industrial titans have invested enormously to develop the state-of-the-art technologies in order to remain their industrial leading positions. Ironically, all they have received is to watch imitators or Shanzhai firms to devour and digest their innovation fruits. Another example is that, according to the result of a survey conducted during the period of 04/2006-07/2012 by the author of this text, of the 150 CEOs of POEs interviewed, 131 of them expressed implicitly or explicitly that "No one cares how, when and where did you get 'it' (technologies), as far as you can make it work", indicating a deeply rooted and determined spirit of imitation, leading the rapid boom of Shanzhai industry in China (Zhao, 2013; 2014). This is why, it is concluded that, failed to understand such a fact is the root-cause of Innovators' Dilemma; and this is also why the open source based innovation model should be the best solution for Innovators' Dilemma because once an innovation is opened to and tied up with a multi-laterally collaborated entities, then, it becomes a shared asset of grouped-owners, forming a greater power of protecting innovators knowledge and technology from being imitated than the power of a single firm, consequently, leaving little room of profit margin for imitators to risk (Zhao, 2013; 2014; 2016; 2017).

It is argued that, innovation and imitation are twins, mutually conflicting but indispensable from each other (Zhao, 2016; 2017). Innovation is the source of imitation, which in turn, force innovators' advancement. It is argued that, the target of imitation is not limited to MNCs or FDIs, those early movers of developing countries are also targeted as well (Mahmood & Rufin, 2005). Therefore, Innovators' Dilemma should be treated as a universal phenomenon

and integrated into strategic management, focusing on how to build an effective management system to improve firms' capability of protecting intangible resources (ex.: innovation capability), and preventing or postponing the value deterioration of their innovation and technology life-cycle. To this end, it is reasonable to argue that, any discussion on the subject of innovation without involving the discussion on the issue of imitation may be considered incomplete for three reasons (See Table 3):

Table 3: Three Reasons of the Mutually Indispensable Relationship between Innovation and Imitation

1st Reason	Adopting innovators' technologies, regardless of legal or illegal adoptions, will inevitably impose destructive impacts on the life-cycle of innovators' investment and expected ROIs (Henderson & Clark, 1990), jeopardize or impair innovators' strategic motivations of innovative efforts (Barney, 1991), and hence, 'innovation' has been considered as the cause of innovation dilemma (Christensen, 1997; Christensen & Raynor, 2003; Christensen et al., 2004; Christensen et al., 2006).
2nd Reason	Imitations also require imitators' resource consumptions and technological capabilities similar to, although not identical with, the requirement of innovators (Ford & Saren, 1996; Jolly, 1998; Loutfy & Belkhir, 2001); furthermore, imitation has been argued as one way of knowledge learning, therefore imitation is often referred as imitative innovation (Boudreau, 2007; Damanpour & Golalakrishnan, 1998; Kim, 1997; Wang, 2009; Zeng, 2007); given these arguments, it is proposed that, innovators must be strategically prepared to avoid immediate imitations (Barney, 2011; Pil & Cohen, 2006; Zhao, 2016).
3rd Reason	Imitation has been considered as one of firms' strategic choices to gain competitive advantages (Ettlie, 1988; 2000; Jolly, 1998), especially for those developing country firms with little or no innovation capability; therefore, imitation seems to be their only way of strategic catching-up (Dutrénit, 2000; Kim, 1998; Luo et al., 2011; Shenkar, 2010; Zeschky et al., 2011; Zhao, 2013; Zhao & White, 2010).

Table 3 explains that innovation and imitation are twined, indicating the inevitability of imitation. The newness of technology is deteriorated through the life-cycle of product market maturity itself over time. Up to date, most of the previous studies focuses on how developing country firms have relied on MNCs' operations (franchising, licensing, partnering and strategic allying) as their international sources; the increasingly growing mobility of skilled workers, the increasingly developed platform of knowledge and technology sharing via information systems, as their domestic sources, and together, these factors constitute the sources of knowledge spillovers or leaks, providing opportunities for imitations, causing Innovators' Dilemma. This is why it is criticized that, previous studies have ignored the fact that, imitation is just one of many causes of deteriorating the newness of technology (Zhao, 2013; 2014; 2016; 2017). It is criticized that, previous studies on innovation are not able to fully mirror the complexity of real business environments (Damanpour & Golalakrishnan, 1998). In reality, innovation is affected by multi-

dimensional factors both internally and externally (Ettlie, 1988; 2000; Filippini & Nalini, 1998; Ford & Saren, 1996; Janszen, 2000; Jolly, 1998; Loutfy & Belkhir, 2001). The dichotomy of science and technology determines the dynamic nature of innovation. On the one hand, the advancement of science and technology is the creative source to provide firms with competitive advantages; on the other hand, the nature of science and technology is to evolve, making the existing ones obsolete or replaced. Thus, the traditional linear model of science–technology–innovation (STI) needs to be upgraded in order to reflect the multilateral nature of innovation and imitation (Freeman & Soete, 2009).

FRUGAL INNOVATION: AN EXTENSION OF IMITATIVE INNOVATION

Frugal Innovation is established in this text as an original framework generated from the combination of in-depth literature review and face-to-face interviews with 150 CEOs, CFOs and members of board of directors of POEs (privately owned enterprises) in China, during the period from 04/2006 to 07/2012, focusing on the aspects of cost controls, price decisions and business models in relation to their respectively disruptive effects on market development. Frugal Innovation is defined as an extension of innovation literature by absorbing the essence and peeling off the irrelevances from the richness of previous research outcomes, leading to a theoretical construction that, innovations of any kind must be disruptive and value-creative (See Figure 4):

Figure 4: Frugal Innovation Value Flow Map – A Catching-up Business Model

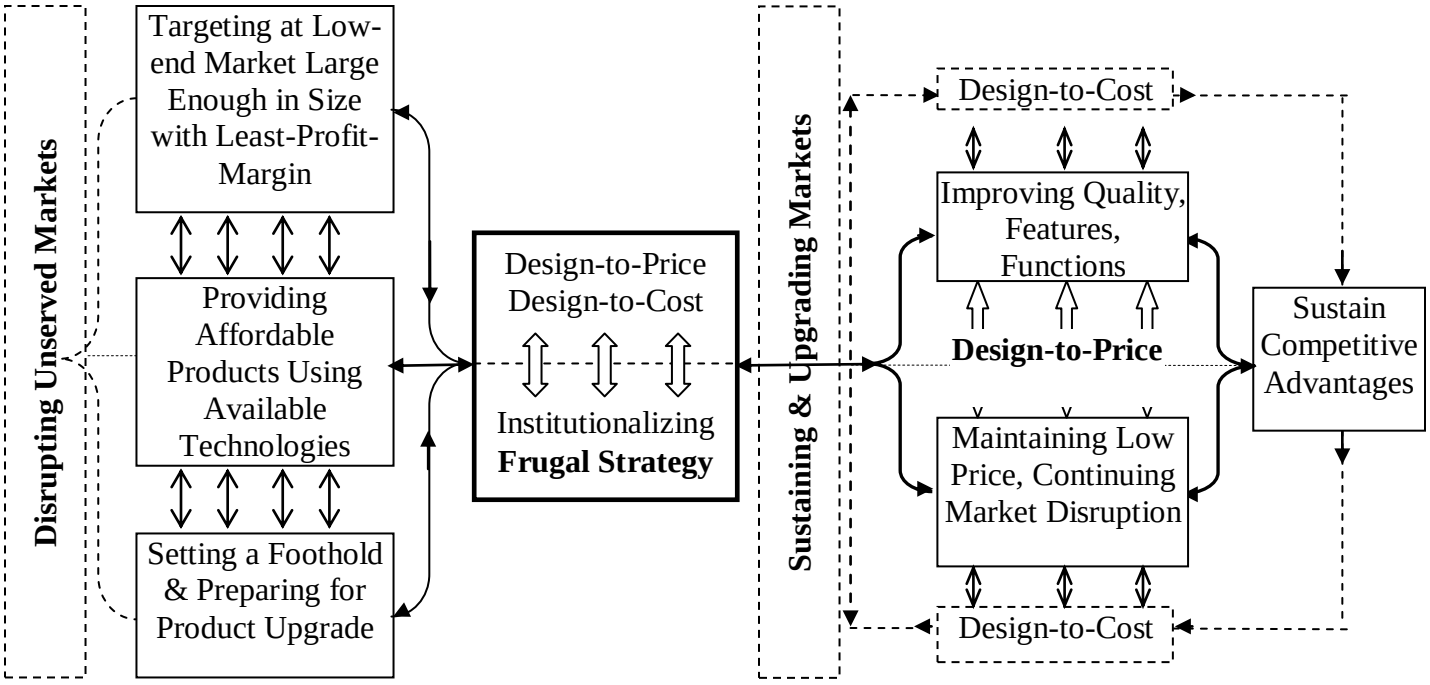


Figure 4 demonstrates that, Frugal Innovation consists of a cohesive set of actions: starting by applying the frugal techniques composed of '*Design-to-Price* and *Reversed-Engineering-to-Cost'*, to produce cheap-enough in price but good-enough in quality products/services to break into and establish a foothold in the low-end market (previously-unserved market large enough in size but with the least-profit-margin/per unit); and then to permeate into mid-upper markets, by applying the techniques of collecting, analyzing and benchmarking with users' feedbacks, to technologically upgrade the degree of products' newness, and to incrementally improve products one step at a time. The degree of newness can be used to measure the distance from the existing products. The rule of thumb is that, the more distanced improvement from the existing products, the higher degree of newness, the more risks and challenges to the innovators, and the more satisfaction to consumers.

Critical Conditions and Triple-A-Characteristics of Frugal Innovation

Frugal Innovation is defined in this text as a Catching-up Business Model by the implementation of Frugal Techniques, namely the combination of '*Design-to-Price*, *Reversed-Engineering-to-Cost* and Incremental Improvement'. The goal of frugal innovation is to identify, break-into and disrupt the low-end but previously-unserved markets at the bottom of the pyramid (Prahalad, 2005), to satisfy consumers at this segments, with limited profit-margin, limited affordability and purchasing power, but willing to purchase products with limited but *good-enough* quality at lower price, and to gain competitive advantages (Christensen & Raynor, 2003).

What characteristics constitute the frugal techniques? How do frugal techniques differ from other innovation techniques? Answers to these two questions may help understand why frugal innovation is practically *critical*, *feasible* and *effective* for startups, late-comers and developing country firms to survive, to catch up and then to compete with existing market leaders. It is *critical* because it ensures frugal innovators to avoid direct competitions with market leaders often entangled and distracted by their peer-rivals at the same level. It is *feasible* and *effective* because it does not require frugal innovators to exhaust heavy inputs (huge Capital investment, equipment/technology, know-how technicians, engineers and skilled workers), for small changes within a pre-defined short period of time. Given these reasons, the author of this text proposes a 'Triple-A-Characteristics', stipulating that, when and only when a technology is *Available*, *Affordable*, *Applicable* for an frugal innovator to adopt and implement, then, the planned innovation can become effectively feasible with a predicable chance of success. Therefore, the critical conditions for implementing frugal innovations may be summarized (See Table 4):

Table 4: Critical Conditions for Implementing Frugal Innovations

Conditions	Descriptions
Disruptive	*Disruptive*: refers to whether a technology with Triple-A-Characteristics can be identified in order for frugal innovators to adopt and disrupt the existing-but-previously-unserved market.
Triple-Enough	*Triple-Enough:* refers to whether frugal innovators can produce and provide products/services with Triple-Enough-Characteristics, cheap-enough in price, good- enough in quality, and large-enough in quantity. Having the 'triple-enough-characteristics' achieved, frugal innovators may become able to survive the low profit-margin and establish a foothold at the low-end market, and then, gradually catch up and incrementally invade toward mid-upper market segments.
Sources of Benchmarks	*Benchmarks:* refers to whether the existing products/services can be used as benchmarks in order for frugal innovators to campaign for the advantageous differentiation of price-to-performance.

Table 4 illustrates the critical conditions for frugal innovators to succeed. These conditions are inter-dependent and complimentary to each other. Together, they make it feasible for frugal innovators to survive, grow and compete. Externally, a technology with 'Triple-A-Characteristics' must exist, and at least one unserved market segment must exist. Internally, frugal innovators must be able to provide 'Triple-Enough' products/services. Only when the external and internal conditions are satisfied, frugal innovations becomes executable.

Institutionalizing Frugal Innovation to Build and Sustain Capabilities and Advantages

Having frugal innovation strategized and institutionalized may help startups, late-comers and developing country firms to build competitive capabilities and advantages, such as reducing Price/Cost, expediting the Speed of production, and enhancing Consumer Satisfaction. This is feasible and achievable by focusing on and targeting at the unserved-markets, previously being overlooked or excluded by those market leaders, because the contribution of profit-margin from these markets is too small to compensate large corporations' R&D investment, and too small to draw and shift their attention from mainstream markets (London & Hart, 2004). For example, the average price of Shanzhai mobile phones is only a fraction (1/5-1/3) of those market leaders (Ericson and Motorola). Shanzhai firms have achieved such a competitive price advantage because they, in addition to cost-saving from imitation, peeled off those redundant features and functions, and kept adding more practically appealing ones to satisfy consumers' dynamically changing preferences, resulting in customers' willingness not only to purchase a Shanzhai phone, but also to purchase one as a backup, just in case when their primary phone is lost, or as a gift to their families and friends (Zhao, 2017).

Given the weaknesses of startups, late-comers and developing country firms, it is logically reasonable to presume that, institutionalizing frugal strategy is an efficient and effective approach (like *picking the lower hanging fruits*) for them to establish a shortcut or fast-track to survive, grow and compete. The priority of institutionalizing frugal strategy is to enable firms to stay abreast of dynamically changing market, and to ensure firms to upgrade products/services consistently aligning with consumers' preferences. It must be noted that, frugal strategy is far beyond cost-saving. Understanding and satisfying customers' preference is the ultimate determinant of value-creation. For example, in counteracting against Shanzhai firms market disruption, Nokia followed Shanzhai market footprint, and launched a campaign in China suburban area in 2009, offering a series of incentive packages such as a free phone bundled with a two-year contract. This promotion did not win Nokia a market expansion as expected, because the suburban Chinese are frustrated, uncomfortable, and not willing to be bundled by a two-year contract.

Reversed-Cost-Control Technique Determines the Success of Frugal Innovation

Frugal innovation is technically opposite to traditional management in terms of efficiency-control process. Frugal innovation adopts a reversed cost-control scheme, starting from the step of setting a price-cap prior to implementing the steps of '*Design-to-Price* and *Reversed-Engineering-to-Cost*'. Having these three steps set in such an interdependent order, one step at a time throughout the process of incrementally improving and upgrading products without increasing the unit-price, ensures and enforces firms to effectively control for material saving, time saving, labor saving, and to achieve *price-to-performance* competitiveness as planned. Such a '*Reversed Cost-Control*' technique provides frugal innovators with unique competitive advantages in risk-control management, avoiding direct attention from market leaders, avoiding a sharp increase in financial inputs, while still pursuing the incremental improvement of products/services with '*Cheap-Enough-Price*' and '*Good-Enough-Quality*'. Such a '*Reversed Cost-Control*' approach has been deemed as the best-practice for startups, late-comers and developing country firms to absorb and accumulate competitive advantages, and to catch up or even compete with market leaders (Kim, 1997; Luo et al., 2011, Markides & Geroski, 2005; Prahalad, 2005). The most classical and successful case of 'Reversed Cost-Control' is Biyadi (BYD), one of few Chinese privately-owned auto-makers. By institutionalizing frugal strategy into its organizational culture and value system, employees and partners of the entire corporation, both domestically and internationally, are incentivized and encouraged to bring in new ideas and technologies. BYD is reputed as a company, spending over hundred millions of RMB annually to purchase the latest model of world-class vehicles, just for the purpose of reversed-engineering

projects, dismantling them into pieces, making use of whatever applicable, benchmarking with the original ones, and highlighting the advantage and competitiveness of price-to-performance to attract consumers. To some extent, it is the application of '*Reversed Cost-Control*' technique that has enabled BYD to become not only a global leader in battery industry, but also a global leader in auto-industry.

Numerous successful examples have been presented to explain how the reversed-cost-control based frugal innovation has help and facilitate those fast-growing companies to catch up and become market leaders. Tata Nano project is perhaps the most impressive case of frugal innovation. With a price-cap preset by the company's CEO, the project team is restrained by the price-cap to start concept development and architecture design, resulting in Nano Car delivered to the mass population, changing or rewriting the history of three-wheel motor-vehicles in India. To a certain extent, it is reasonable to argue that, Tata would not be able to achieve such a revolutionary success if without a tedious and tenacious curve of learning and process of imitating, neither possible if without an outsourcing strategy to have those particularly critical components designed by the carefully selected third parties. Mexico's Mabe and Turkey's Arcelik are also companies being reported and described as fast learners and adopters of the reversed-cost-control technique to pursue and accomplish their catching-up process respectively (Bonaglia, Goldstein, & Mathews, 2007). Canon portable all-in-one machine is a typical one deserving attentions especially from researchers and educators. Given the expensive cost of purchasing and maintaining the previously large-in-size Xerox copy-machine, which is mostly (if not solely) suitable for institutions or corporations to lease, Canon, foreseeing the potential demand for smaller-in-size, cheaper-in-price, and portable for personal use, captured this innovation opportunity. By imitating, benchmarking and shrinking the size of Xerox machine, and incrementally adding more functions such as scanning and printing, Canon has stirred up a rapid boom of market expansion from office users to personal PC-users, turning Canon into a reputed legend of creating a revolutionary innovation, forcing Xerox copy-machine to fade away from its previously occupied market (Markides & Geroski, 2005). Another example of adopting and applying frugal innovation strategy to gain catching-up capability and competitive advantage is Galanz, a former China's textile and garment manufacturer before 1992. By identifying the potential market demand for microwave oven at that time when only 2% of China population owned the product (Hart & Christensen, 2002), Galanz decided to enter the market characterized as low-threshold but with huge market potentials. By adopting and applying the reversed-engineering technique, Galanz has incrementally developed and launched a series of energy-saving microwave ovens, small-enough to fit in a tiny kitchen, and cheap-enough to meet the affordability of mass population.

Frugal Innovation Determines the Path-dependent Trajectory of Imitative Innovation

Taking advantage of existing technologies as the source of imitation makes it possible for startups, late-comers and developing country firms to skip the expensive costs and time consuming process of R&Ds (Kim, 1998). The combination of imitation and frugal techniques (*Design-to-Price*, *Reversed-Engineering-to-Cost*) makes it possible for these firms to incrementally enhance and upgrade the degree of newness, deliver and satisfy consumers' preferences, undercut the durability of market leaders' first-mover advantages (Lee et al., 2000), and ultimately, lead to Innovators' Dilemma (Christensen, 1997; Mahmood & Rufin, 2005).

The internal resource portfolio (technological talents and in-house R&Ds) determines firms' capabilities of organizing, digesting and assimilating the external resources (Janszen, 2000), the higher the internal R&D capability, the lower the path-dependent on the external resources; the lower the internal R&D capability, the higher the path-dependent on the external resources, and the higher propensity for imitative innovations (Jolly, 1998). It is indicated empirically that, the type of innovation a firm is likely to choose tends to associate with the predictability and stability of external environment, for example, when an industrial environment is unstable with frequent policy changes, it is likely to force firms to opt for imitative innovations to compete for speed of new products/services development, and to reduce the potential risks; when an industrial environment remains relatively stable and predictable, then, creative innovations dominate the market competition (Damanpour & Golalakrishnan, 1998). This is why the rapid development of China economy is largely attributed to its government policies (white cat, black cat, capturing the mouse is the good cat), to encourage and incentivize imitation as an approach to the speed of economic catching up (Zhao, 2017). Along with their continuing growth of economy, the role of government policies in those developing countries will be inevitably forced to change (Mahmood & Rufin, 2005).

After China becoming the 2nd of world economy, its government has launched a series of policies to initiate and call for transformation from its imitation-based economy to knowledge-based economy. This is why some scholars argue that, the path-dependent transition from imitation to innovation reflects an epistemological progress in cognizing the relationship between knowledge development and economic catching up (Chittoor et al., 2009; Kale & Little, 2007). This is why the author of this text proposes that, having frugal framework systematically established may be significantly meaningful to the development of management theory and education.

Imitative Innovation: an Effective and Irresistible Technique for Both Innovators and Imitators

Given the nature of knowledge is to grow through the process of learning and sharing from one to another, therefore, there is no reason to deny the fact that, imitation is the initial point of innovation, the two only represent their respective status at different stage of knowledge development, and that, the conventionally authenticated 'in-house R&D' type of knowledge development must be updated in order to fit into today's increasingly globalized open-platform of knowledge distribution through the ubiquitous information system (i.e. internet), and through the increasingly diversified and expedited speed of communications and interactions between knowledge-seekers (imitators) and knowledge-developers (innovators). As a result, the transformation between imitators and innovators becomes dynamically mutual (Zhao, 2017).

Despite the endless debate over the issue of imitation, and despite the increasingly opinionated stances between pros and cons, either defending or criticizing the impacts of imitation activities on innovators' investments and competitive advantages, the increasingly globalized business environment has been relentlessly forcing a transition from traditionally closed-door R&D-based innovation model, to an increasingly open-ended and collaborated platform-based innovation model. Such a transition of innovation model has been not only stimulating the growth of global economy as a whole, but also generating excessive sources/outlets of knowledge leaks and spillovers, making imitation an irresistible technique, feasible, applicable, affordable and effective in bridging the technological gap between developing and developed countries firms (Cai, 2009; Wang, 2009). Empirical findings show that, an increased rate of innovation of developed country firms is positively related to an increase of MNCs' rate of technological transfer, and consequently, an increased rate of imitation in those developing countries; such a linear direction is determined by the scale and speed of FDIs' inflow through the channels including but not limited to contracting, licensing, franchising and so forth (Zeng, 2007).

SHANZHAI IMITATIVE INNOVATION: THE CHINTREPRENEURSHIP

The last entry to the theoretical framework of innovation is Shanzhai, defined as Chintrepreneurship, or the China-way of doing business, or Imitative Innovation (Zhao, 2017). The concept of 'Imitative Innovation' is defined as a path-dependent trajectory for developing country firms to evolve from imitation to innovation (Kim, 1997). The rapidly globalized and open-ended information platform (internet) in combination with the increasingly activated trend of talents mobility are identified as major sources of knowledge leaks and spillovers, motivating,

driving and expediting the speed, scale and scope of imitation activities in China (Zhao, 2013; 2014; 2016; 2017).

Imitation + Frugal Techniques = Formula for Shanzhai Firms to Kick into the Low-end Market

The combination of imitation and frugal techniques is described as Shanzhai formula that has enabled millions of POEs in China to successfully survive, grow, and outperform those market leaders. The success of Shanzhai would not be possible if without its targeting at low-end market as a start primary strategy to kick into and establish a foothold, by the means of providing products/services *cheap-enough* in price and *good-enough* in quality. Once the foothold is set, incrementally improving and upgrading the quality of products/services without raising the unit price becomes the secondary strategy for Shanzhai firms to invade into the mid- and upper- ends of market.

Radical vs. Incremental: Which Approach Suits Shanzhai Innovation?

Given the weaknesses of Shanzhai firms both technologically and managerially, radical innovation is obviously out of their reach, and incremental progress through imitation seems to be their only option to squeeze the minimum ROIs from low-end market, characterized as least-profit-margin per unit but large-enough in volume, so that Shanzhai firms can establish a foothold by reaching the economy of scales. This is achievable because, consumers at the low-end market are not only huge in size, but also easy-to-satisfy since they are generally not as familiarized and experienced with products' qualities, features and functions as consumers at the high-end market. This explains why selecting and applying a technology *available, affordable, applicable*, to suit the technological and managerial portfolio of Shanzhai firms is the key for them to kick off; and why reversed-engineering based imitation combined with frugal techniques (*Design-to-Price/Cost* and *Incremental Improvement*) is defined as the imitative innovation approach for developing country firms to survive, grow and compete, as long as they are capable of learning, absorbing, assimilating and integrating the advanced technologies leaked from those well-established firms into their own business operations.

As for those market leaders, radical innovation, by pursuing high-degree of newness to change their products/services, might be the best option for them to maximally take advantage of their technological muscles, strengthen their prowess of reputations, and reap off industrial profits (Markus, 2008). To this end and for comparison purpose, it is reasonable to hypothesize that, developing country firms are most likely to adopt a conservative or bottom-up approach to incrementally pursue their innovations and market expansion; while, market leaders are likely to

take an aggressive or top-down approach to radically pursue their innovations and market expansion (See Figure 5).

Figure 5: Differentiated Technological Approaches for Innovation

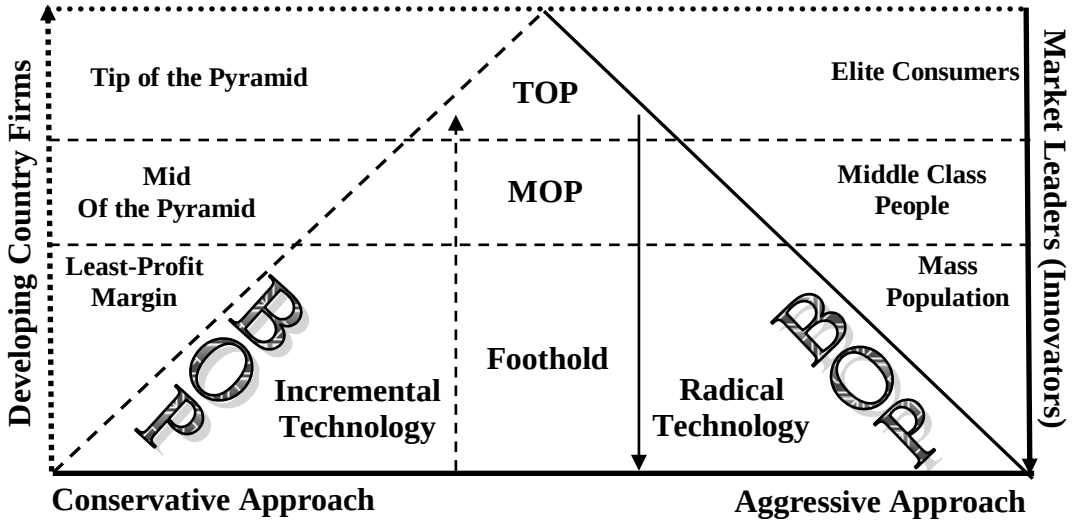


Figure 5 indicates that, conservative approach is favorable to startups, late-comers and developing country firms, possessing little/no R&D capability and market reputation, only capable of pursuing a low-degree-of-newness in products/services development, one step at a time, to incrementally moving-upward from BOP to TOP. In contrast, aggressive approach suits for large corporations or market leaders with solid-base of R&Ds and financial capabilities to pursue high-degree-of-newness or radical changes in products/services development, endeavoring to monopolize the market from top-down approach. It is argued that, incremental approach is more effective than radical approach for small firms to reduce or avoid unnecessary risks involved (Markides & Geroski, 2005). Incremental improvement can be measured by benchmarking the distance (degree of newness) between the 'cheap-enough in price and good-enough in quality' frugal products/services and the existing ones. Too distanced may be unrealistic or overly risky for small firms to undertake; while distanced not-enough may not help firms to break into and disrupt the target market, and may draw suspicious of copyright breach and infringement.

Tianyu for example, a typical Shanzhai firm, started from scratch and rapidly became one of the fast-growing Chinese mobile phone industrial leaders. Such a success is indispensable from adopting and applying the combination of imitation and frugal techniques, targeting and satisfying the anticipated needs of consumers in suburban areas with low-educational or professional background. By willing to accept the least-profit-margin per unit in

this low-end market, and by focusing on incrementally adding and upgrading those particularly preferred features and functions, such as long-standby batteries, volume of speakers, easy-to-use phone books, in the meantime, adjusting or reducing those not appealing features and functions such as M-commerce and Bluetooth – Tianyu has gained its controls over cost and price, achieved its competitive advantages from price-to-performance, satisfied and attracted more and more consumers, enabling Tianyu not only to establish a foothold, but also to build its brand reputation characterized as '*cheap-and-good-enough*', and most importantly, to accumulate resources (capital, technological) required for market expansions, from low-end (suburban), to mid-upper markets in urban areas of China, and then, to overseas markets of those developing countries. In contrast to Tianyu market strategy, it is worth to note that, G'Five is another successful Shanzhai star in mobile phone industry but in an opposite direction. G'Five started by moving its business from China to India wherein, G'Five has achieved a great success, ranking as the second largest provider (next to Nokia), expanding its market from India to other 19 countries within a decade, indicating that, Shanzhai model is an effective approach.

The Roles of Information and Digital Technologies in Promoting Shanzhai Innovation

It must be noted that, the rapid development of information technology, especially the digital application (3D CAD) has played an indisputable role in promoting Shanzhai firms or developing country firms to pursue their imitative innovations. PeopleSoft for example, is a synthetic package of management software, designed for firms to integrate the designs of products/services into one digital platform, and to establish a synergy that prevents firms from the threat of being immediately imitated. It is suggested that, digital applications can strengthen the collaborations in a digital-mode among supply-chain partners (material suppliers, manufacturers, assemblers and market distributors); such a digital-collaboration can provide a competitive advantage for collaborators to visualize and modify the designs of products/services on screens, making communication simultaneous among designers, engineers and front-line workers from any geographic locations; shortening the lead-time of back-and-forth processes of trials-and-errors, which otherwise would only be completed at a later stage of products/services development; and ultimately, establishing an integrated barrier to prevent potential threats from imitators and competitors, both technologically and managerially (Baba & Nobeoka, 1998). This is why, it is argued that, the rapid development of digital technology has been functioning as a platform, on which, Shanzhai firms or developing country firms have speeded up their processes of learning, absorbing, assimilating, leveraging the existing technologies (source technologies), and gradually, enhancing and strengthening their synthetic capabilities of time saving, cost saving and resource saving (Zhao, 2011).

CONCLUSIONS AND DISCUSSIONS

Despite the richness of the existing literature on the subject of innovation, there appears to have a disconnected theoretical cohesion that can be applied to logically and systematically reflect the evolutionary continuity of the dynamically diversified mechanism of innovations (Garcia & Calantone, 2002). Traditional theories seem feeble or weak to rationalize the correlation between the rapidly emerged innovative business phenomena from those fast growing developing economies and the increasingly globalized business environment during the past 30 some years (Cappelli et al., 2010; Chen & Miller, 2010; Freeman & Soete, 2009; Stieglitz & Heine, 2007; Zeschky et al., 2011).

The Significance of Paradigm-Shift: From Technology-Centered to Management-Oriented Innovations

Relying on the findings from a large quantity of case studies of both within- and cross-industries, some scholars discovered and initiated a paradigm-shift, theorizing that, the very essence of innovation is to transform the human wisdom (knowledge and technology) into the process of value-creation (Chesbrough, 2003; Christensen, 1997), otherwise, it would be meaningless (Christensen & Raynor, 2003). Despite their great contributions in pushing such a paradigm-shift, refreshing or even sabotaging the traditionally technology-centered innovation framework, nevertheless, these scholars seem still being trapped inside the traditional shadow, still separating imitation from innovation, and still treating imitators as enemies of innovators. It is indicated that, these scholars are only a half-way-through and incomplete in cognizing and unfolding the fact that, innovators and imitators are genetically twined and mutually inseparable actors or forces in driving the evolution and revolution of knowledge and technology (Zhao, 2016;2017). This is why some scholars claimed that, unless innovations' strategies and decisions can lead to value-creation, otherwise would be meaninglessly wasteful (Ford & Saren, 1996). To this end, the significance of the paradigm-shift from traditionally technology-centered to contemporarily management-oriented mechanism of innovations may be interpreted and rationalized from two perspectives (See Table 5).

Table 5: The Significance of Paradigm-Shift from the Technology-Centered to the Management-Oriented

Value-Creation Perspective	Innovation must create values. It is the management rather than technology itself that prioritizes the value-creation as the primary motivation for firms to pursue innovations, and transforms technologies into business values. Therefore, the paradigm-shift from technology-centered to management-oriented innovation model signifies and highlights

	the significance of the intrinsic link, from creating new ideas and/or new technologies, to transforming or commercializing them into a process of value-creation.
CSR Perspective	Innovation must create values beyond providing better products/services. Innovation has been functioning as an intelligent or smart way of developing and utilizing human wisdom, and applying it to improve productivities, reduce resource consumption, and alleviate environmental pollutions and contaminations. The paradigm-shift from technology-centered to management-oriented innovation model helps establish a meaningful system in evaluating the performances of innovations in terms of triple-bottom-lines (TBL) or corporate social responsibilities (CSR), namely, stimulating the economic growth of regional, national and global income per capita, employment rate, driving the evolutionary progress of individual life and social well-beings as a whole, and reducing negative impacts on environmental sustainability (Ahlstrom, 2010).

The Framework of 'Frugal and Shanzhai' Serves as an Extension to the Existing Theory of Innovation

The framework of 'Frugal and Shanzhai' proposed in this text is original, as an attempt to reflecting and interpreting the mechanism of how developing country firms have been endeavoring to build their competitive capabilities and advantages, by the means of adopting and applying the combination of Frugal and Shanzhai techniques, namely, design-to-price, reversed-engineering-to-cost, and incremental improvement through imitations. The increasingly globalized information platform in conjunction with the rapidly developed digital technology makes Frugal techniques and Shanzhai imitation feasible and effective approaches to facilitate developing country firms to catch-up, just like *picking the lower hanging fruits* (the existing-but-previously-unserved markets combined with the existing-technologies with Triple-A-Characteristics, namely, available, affordable and applicable). The framework of Frugal and Shanzhai innovations proposed in this text may serve as extensions of 'Disruptive Innovation' and 'Open Source based Innovation', and serve to rationalize that: as far as those developing country firms are capable of producing and providing products/services with Triple-Enough-Characteristics, namely, cheap-enough in price, good-enough in quality, and large-enough in quantity, then, they deserve to be recognized as innovators, capable of disrupting and re-shaping the industrial and market patterns already established and monopolized by those incumbents.

Given the genetically twined relationship between imitators and innovators, regardless of like it or not, the 'mouse and cat' kind of ecologically structured predatory game between the two will continue, competing against each other upon the speed of technological enhancement combined with the degree of technological integration (integrating different pieces of

technologies into one package). It is suggested that, the faster speed and higher degree of technological integration the innovators can achieve, the harder for imitators to follow, and the longer length of time for innovators to gain and sustain their expected ROIs, and consequently, the more effective solutions for innovators to prevent or slow down the speed of imitations, and avoid innovators' dilemma (Pil & Cohen, 2006). Although pending for future research to verify, it is plausible to hypothesize for the time being that, 'Frugal and Shanzhai' framework is just a contemporary point passing through the theoretical evolution of innovation. What is the next then?

ACKNOWLEDGEMENT

The author has been endeavoring to concentrate on the research of Shanzhai for more than 10 years. During the period, discussions with colleagues at Konkuk University and Catholic University of Korea provide great help directly or indirectly, gratefulness is beyond the words. Special thanks must be sincerely extended to the editors and reviewers for their time and efforts spent in the process of evaluation.

REFERENCES

Abernathy, W.J. & Utterback, J.M. (1978). Patterns of Industrial Innovation. Technology Review, 80:(7), 40-47.

Ahlstrom, D. (2010). Innovation and Growth: How Business Contributes to Society. Academy of Management Perspectives, 24:(3), 11-24.

Altrichter, H., Feldman, A., Posch, P. & Somekh, B. (2008). Teachers Investigate Their Work; An Introduction to Action Research Across the Professions. 2nd Ed., Routledge, London.

Amara, N., Landry, R., & Doloreux, D. (2009). Patterns of innovation in knowledge-intensive business services. The Service Industries Journal, 29:(4), 407-430.

Anthony, S.D, Johnson, M.W., & Sinfield, J.V. (2008). Institutionalizing Innovation. MIT Sloan Management Review, 2008 Winter, 49:(2), 44-53.

Anthony, S.D, Johnson, M.W, Sinfield, J.V, & Altman, E. J. (2008). Innovator's Guide to Growth - Putting Disruptive Innovation to Work. Harvard Business School Press.

Assink, M. (2006). Inhibitors of disruptive innovation capability: a conceptual model. European Journal of Innovation Management, 9:(2), 215 – 233.

Baba, Y. & Nobeoka, K. (1998). Towards knowledge-based product development: the 3-D CAD model of knowledge creation. Research Policy, 26:(6), 643-659.

Barney, J.B. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management; 17:(1), 99–120.

Barney, J.B. (2011). Operations Gaining and Sustaining Competitive Advantage. 4th Edition, Prentice Hall.

Bell, M. & Pavitt, K. (1992). Accumulating technological capability in developing countries. In Proceedings of the World Bank Annual Conference on Development Economics, Washington D.C.: World Bank.

Blalock, G., & Veloso, F.M. (2007). Imports, Productivity Growth, and Supply Chain Learning. World Development, 35:(7), 1134-1151.

Blythe, J. (1999). Innovativeness and newness in high-tech consumer durables. Journal of Product & Brand Management, 8:(5), 415-429.

Bonaglia, F., Goldstein, A., & Mathews, J. A. (2007). Accelerated internationalization by emerging markets' multinationals: The case of the white goods sector. Journal of World Business, 42:(4), 369–383.

Boudreau, K.J. (2007). Does Opening a Platform Stimulate Innovation? The Effect on Systemic and Modular Innovations. MIT Sloan Research Paper, No. 4611-06. Available and downloadable at: http://ssrn.com/abstract=913402

Bower, J.L. & Clayton, M. (1995). Disruptive Technologies: Catching the Wave. Harvard Business Review, January-February, 43-53.

Bozdogan, K., Deyst, J., Hoult, D., & Lucas, M. (1998). Architectural innovation in product development through early supplier integration. R&D Management, 28:(3), 163-173.

Bureth, A., & Penin, J. (2007). Modular Innovations and Distributed Processes. The Case of Genetically Engineered Vaccines. European Journal of Economic and Social Systems, 20:(2), 251-274.

Burgelman, R., Maidique, M., & Wheelwright, S. (2004). Strategic Management of Technology and Innovation. A working paper presented at the conference of 'Times Mirror Higher Education Group', Chicago.

Cai, W.Y. (2009). Study on Knowledge Spillover and Technological Progress in the Context of Globalization. Proceedings of China National Doctoral Conference, 47-53. (PDF Downloadable at http://cpfd.cnki.com.cn/Article/CPFDTOTAL-XMHG200910001024.htm)

Chen, M-J., & Miller, D. (2010). West meets East: Toward an ambicultural approach to management. Academy of Management Perspectives, 24:(4), 17–24.

Chesbrough, H.W. (2003). Open Innovation: The new imperative for creating and profiting from technology. Boston: Harvard Business School Press.

Chesbrough, H.W. (2003). The Era of Open Innovation. MIT Sloan Management Review, 44:(3), 35–41.

Chesbrough, H.W. & Teece, D.J. (1996). When is virtual virtuous? Organizing for innovation. Harvard Business Review, 74:(1), 65-73.

Chesbrough, H.W., Vanhaverbeke, W. & West, J. (2006). Open Innovation: Researching a New Paradigm, Oxford University Press.

Child, J. & Faulkner, D. (1998). Strategies of Co-Operation – Managing Alliances, Networks and Joint Ventures. Oxford University Press, Oxford.

Chittoor, R., Sarkar, M. B., Ray, S., & Aulakh, P. (2009). Third-world copycats to emerging multinationals: Institutional changes and organizational transformation in the Indian pharmaceutical industry. Organization Science, 20:(1), 187–205.

Christensen M.C. (1997). The Innovator's Dilemma: when new technologies cause great firms to fail. Cambridge: Harvard Business School Publishing Co.

Christensen, M. C. & Raynor, F. M. (2003). The innovator's solution: creating and sustaining successful growth, Cambridge: Harvard Business School Publishing Co.

Christensen, M. C., Anthony, S. D., & Roth, E. A. (2004). Seeing What's Next, Harvard Business School Press.

Christensen, M.C., Baumann, H., Ruggles, R., & Sadtler, T. M. (2006). Disruptive Innovation for Social Change, Harvard Business Review, 84(12), 94.

Cohen, L., & Manion, L. (2000). Research methods in education. 5th Ed., Routledge, London. p. 254.

Collis, D.J. & Montgomery, C.A. (1995). Competing on resources strategy in the 1990s. Harvard Business Review, July-August 1995.

Cooper, J.R. (1997). A Multidimensional Approach to the Adoption of Innovation. Proceedings of the Portland International Conference on Management of Engineering and Technology (PICMET97), Portland, 27-31 July.

Cooper, R.G., & Edgett, S.J. (2008). Maximizing productivity in product innovation, Research-Technology Management, 51: (2), 47-58.

Damanpour, F. & Golalakrishnan, S. (1998). Theories of Organizational Structure and Innovation Adoption: The Role of Environmental Change, Journal of Engineering and Technology Management, 15: (1), 1-24.

Dodgson, M., Gann, D., & Salter, A. (2005). Think, Play, Do: Technology, Innovation, and Organization. London: Oxford University Press.

Doloreux, D., & Shearmur, R. (2010). Exploring and comparing innovation patterns across different knowledge intensive business services. Economics of Innovation and New Technology, 19:(773147624), 1-21.

Ettlie, J.E. (1988). Taking Charge of Manufacturing - How Companies are Combining Technological and Organizational Innovation to Compete Successfully. Jossey-Bass Publishers, San Francisco.

Ettlie, J.E. (2000). Managing Technological Innovation. John Wiley & Sons, New York.

Ettlie, J.E., Bridges, W.P., & O'Keefe, R.D. (1984). Organization Strategy and Structural Differences for Radical versus Incremental Innovation. Management Science, 30:(6), 682-695.

European-Commission. (2005). Oslo Manual: Guidelines for Collecting and Interpreting Technological Innovation Data, 3rd Edition. Committee for Scientific and Technological Policy, OECD-OCDE, Paris.

Fan, P.L. (2006). Catching up through developing innovation capability: evidence from China's telecom-equipment industry. Technovation, 26:(3), 359-368.

Fifarek, B.J., & Veloso, F.M. (2010). Offshoring and the global geography of innovation. Journal of Economic Geography, 10:(4), 559-578.

Figueiredo, P.N. (2001). Technological Learning and Competitive Performance. Edward Elgar Publishing Ltd., UK.

Filippini, R. & Nalini, F. (1998). Product Architecture, Competence and Integration: A Reference Model and a Case Study. Proceedings of the 5th International Product Development Conference, 25-26 May, Como, 369-383.

Ford, D. & Saren, M. (1996). Technology Strategy for Business. International Thomson Business Press, London.

Freel, M. (2006). Patterns of Technological Innovation in Knowledge-Intensive Business Services. Industry and Innovation, 13:(3), 335-358.

Freeman, C., & Soete, L. (2009). Developing science, technology and innovation indicators: What we can learn from the past. Research Policy, 38:(4), 583-589.

Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: a literature review. Journal of Product Innovation Management, 19:(2), 110-132.

Galunic, C. D., & Eisenhardt, K.M., (2001). Architectural Innovation and Modular Corporate Forms. The Academy of Management Journal, 44:(6), 1229-1249.

Hagel, J., & Brown, J.S. (2005). The only sustainable edge, Harvard Business School Press, Boston.

Hamel, G., & Prahalad, C.K. (1994). Competing for the future. Harvard Business School Press, Boston.

Hart, S.L., & Christensen, C.M. (2002). The great leap. Driving innovation from the base of the pyramid. MIT Sloan Management Review, 44:(1), 51-56.

Henderson, R.M., & Clark, K.B. (1990). Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms, Administrative Science Quarterly, 35:(1), 9 - 30.

Hobday, M. (1995a). Innovation in East Asia: the challenge to Japan. Aldershot, Elgar.

Hobday,M. (1995b). East Asian Latecomer Firms: Learning the Technology of Electronics. World Development, 23:(7), 1171–1193.

Hoetker, G. (2006). Do Modular Products Lead to Modular Organizations? Strategic Management Journal, 27:(6), 501-518.

Husig, S; Kohn, S; & Poskela, J. (2005). The Role of Process Formalisation in the early Phases of the Innovation Process. Presentation at 12th International Product Development Conference. Copenhagen.

Janszen, F. (2000). The Age of Innovation - Making Business Creativity a Competence, Not a Coincidence. Prentice Hall, London.

Jin, J. & von Zedwitz, M. (2008). Technological capability development in China's mobile phone industry. Technovation, 28:(6), 327- 334.

Jolly, D. (1998), Revisiting Technology Portfolios Using the Resource-based Approach. Proceedings of the 7th International Conference on Management of Technology, Orlando, 16-20 February, 1005-1014.

Johannessen, J., Olsen, B., & Lumpkin, G.T. (2001). Innovation as newness: what is new, how new, and new to whom? European Journal of Innovation Management, 4:(1), 20-31.

Kale, D., & Little, S. (2007). From imitation to innovation: The evolution of R&D capabilities and learning processes in the Indian pharmaceutical industry. Technology Analysis & Strategic Management, 19:(5), 589–609.

Kanter, R. (1989). Swimming in Newstreams: Mastering Innovation Dilemmas. California Management Review, 31(4), 45-69.

Kim, L. (1997), Imitation to Innovation: the Dynamics of Korea's Technological Learning. Boston: Harvard Business School Press.

Kim, L. (1998). Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor, Organization Science, 9:(4), 506–521.

Lawson, B., & Samson, D. (2001). Developing Innovation Capability in Organizations: A Dynamic Capabilities Approach. International Journal of Innovation Management. 5:(3), 377–400.

Lee, J., Smith, K. G., Grimm, C. M., & Schomburg, A. (2000). Timing, order and durability of new product advantages with imitation. Strategic Management Journal, 21(1), 23–30.

Lee, J., & Veloso, F.M. (2008). Interfirm Innovation under Uncertainty: Empirical Evidence for Strategic Knowledge Partitioning. Journal of Product Innovation Management, 25:(5), 418-435.

Lindsay, J. (2000). The Technology Management Audit - the tools to measure how effectively you exploit the technological strengths and know-how in your company. Financial Times, Prentice Hall, London.

Liu, X. (2005). China's Development Model: An Alternative Strategy for Technological Catch-Up. Working Paper, Institute of Innovation Research Hitotsubashi University.

London, T. & Hart, S.L. (2004). Reinventing Strategies for Emerging Markets: Beyond the Transitional Model. Journal of International Business Studies. 35: 350-370.

Loutfy, R. & Belkhir, L. (2001). Managing Innovation at Xerox. Research Technology Management, 44: (4), 15-24.

Luo, Y.D., Sun, J.Y., & Wang, S.L. (2011). Emerging Economy Copycats: Capability, Environment, and Strategy. Academy of Management Perspectives, 25: (2), 37-56.

Mahmood, I.P. & Rufin, C. (2005). Government's Dilemma: The Role of Government in Imitation and Innovation. The Academy of Management Review, 30:(2), 338-360.

Markides, C. & Geroski, P. (2005). Fast Second: How Smart Companies Bypass Radical Innovation to Enter and Dominate New Markets. San Francisco: Jossey-Bass.

Markus, S. (2008). Corporate governance as political insurance: firm-level institutional creation in emerging markets and beyond. Socio-Economic Review, 6: 69–98.

Mathews, J.A. (2005). Strategy and the Crystal Cycle. Californian Management Review, 47:(2), 6-32.

Mathews J. A. (2006). Dragon multinationals: New players in 21st century globalization. Asia Pacific Journal of Management, 23:(1): 5-27.

Muscioa, A. (2006). Patterns of Innovation in Industrial Districts: An Empirical Analysis. Industry & Innovation, 13:(3), 291-312.

O'Donoghue, T., & Punch, K. (2003). Qualitative Educational Research in Action: Doing and Reflecting. Routledge, London. p.78.

Penin, J., Hussler, C. & Burger-Helmchen, T. (2011). New shapes and new stakes: a portrait of open innovation as a promising phenomenon. Journal of Innovation Economics, 7, 11–29.

Pil, F.K. & Cohen, S.K. (2006). Modularity: Implications for Imitation, Innovation, and Sustained Advantage. The Academy of Management Review Archive, 31:(4), 995-1011.

Pisano, G.P. (1997). The Development Factory - Unlocking the Potential of Process Innovation. Harvard Business School Press, Boston.

Prahalad, C.K. (2005). Fortune at the bottom of the pyramid. Wharton School Publishing, New Jersey.

Rothwell, R. (1992). Successful industrial innovation: critical factors for the 1990s. R&D Management, 22:(3), 221-240.

Rudberg, M. (2004). Linking competitive priorities and manufacturing networks: a manufacturing strategy perspective. Journal of Manufacturing Technology Management, 6:(1/2), 55-80.

Rudberg, M. & West, M. (2008). Global operations strategy: Coordinating manufacturing networks. Omega, 36, 91-106.

Rycroft, R.W. & Kash, D.E. (2002). Path dependence in the innovation of complex technologies. Technology Analysis Strategic Management, 14:(1), 21-35.

Shenkar, O. (2010). Copycats: How smart companies use imitation to gain a strategic edge. Boston: Harvard Business Press.

Stieglitz, N., & Heine, K. (2007). Innovations and the role of complementarities in a strategic theory of the firm. Strategic Management Journal, 28:(1), 1-15.

Tapscott, D. (2008). Grown Up Digital: How the Net Generation is Changing Your World. McGraw-Hill.

Tapscott, D. & Ticoll, D. (2003). The Naked Corporation: How the Age of Transparency Will Revolutionize Business. Free Press.

Tapscott, D. & Williams, A.D. (2006). Wikinomics: How Mass Collaboration Changes Everything. Portfolio Trade.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18:(7), 509-533.

Tether, B.S. (2004). Do Services Innovate (Differently)? Published by Center for Research on Innovation and Competition (CRIC). Discussion Paper of CRIC, N. 66. November 2004. Downloaded on June 21st 2011 at: http://www.cric.ac.uk/cric/Pdfs/dp66.pdf

Thomke, S. (2001). Enlightened Experimentation: The New Imperative for Innovation. Harvard Business Review, 1-8

Thomke, S. (2003). Experimentation Matters. Harvard Business School Press

Thomke, S. (2006). Capturing the Real Value of Innovation Tools. MIT Sloan Management Review, 47:(2), 24-32.

Thomke, S. & Fujimoto, T. (2000). The Effect of Front Loading Problem Solving on Product Development Perfarmance. Journal of Product Innovation Management. 17: 128-142.

Tidd, J. (1997). Complexity, Networks & Learning: Integrative Themes for Research on Innovation Management. International Journal of Innovation Management, 1:(1), 1-21.

Tushman, M.L., Anderson, P.C. & O'Rielly, C (1997), Technology cycles, innovation streams, and ambidextrous organizations: organization renewal through innovation streams and strategic change, in Managing strategic innovation and change - a collection of readings. Edited by Tushman, M.L. & Anderson, P. (1997). Oxford University Press, Oxford, 3-23.

Vaccaro, A., Brusoni, S., & Veloso, F.M. (2011). Virtual Design, Problem Framing, and Innovation: An Empirical Study in the Automotive Industry. Journal of Management Studies, 48:(1), 99-122.

Vaccaro, A., Parente, R., & Veloso, F.M. (2010). Knowledge Management Tools, Inter-Organizational Relationships, Innovation and Firm Performance. Technological Forecasting and Social Change, 77:(7), 1076-1089.

Van de Ven, A. (1986). Central problems in the management of innovation. Management Science, 32, 590-607.

Vemuri, V. & Bertone, V. (2004). Will the Open Source Movement Survive a Litigious Society? Electronic Markets, 14:(2), 114–123.

Vence, X., & Trigo, A. (2009). Diversity of innovation patterns in services. The Service Industries Journal, 29:(12), 1635-1657.

Wang, X. (2009). Study on the Dual-Mode Dynamic Mechanism: from Imitation to Innovation. Presentation at the Fourth Chinese Annual Conference on Technology and Innovation Management, 2009, Beijing, China. (PDF Downloadable at http://www.docin.com/mydoc-204014-41.html&&folderId=0).

Wolter, C., & Veloso, F.M. (2008). Do modular products lead to modular organizations? The Academy of Management Review, 33:(3), 586-605.

Yin, R.K. (2009). Case Study Research: Design and Methods, 4th Ed., Sage Publications, California.

Zeng, Y.J. (2007). MNCs' Production Transfer and Host-Countries' Technology Selection: A Theoretical Model Based on Innovation and Imitation. International Economics and Trade Research, 4, 56-60.

Zeschky, M., Widenmayer, B., & Gassmann, O. (2011). Frugal Innovation in Emerging Markets: The Case of Mettler Toledo, Research-Technology Management, 54: (4), 38-45.

Zhao, J. (2017). Chintrepreneurship as a Catch-up Model for Developing Economies: A Tripartite Framework of Government Intervention, Entrepreneurship and Economic Development. International Journal of Economics, Commerce and Management (IJECM), 5(6): 245-273. ISSN 2348 0386, UK. DOI: http://ijecm.co.uk/wp-content/uploads/2017/06/5616a.pdf. Or, http://ijecm.co.uk/?s=jiangning

Zhao, J. (2017). Government Intervention, Seedling Approach, and Global Networks: A Modeling for the China-way of Entrepreneurship. International Journal of Economics, Commerce and Management (IJECM), 5(2): 1-55. ISSN 2348 0386, UK. DOI: http://ijecm.co.uk/wp-content/uploads/2017/02/521.pdf. or, http://ijecm.co.uk/?s=jiangning

Zhao, J. & Zhang, B. (2017). Chintrepreneurship – The China-way of Entrepreneurship: Government Intervention, Seedling Approach – A Network-based Model of Entrepreneurship. Management and Organizational Studies (MOS), 4(1): 30-66. DOI: https://doi.org/10.5430/mos.v4n1p30.

Zhao, J. (2016). A Conceptual Discussion on the Peculiarity of Doing Business in China – A Framework Extracted from Critical Review of HBSP China Case Studies. International Journal of Economics, Commerce and Management (IJECM), 4(4), 411 – 452. ISSN 2348 0386, UK. DOI: http://ijecm.co.uk/volume-iv-issue-4/. The full paper is downloadable at: http://ijecm.co.uk/wp-content/uploads/2016/04/4424.pdf.

Zhao, J., & Zhang, B. (2016). A Theoretical Framework on the Peculiarity of Doing Business in China—An Extensive Review on HBSP China Business Cases. Modern Management Science & Engineering (MMSE), 4(1), 62 – 100. © Scholink. ISSN 2052-2576, UK. DOI: http://www.scholink.org/ojs/index.php/mmse/article/view/532. The full paper is downloadable at: http://www.scholink.org/ojs/index.php/mmse/article/view/532/499.

Zhao, J. (2014). An Argument on the Existing Framework of Entrepreneurship – Shanzhai: An Emerging Entrepreneurial Model. International Journal of Economics, Commerce and Management (IJECM), 2(5), 1 – 51. ISSN 2348 0386, UK. DOI: http://ijecm.co.uk/volume-ii-issue-5/. The full paper is downloadable at: http://ijecm.co.uk/wp-content/uploads/2014/05/253.pdf.

Zhao, J. (2013). A Cognitive Discussion on Shanzhai: An Emerging Innovation Model. Global Advanced Research Journal of Management and Business Studies (GARJMBS), 2(3), 137-153. ISBN: 2315-5086. DOI: http://garj.org/garjmbs/3/2013/2/3/a-cognitive-discussion-on-shanzhai-an-emerging-innovation-model#.

Zhao, J. (2012). The Role of CAD Application in Open Innovation Model: Innovation Technology in the Chinese Shipbuilding Industry. International Journal of Business Innovation and Research (IJBIR), 6(6), 698-719. © InderScience. DOI: 10.1504/IJBIR.2012.049492

Zhao, J. & White, S. (2010). Dynamic Capability – Explaining the Impact of ISO-14001 on Corporate Financial Performance. International Journal of Service and Operations Management (IJSOM), 6(4), 470-488. © InderScience. DOI: 10.1504/IJSOM.2010.032920

Zhao, J. (2008). The Effect of ISO-14001 Environmental Management System on the Corporate Financial Performance. International Journal of Business Excellence (IJBEX), 1(1/2), 210-230. © InderScience. DOI: 10.1504/IJBEX.2008.017575

Zhou, K.Z., Yim, C. K., David, K. & Tse, D.K. (2005). The Effects of Strategic Orientations on Technology- and Market-Based Breakthrough Innovations. Journal of Marketing, 69:(April), 42–60.