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ASSESSMENT OF DISRUPTIVE INNOVATION ROAD MAPS: A MULTIPLE CASE STUDY FROM CHINA

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ABSTRACT

Given the growing awareness of the importance of disruptive innovation (DI) in both emerging and advanced economies, it becomes meaningful to examine under which circumstances disruptive innovation occurs and how to assess the essential characteristics and success factors for disruptive innovation through opportunity generation to provide a basis for guidance to practitioners.

This paper focuses on assessment of disruptive innovation in the particular context of the Republic of China, one of the emerging markets for new management processes and practices. The previous has not been substantially addressed in the literature. Therefore, the intention in this paper is to contribute to bridge this gap through addressing how new innovation processes enable disruptive innovation drawing from Christensen's disruptive innovation and using an assessment framework proposed by Hang and Yu.

To examine the above an inductive theory building methodology was carried out utilizing a multiple case study strategy. In this study we examine the case of three Chinese firms through the lens of new-market disruption to develop principles that explain how and what are the characteristics that facilitate disruptive innovation when it occurs. The findings suggest that when it comes to China, the innovative processes adopted enable opportunities that incorporate key features of disruptive innovation. In particular the evaluation and assessment framework explains in detail the holistic success factors for disruptive innovation. Some final insights on the managerial implications and directions for future research.

KEYWORDS: *Disruptive Innovation, Assessment, Framework, Case study China*

1. INTRODUCTION

One of the most influential management ideas of the new millennium has been 'disruptive innovation' (DI). The theory has seen widespread implementation in a range of industries and public services, such as educational, health and technological (Halvorsen, 2014). Further to these, the theory has brought significant implications for management practices and gathered substantial interest in academia (Yu and Hang, 2010). The disruptive innovation framework was popularized following Clayton Christensen's renownedbook "The Innovator's Dilemma" however it was preceded by a series of previous technological innovation studies as Figure 1 illustrates.

Figure 1. Timeline of evolution of Disruptive Innovation Theory (Source: Yu and Hang, 2010:436)

Over the years as disruptive innovation gained interest for competitive strategy practices, it became meaningful in terms of research to examine how disruptive innovation occurs. In this sense, several researchers have looked into the concept to explore under which circumstances disruptive innovation happens for a company or organization. Although the latter has been substantially investigated, there is still a scarcity of research on the nature of innovation processes and assessment of the characteristics and success factors that can lead to disruptive innovation(Yu and Hang, 2010). Therefore we are left we insufficient understanding of the nature of R&D and opportunity for discovery and creation processes that would enable potential disruptive innovation.

Concurrently, there is an increasing realization accompanied by empirical findings that denotes how emerging economies are fruitful ground for disruptive innovation(Hart and Christensen, 2002; Li, 2013). These sorts of market environments enable disruptive innovation resultsthat derive from the fact that alterations in product design and business models to dramatically reduce costs and improve value for money are incremental to unlocking mass-market segments of low income customers. In addition, having a large number of customers who shop for the first time and don't have particular pre-existing preferences and expectations, fewer legacy assets also suggests it is more likely to launch, test and improve disruptive innovations(Williamson et.al., 2013). There are examples to confirm the latter in developing countries like India and Brazil. However of the most characteristic examples of emerging markets where disruptive innovations flourish is China.

1.1 The context of the study

In the case of the Republic of China, the world's most populous country, variant industries from health to innovation business models for e-

commerce and social media portals have exhibited disruptive innovation patterns (Williamson et.al., 2013). In this sense it has been claimed that China has the potential to cultivate the capacity for disruptive innovation and become a global leader in innovation. In this study, the intention was to examine a set of case studies from companies based in China aiming to get insights and assess the extent to which disruptive innovation occurs and its success factors. The pursue of this paper is to explore the disruptive impact based on a particular theoretical framework proposed to enlighten the path for developed countries as well with regard to how to evaluate disruptive innovation and illuminate its characteristic features for success and improved performance.

In undertaking this investigation, one critical consideration was with regards to the debate on whether entrepreneurs discover or create opportunities, in particular from the perspective of disruptive innovation (Alvarez and Barney, 2007). The literature suggests that such opportunities to innovate can derive from changes in technology, demographics, and geographic distribution of markets (Hang and Garnsey, 2011). In particular for emerging markets like China the claim is that they provide a most fertile ground for innovation opportunities to occur. Our study examining the particular case of China, confirms the latter argument with evidence that multiple opportunities arise for disruptive innovation, which refers to opportunity discovery. Nevertheless, this advantage does not guarantee that disruptive innovation will occur. It is a question also of entrepreneurs realizing these opportunities through proactive action. The previous statement was observed in the case of this study where opportunities do not arise independently of the entrepreneurs' initiatives. On the contrary, as it will be discussed later in this paper, entrepreneurs create opportunities for disruptive innovation much more than they simply discover them in China.

Before we proceed to the core of this paper, it is incremental to examine the relevant literature on disruptive innovation theory focusing on the concept of Low and New Market disruption. The previous were defining for identifying a gap in research and determine the case study strategy chosen as the research methodology employed alongside the data collection and analysis tools utilized which are elaborated in the next section of this paper. Following this, the findings from the case studies are presented and a discussion and conclusions are derived as well as implications and future research recommendations.

2. BACKGROUND TO THE STUDY

This study stems from the theory of disruptive innovation to interpret empirical evidence and support the theoretical contributions of the study. This section seeks to demystify what the concept of disruptive innovation theory entails. This section is followed by some key new approaches of disruptive innovation which have been developed by Chinese firms. The latter led to identification of the following research question: What are the roadmaps to disruptive innovation currently emerging in Chinaand how can these be assessed?

2.1 Philosophical groundings of disruptive innovation

The concept of disruptive innovation gained remarkable popularity following Christensen's work as mentioned in the introduction of this paper. Christensen describes disruptive innovation as "the process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up Market, eventually displacing established competitors" (Christensen, 1997). Disruptive Innovation in other words, creates a new market and value network, by displacing an earlier technology. An example to this concept is how the innovation of Cellular Phones displaced fixed line telephones (Christensen, 1997).

Christensen articulated on the existence of innovations that create new markets by discovering new categories of customers. This is achieved through a mixture of harnessing new technologies while also developing new business models and exploiting old technologies in new ways (Economist, 2015). Disruptive Innovation therefore differs from Incremental Innovation, which merely sustains an existing industry by improving existing products.

As a continuum of the conceptualizations on the innovator's dilemma for how incumbent firms can avoid disruption by disrupt themselves, Christensen and Raynor (2003) elaborated on The Innovator's Solution. In this book, they establish the use of the term 'disruptive innovation' instead of 'disruptive technology' to expand on the range of businesses where the theory can be applied. Christensen in his later writings clarifies how disruptive innovation can arise not only from new technologies that outperform existing prominent technologies, but also it can be the result of changes in the business model or underlying processes that deliver greater or new value to consumers.

Several characteristics according to Christensen are typical of disruptive businesses, at least in their initial stages: lower gross margins, smaller target markets, and simpler products and services that may not appear as attractive as existing solutions when compared against traditional performance metrics. The opportunity for new disruption to occur emerges in the space at the bottom of the market where lower gross margins

appear as unattractive to firms moving upward (Christensen, 2015).In its definition of disruptive innovation, the Oslo Manual refers to the work of Christensen and warns that "it might not be apparent whether an innovation is disruptive until long after it has been introduced", a major challenge for analyzing disruptive innovation (OECD, 2005). What is also important is that disruptive innovation applies to various types of innovation depending on (i) the type of innovation and (ii) the degree of novelty as noted in Table 1 (OECD, 2005). The boundaries between the different categories are blurred and an innovation can lead towards one or the other end.

Degree of novelty / *Type of innovation*	New to firm	New to market	New to world	**Disruptive**
Product innovation				
Process innovation				
Marketing innovation				
Organisational innovation				

Table 1. Framework for classifying innovations (based on OECD Oslo Manual, 2005)

2.2 Low end and New Market Disruption

Apart from the establishment of the term 'disruptive innovation', evidence of Christensen's evolution of his original thinking in "The Innovator's Solution: Creating and Sustaining Successful Growth", was distinguishing among two types of innovations with a different measure of successand performance that involves new customers and new contexts for consumptionas shown in Figure 2:Low-End and New-Market (Christensen and Raynor, 2003). Low End Market refers to companies addressing the needs of consumers who are looking to buy a good performance product at a lower price (Chaston, 2015). New-Market disruptive innovations on the other hand relate to compete with what Christensen calls "non consumption" (Halvorsen, 2014). This term refers to simple and affordable products that come to cover the needs of a new type of consumers who do not have previous experience of using a certain product or service and are now provided with this chance (Chaston, 2015; Halvorsen, 2014).

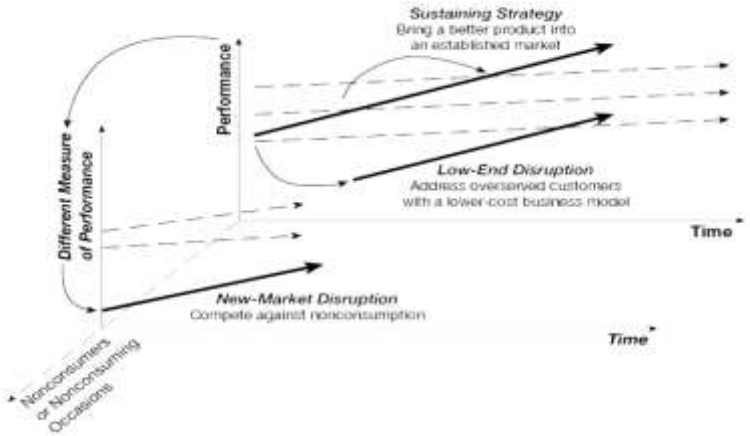


Figure 2. Types of Disruptive Innovations: Low-End and New Market disruptions (Source: Sauramo, 2014)

New-Market disruptors face the challenge of creating a new value network, where they must overcome non consumption (Christensen &Raynor, 2003; Christensen et al., 2004). With improved performance new market disruptive innovations can reach this level of new value network (Christensen & Raynor, 2003) by pulling customers out of the mainstream market as they find it easier to use the

new product (Halvorsen, 2014).Schmidt and Druehl (2008) brought to the foreground of the discussion two types of new-market disruptions: Fringe market and detached market. The former refers to new market disruptions that sell to customers at the low-end fringe of the existing market. The latter, refers to a type of new market disruption where initially sales take place in the context of a detached market from the market of the old product. Due to the fact that the old and new product sell in opposite ends of the market, this detached type of new market disruptions are initially usually high priced.

Disruptive businesses originally act in a space outside existing markets and this creates a dynamic area of new net growth (Gilbert, 2003). Gradually, with improved quality and decreased cost, the new product is more appealing to users of the old product, and the two ends of the market, the disruptive business and established business meet and merge (Halvorsen, 2014) as Figure 3. It is noteworthy that by the time traditional market leaders realize their customers turning to new products, market disruption has already occur (Insight Centre, 2015). Once this phenomenon happens, the features that characterize the new product and new entrants have already permanently reshaped the traditional market place (Insight Centre, 2015). According to Gilbert (2003), the explanation behind the slow rhythm for managers in established companies to recognize disruptions as opportunities related to how new markets are found outside their existing resource base. Stevenson cohorts with the latter in his definition of entrepreneurship as "the pursuit of opportunity without regard for the tangible resources currently controlled" (Stevenson and Jarillo, 1990). In this respect, Gilbert (2003) and Gilbert and Bower (2002) sustain that incumbent firms fail to acknowledge the potential benefit from using the new market and mistakenly assume that the disruption will harm and displace their established business.

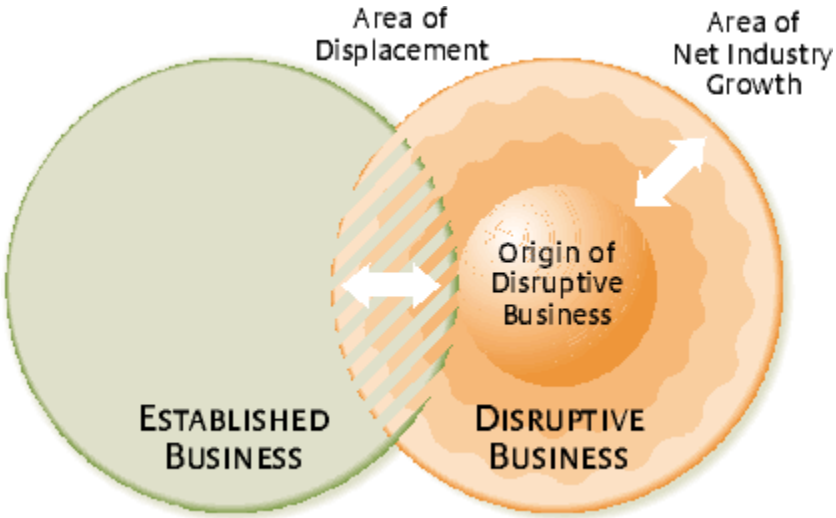


Figure 2. The process of New Market disruption (Source: Gilbert, 2003)

3. CONCEPTUAL FRAMEWORK OF THE STUDY

This study relies on a framework for assessment of disruptive innovation proposed by Hang and Yu (2011) to determine the success factors for disruptive innovation. The framework builds on Govindarajan and Kopalle's (2006) measurement of disruptive innovation rather than the structural approach proposed by Gatignon et al (2002) for an improved understanding of disruptive innovation challenges and the consideration of innovation as a dynamic process (Hang and Yu, 2011). The authors explain how the typology used by Gatignon et al (2002) although valuable for describing innovations and their importance to innovation outcomes, does not address the scale items to measure the disruptiveness of innovation (Hang and Yu, 2011, p.5). The researchers looking to create a sustainable yet concrete framework proposed a framework consisting of three main parts: market positioning, technology and other drivers(Hang and Yu, 2011, p.5). A summary of the framework is presented in Figure 3.

	Yes	No
A. Market Positioning		
• Viable business in the low-end market	☐	☐
• Viable business in a new, niche market	☐	☐
• Are incumbents in the main-stream market willing to run away or ignore the initial disruptors?	☐	☐
B. Technology		
• There exists a performance overshoot in the main-stream market	☐	☐
• Adequate for a foothold in the low-end market	☐	☐
• Adequate for a foothold in a new, niche market	☐	☐
• Could be further improved in performance, price/ performance, etc.	☐	☐
• R&D needed to improve the disruptive technology is feasible, affordable, and well executed	☐	☐
C. Other Favourable Drivers		
• e.g. Favorable life-style changes	☐	☐
• e.g. Helpful legislations	☐	☐

Figure 3. Assessment form of the framework by Hang and Yu (Source: Hang and Yu, 2011)

The researchers proposed that an in-depth study of the case to be assessed would be necessary before definitive answers could be made for each question in the framework. Therefore, the proposed plan is to conduct sufficient investigation using primary sources of information including official documents, reports and further conduct surveys/interview to answer the questions in the framework (Hang and Yu, 2011, p.5). These guidelines informed the research process described in the methodology section of this chapter. Hang and Yu (2011) caution that certain iterations could be needed to complete the assessment form accurately. Nevertheless, once this point is reached in the investigation, assessments are feasible:

a) In the event that all the answers are affirmative (yes), the framework suggests that both low- end and new market disruptions are occurring concurrently.
b) If all the answers except from two negative ones (no) for low-end market, are affirmative (yes) then the framework suggests a new market disruption is about to set in. On the other hand, if the two negative boxes are ticked for new market, then this suggests that a low-end disruption is about to happen.
c) If other boxes are ticked "no" apart from the aforementioned, there exist doubts about the course and eventual success of the disruption.

The assessment framework by Hang and Yu (2011) has been verified using the example of ten successful cases from Christensen's (1997) nominal work on disruptive innovation.

4. MATERIALS AND METHODS

In this paper we have already elaborated on the choice of China as the ground for investigation based on its development and growth pattern. Japan's 'Post-War Miracle' is comparable to China as the 'Rising Dragon of the East'. Both countries were able 'command and control' economies using comparable innovation strategies. Therefore an in-depth look into Chinese firms can potentially bring useful insights to examine what particular characteristics and success factors can be employed to convert opportunities into disruptive innovations.

Christensen (2000) recommends that in order to examine the disruptiveness of a given technology or innovation, one should graph the trajectories of performance demanded and offered. He therefore suggests that case study is an appropriate approach to examine the latter. Further to this, the theoretical conceptualizations that inform this study and rely on Hang and Yu's (2011) assessment framework highlight the importance of in-depth study before definitive answers can be given with regards to assessing disruptive innovation.

Given these considerations,it was considered appropriate to use a case study strategy for the research process.Yin (1994) suggests that the use of case studies allows for the examination of a phenomenon in its natural context and to identify

with cause and effect relationships that otherwise would have been lost (Yin, 1994). The decision was to deploy a multiple case study research strategy for the subject matter as it appears to be an effective approach to develop new theory through comparative analysis of a wealth of case data through a replication logic in which each case can potentially confirm or not the emergent theory (Martin, 2011).Further to these, a multiple case studies strategy was preferred instead of a single case study as it can allow for generalizations, through a robust and parsimonious theory (Yin, 2003).

4.1 Data collection tools

Several data collection tools were employed for the conduct of the multiple case studies including observations, interviews, and documentary analysis in order to allow for triangulation of data and enhance the reliability and validity of the research. The number of cases to be examined was determined based on what volume of cases would enable more accurate insights and represent the actual situation under study, while also taking into consideration time and resource limitations.

Based on the above, the basis for this article was a two year study that examined and sought to assess the essential characteristics and success factors of disruptive innovation from examining three companies. The assessment framework by Hang and Yu (2011) presented earlier in this paper was employed to guide detailed data collection and analysis needed to answer the key questions that derive from the framework.A particular focus was on disruptive innovation and technology. Field data were collected from the three established Chinese companies using both qualitative and quantitative methods of comparative analysis in order to examine the evolution of the impact of disruptive innovation on an industry over time.

4.2 Data analysis

Following guidelines on how to conduct optimum multiple case studies (Eisenhardt, 1989; Miles and Huberman, 1994), both within-case and cross-case analysis approaches took place. The process involved different stages: firstly, the report from individual cases using triangulated methods of data collection was pursued. Then, a cross-case analysis through applying a replication logic was undertaken. At this point, keeping in mind the inductive nature of the research we tried to incorporate any new theory emerging apart from that the initial conceptualizations (Gilbert, 2005). Data analysis stopped when a strong match between emergent theory and the empirical data was met. The analysis was based on the questions of the assessment framework by Hang and Yu (2011).

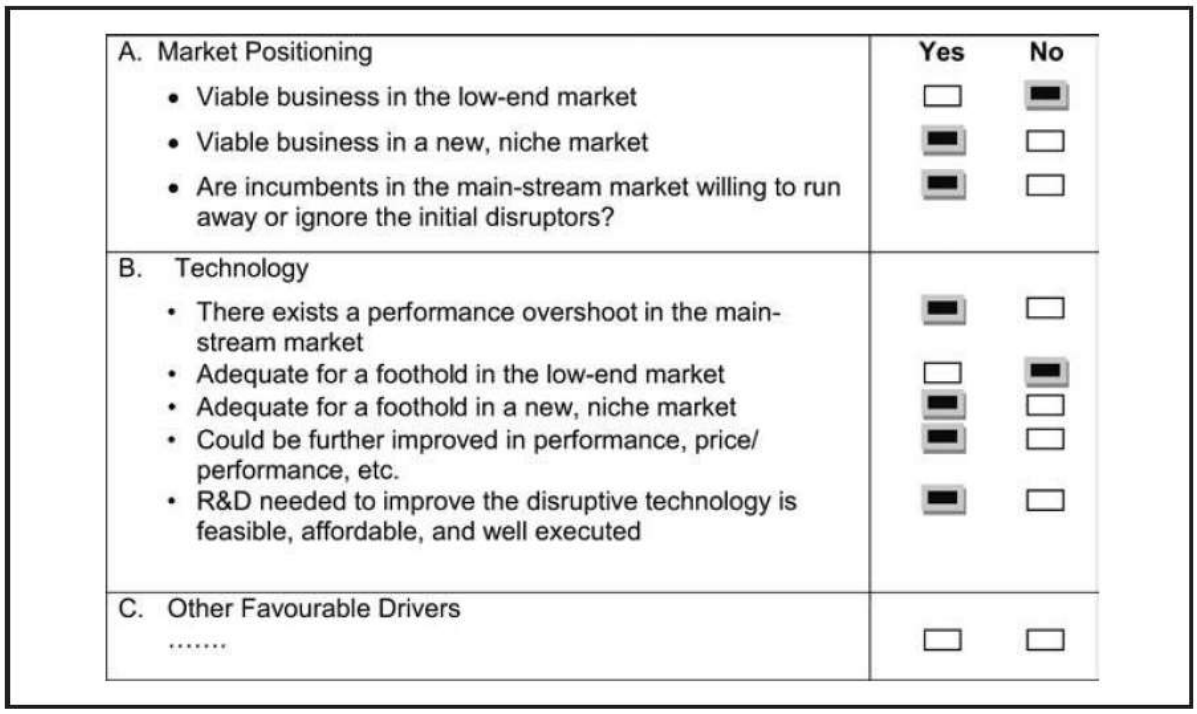
5. RESULTS

An overarching finding ofourresearchis that there are some essential characteristics and success factors fordisruptive innovation which were common across the case studies examined that were examples of success. The reminder of this paper addresses each ofthe three case studies examined with relevance to the assessment framework by Hang and Yu (2011), which is the primary focus of this paper.

5.1 Case study One

Huawei, is a multinational networking and telecommunications equipment and services company that its headquarters are located in Shenzhen, Guangdong province. The company was founded in 1987 originally as a distributor of imported telecom products having a registered capital of only 3000 USD. It became a strong incumbent in the market after its success in disrupting the telecoms industry by offering telecommunications equipment to operators with such functionality and reliability that could easily be installed and customized to local requirements remotely and at a lower price than other competitors (Wan et al., 2015). This disruptive innovation process led to the company becoming one of the largest telecommunications equipment maker in the world (Economist, 2012).

Following the empirical analysis of the company with data collection instruments described, the assessment form developed as shown in Figure 4. It is obvious that Huawei had all answers that were affirmative to ensure its success in creating a new and large networking and telecommunications market, and eventually disrupting other established firms in the telecoms market.At the same time no other significant drivers existed that might have affected the assessment.



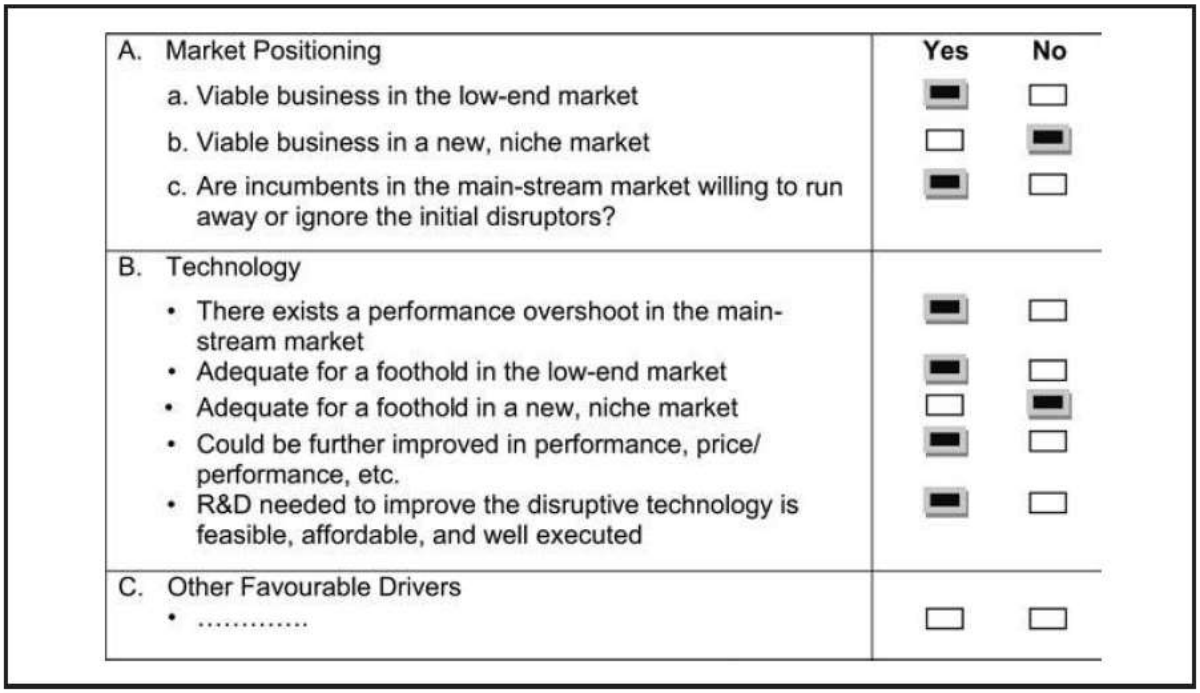
	Yes	No
A. Market Positioning		
• Viable business in the low-end market	☐	■
• Viable business in a new, niche market	■	☐
• Are incumbents in the main-stream market willing to run away or ignore the initial disruptors?	■	☐
B. Technology		
• There exists a performance overshoot in the main-stream market	■	☐
• Adequate for a foothold in the low-end market	☐	■
• Adequate for a foothold in a new, niche market	■	☐
• Could be further improved in performance, price/ performance, etc.	■	☐
• R&D needed to improve the disruptive technology is feasible, affordable, and well executed	■	☐
C. Other Favourable Drivers		
.....	☐	☐

Figure 4. Case study One: the assessment (success)

5.2 Case study Two

Lenovo is a leading Chinese multinational technology firm that is headquartered in Beijing, China and Morrisville, North Carolina, United States. Founded in Beijing in 1984, the company initiated as a reseller and distributor for foreign brands such as IBM. A few years later, in 1990, Lenovo started to produce its own personal computers (PCs) and by 1997 it was the market leader manufacturer in China surpassing firms like Dell, HP and IBM. Despite this progress, Lenovo made a strategic move to expand in 2004 and bought IBM's PC business including ThinkPad for USD 1.25 billion. At this point the company proceeded to disrupt the global PC sector by introducing the IdeaPad computers for home consumers, and the ThinkPad computers for business customers at low prices. Following this shift, Lenovo became the world's second largest personal computer vendor by unit sales (Gartner Corporation, 2013).

When Lenovo regained their acquisition of IBM's PC business in late 2004, it also adopted many of the R&D strategies IBM had implemented over decades of successful innovation. However one differentiation was with regards to introducing a parallel processing approach where instead of treating R&D as a linear process, Lenovo utilized a new R&D process that has the flexibility to conduct various functions simultaneously instead of being done in sequential steps as it was until then (Wan et al., 2015). Based on the analysis from the in-depth study we proceeded to the completion of the assessment form as shown in Figure 5. Lenovo, similar to Huawei, provided only positive answers which ensured its disruptive effect and success over the incumbents at the lower-ends. No significant driver existed in this area that would affect the assessment. Neither was there a new market disruption dimension.



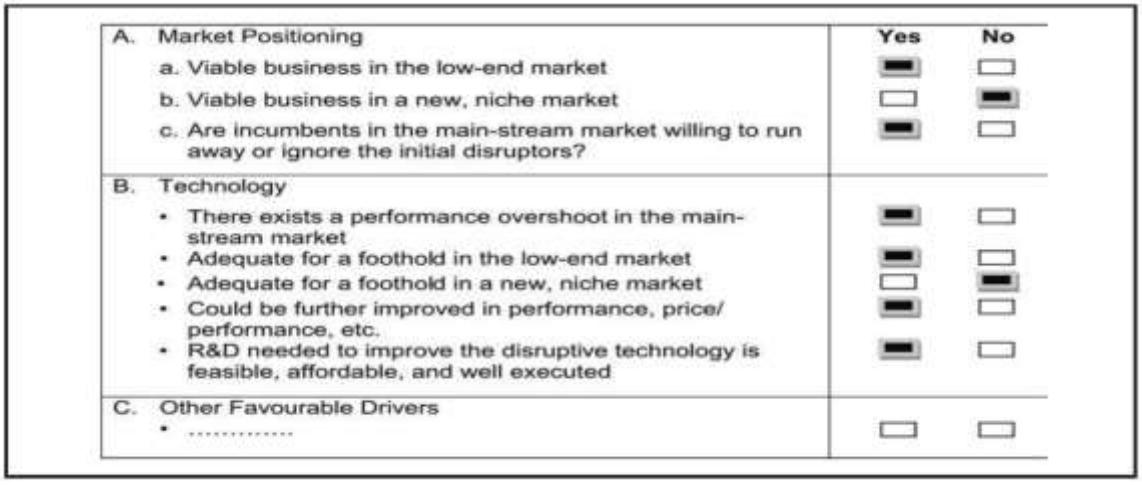
	Yes	No
A. Market Positioning		
a. Viable business in the low-end market	■	□
b. Viable business in a new, niche market	□	■
c. Are incumbents in the main-stream market willing to run away or ignore the initial disruptors?	■	□
B. Technology		
• There exists a performance overshoot in the main-stream market	■	□
• Adequate for a foothold in the low-end market	■	□
• Adequate for a foothold in a new, niche market	□	■
• Could be further improved in performance, price/ performance, etc.	■	□
• R&D needed to improve the disruptive technology is feasible, affordable, and well executed	■	□
C. Other Favourable Drivers		
•	□	□

Figure 5. Case study Two: the assessment (success)

5.3 Case study Three

The Pearl River Piano Group, is the world's largest maker of pianos with a 25% share in the global market. The firm owns the Ritmüllerbrand and supplies Steinway & Sons, founded in 1956 in Guangzhou, Guangdong, China.Unlike its Western competitors who use groups of two or three professionals for the four key components needed to create a new piano, (the resonance system, the keyboard, the pedal system, and the case), Pearl River employs a simultaneous engineering approach whereby uses large teams of approximately 20 people including designers, sales, testers, computer engineers and craftsmen. The previous approach succeeds to produce new designs in a significant little time at a low cost and approximately 10 times less that what their highest competitors would take for completing in several years (Wan et al., 2015).

Figure 6 maps the above analysis from data derived into the assessment form. Similar to the cases of Huawei and Lenovo, the assessment form suggests that only affirmative answers exist in relation to the company which justify for its disrupting of other firms and overall success. There was no evidence of other significant factors that would affect the innovation.



	Yes	No
A. Market Positioning		
a. Viable business in the low-end market	■	□
b. Viable business in a new, niche market	□	■
c. Are incumbents in the main-stream market willing to run away or ignore the initial disruptors?	■	□
B. Technology		
• There exists a performance overshoot in the main-stream market	■	□
• Adequate for a foothold in the low-end market	■	□
• Adequate for a foothold in a new, niche market	□	■
• Could be further improved in performance, price/ performance, etc.	■	□
• R&D needed to improve the disruptive technology is feasible, affordable, and well executed	■	□
C. Other Favourable Drivers		
•	□	□

Figure 6. Case study Three: the assessment (eventual failure)

6. CONCLUSIONS

Disruptive innovationis diachronically a huge source of economic growth. Some conclusions can be made in relation to theoretical and methodological aspects of the research presented here. First, it can be said that new or unconventional R&D and innovation processes are important determinants of disruptive innovation and in particular Chinese firms who have been claimed to lead innovation confirming the literature on the importance of R&D for enabling with opportunities for companies to reach at disruptive innovation (Yu and Hang, 2011). The need for continuing R&D has not been sufficiently addressed in the past by researchers and therefore it is important that it becomes a concern and reason for more systematic research in the field (Hang and Yu, 2011). The assessment framework used in this study acknowledges the importance of R&D and the time and resources needed particularly in the case of disruptive technology (Yu and Hang, 2011).

The multiple case study research conducted with the assessment framework by Hand and Yu as a guide with a systematic empirical evidence for determining characteristics and success factors of disruptive innovation. The framework examined key success factors that relate to market positioning, technology and other favorable drivers based on the data from the in-depth case studies. Our experience from using the framework proved that it has the potential to inform further research and systematic investigation in the area of disruptive innovation as its application in the selected cases showed that the framework can successfully guide a detailed data collection and analysis needed to evaluate evidence of factors of disruptive innovation. The study therefore provided with some key indications that can inform future considerations for policy makers and researchers on how to aim at successful strategies for disruptive innovationthrough a holistic and systematic assessment contributing to a scarcity of relevant empirical research.

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