

Zhang, Jian; Vialle, Pierre

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An event-based analysis of Huawei's strategic path and style

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Jian Zhang, Pierre Vialle

LITEM, Telecom Business School, Institut Mines Télécoms, Evry,
France

Pierre.vialle@telecom-em.eu

An Event-Based Analysis of Huawei's strategic Path and Style

Abstract

Founded in 1987 as a sales agent of PBX (private branch exchange), Huawei has become one of the world's leaders in the ICT Industry. It initially had little technological and management knowledge, but competed with the incumbents including Sino-foreign joint ventures (JVs), state-owned firms, and foreign vendors. In 2013, Huawei has become the world's largest telecom network infrastructure vendor. It operates business in more than 140 countries, and foreign markets represent two thirds of its revenue. It is one of a few vendors able to provide end-to-end telecommunications equipment and solutions. 44% of the 140,000 employees are R&D engineers, and 10% to 20% of its annual revenue is invested in R&D. In a recently published analysis of patents "Patent Power 2012" by IEEE Spectrum, Huawei is the only Asian firm in the top 20 in communication/internet equipment category.

As other Chinese firms, Huawei has benefitted from specific country factors, and in particular from the impact of policies. The Chinese public policy has skilfully used inter-organisational relationships and networks in order to develop a Chinese "knowledge pool" with worldwide connections (Vialle 2007, 2009). the development of the University system, the close links between research centres and industry, the development of JVs, and focused research projects, have created a system which is not only able to acquire, produce and diffuse publicly available and rather codified knowledge, but also to convert tacit knowledge endogenously generated by industrial activity into a more codified form. One benefit for Chinese Telecom companies has been the large availability of relatively cheap qualified manpower.

However, Huawei has obviously outperformed its Chinese rivals, so there must be specific firm factors allowing to explain this distinctive performance. Therefore, in this paper, *we aim at identifying the strategic decisions that may explain the competitive advantage from which Huawei has benefitted over its history.*

A longitudinal in-depth single case study based on historical events is applied as current research method. In practice, a single case study can be applied if the case is representative, i.e., the case is highly retrospective and unusually advanced within the group it belongs to (Gomm et al, 2000). As exposed in this article, Huawei's case exhibits these properties. Long time longitudinal event-based study strengthens the single case study. Yin (2008) suggests that the single case study can be employed if the case is studied based on a long time observation.

This research samples Huawei's events since its foundation in 1987 to 2011 which covers the whole catch-up process. 290 historical events have been selected and documented to build the case study, in the context of a broader scope PhD dissertation (Zhang, 2014). Out of these 290 events, 151 events are related to "product/market and technology", 50 events to "relationships", and 129 to "routines". Documents are the major sampling source, and interviews are used to improve their reliability through providing and checking information.

Three mainstream competitive advantage approaches constitute the case study method's theoretical basis: the Resource-Based View (RBV), the Dynamic Capabilities approach and the Network Approach. They share the common assumption of heterogeneity of firms and resources, but have different research focuses on the source of competitive advantages. Additionally, the literature on routines is used. The catching-up literature is also used in order to facilitate the application of these general theoretical streams to the specificities of latecomer firms.

Huawei's catch-up process has been divided into four phases by the development of Huawei's fixed line and mobile telecommunications product lines: enter telecommunications market (1987-1994), follow and expand (1995-2003), compete within the leading group (2004-2009), and transformation (2011-2011).

The analysis method is based on the three competitive advantage approaches and the existing catch-up research. It includes three parts: 1) the theoretical basis (which theories are applied), 2) the analysis units (what is analysed) including product/market and technology, relationships, and routines; and 3) the analysis framework (how to make the analysis). The analysis units are defined through comprehensively considering the theories, the catch-up literature, the research questions, the general case study method, and the available data. The analysis framework is derived from the theoretical basis and defines how to analyse the case of Huawei by taking historical events as input. The outputs are

the strategic path and strategic style. They are the study findings that are discussed subsequently.

Then the strategic path is identified for each analysis unit over the four phases. Analysis results show that Huawei had different strategic emphases in each phase. Briefly, Huawei didn't have an overall strategy in Phase 1 but tried hard to generate several product lines and then to sell more of them. Since Phase 2, Huawei was gradually able to comprehensively and effectively make strategies which helped Huawei overcoming variety of problems and surpass its domestic and international rivals. By the end of Phase 3, Huawei was strategically mature and sought for further direction when accomplishing catch-up process and becoming one of the industrial leaders. Although Huawei strengthened the basic research and technologically progressed, it took diversification as its major direction: transform itself into ICT solution provider and expand from the carrier market to a broader ICT market.

The strategic style is identified by analyzing regularities in decision making concerning the three analysis units decisions from 1987 to 2011. We have identified several patterns and principles. First of all, Huawei tended to implement independent development more extensively than its Chinese rivals. The other patterns or principles are related to this more general pattern. Huawei's basic innovation principle is to "follow" in both product/market and technology, rather than lead. It is related to "platform development" and "scale and market share rather than profit margin". "Rich product portfolio", "business offer differentiation" and "encircle the cities" are product/market principles that have further guided innovation decision. Huawei developed product/market and technology mainly on its own. Relationships and acquisition were adopted as relatively minor strategies. Concerning to relationships, Huawei was quite selective. It considered firstly accessing and expanding markets and then accessing product and technology. Therefore, Huawei developed cooperative relationships with operators, local partners, governments, and banks mainly for accessing, expanding and securing market. Huawei cooperated quite well with clients, IT and telecom related firms, governments and banks, but less with telecommunications vendors. When forming routines, Huawei showed strong motivation and implementation capacity, and preferred a pragmatic approach to achieve its goals: radical imitation and learning rather than generating new routines by theories or by trial and error method.

Keywords: Huawei, China, Telecommunications, catching-up, latecomer

1. Introduction

Founded in 1987 as a sales agent of PBX (private branch exchange), Huawei has become one of the world's leaders in the ICT Industry. It initially had little technological and management knowledge, but competed with the incumbents including Sino-foreign joint ventures (JVs), state-owned firms, and foreign vendors. In 2013, Huawei has become the world's largest telecom network infrastructure vendor¹ and successfully internationalized. It operates business in more than 140 countries and overseas markets represent two thirds of its revenue. 70% of the employees outside of china are local hires². It is one of a few vendors that are able to provide end-to-end telecommunications equipment and solutions. It further accesses security, computing, chips, marine cable and civil aviation air-ground communications markets. In a recently published analysis of patents "Patent Power 2012" by IEEE Spectrum, Huawei is the only Asian firm in the top 20 in communication/internet equipment category³.

Harwit (2008) describes Huawei as "a prominent role for the private sector" that represents China's telecommunications revolution. Ernst and Naughton (2007) notes the firm's growth typically reflects "the general picture of openness, flexibility, and technological dynamism" and "displays all the characteristics of a company that is building impressive and genuine technological capabilities".

The literature has identified the importance of institutional factors for the Chinese telecommunications vendors' catch-up. As other Chinese firms, Huawei has benefitted from specific country factors, and in particular from the impact of policies. The Chinese public policy has skillfully used inter-organizational relationships and networks in order to develop a Chinese "knowledge pool" with worldwide connections (Peng, 2000; Mu and Lee, 2005; Von Zedtwitz, 2005; Vialle, 2007, 2009; Tang and Hussler, 2011; Springut et al, 2011; He and Mu, 2012). The policies provided a market where the Chinese firms were encouraged to technologically catch-up, innovate and compete with foreign rivals (Gregory and Tenev, 2001; Lee and Lim, 2001; Tan, 2002; Mu and Lee, 2005; He and Mu, 2012). Chinese government plays an important role in the market system through ownership and regulation (Peng, 2000; Child and Tse, 2001). Besides, the large availability of relatively cheap qualified

¹ Source:

<http://www.telecomlead.com/telecom-equipment/huawei-leads-telecom-market-in-2013-ahead-of-ericsson-41365/>

² Source: Huawei's 2013 annual report

(<http://www.huawei.com/en/about-huawei/corporate-info/annual-report/2013/index.htm>)

³ Source: <http://spectrum.ieee.org/static/interactive-patent-power-2012>

manpower benefits Chinese Telecom companies (Lu, 2000; Banister, 2005; Ernst and Naughton, 2007).

However, the literature is insufficient to explain why Huawei has obviously outperformed its Chinese rivals, since those factors did not benefit Huawei more than others. There must be specific firm factors causing this distinctive performance. Therefore, in this paper, we aim at identifying the strategic decisions that may explain the competitive advantage from which Huawei has benefitted over its history. Specifically, we identify Huawei's strategic path and style. The strategic path is the evolutionary course of the strategies it adopts in order to address competitive disadvantages and get advantages during its catch-up process. The strategic style refers to Huawei's preference and pattern when making and implementing strategies.

A longitudinal event-based single case study based on historical events is applied as current research method. 290 historical events have been selected and documented to build the case study, in the context of a broader scope PhD dissertation (Zhang, 2014)). Three mainstream competitive advantages approaches (the Resource-Base View, the Dynamic Capabilities approach and the Network Approach), routine literature, and existing catch-up research are employed to construct the analysis method.

The analysis output firstly show a clear strategic evolutionary path and second the strategic style which had been formed during the strategic path. The path and style are the study findings that are discussed subsequently. The study contributes to understanding Huawei catch-up case in terms of strategy. The similarity and particularity enriches literature. Additionally, due to the fact that firms sharing the same institutional context tend to adopt similar strategies (DiMaggio and Powell, 1983), the current research probably facilitates the understanding of other similar cases, such as other Chinese latecomers' catch-up strategies.

2. Literature review

Rich research has been conducted on the catch-up strategies of the latecomers in developing countries. However, the study results are insufficient when applied to explain Huawei's specific case.

2.1. Latecomer firms

A latecomer is a firm founded in a populated environment with few initial competitive advantages but catching-up with the existing incumbents (Child, 2005; Mathews, 2006a).

It is neither a late entrant nor a start-up (Mathews and Cho, 1999). A latecomer is "condemned to be a latecomer by history" and is born as "a fast follower" (Mathews and

Cho, 1999). The most significant difference between a latecomer and a start-up is that the start-up has some considerable advantages (Anderson and Tushman, 1990) and “generally does not suffer from the isolation and lack of capabilities” as the latecomer which acts initially more like “an imitator rather than innovator” (Mathews and Cho, 1999).

The latecomers have certain initial competitive advantages deriving from the local situation. Compared with industrial incumbents from other regions, latecomers can utilize their familiarity to the local markets and institutional factors (Khanna and Palepu, 2006), and adopt and adjust strategies rapidly (Mathews, 2006a), particularly when the environment is very different (Lu, 2000). Sometimes, local policies and cheap local resource conduce to advantages of business operation and product manufacturing (Lemoine and Ünal-Kesenci, 2004; Lu, 2000; Hobday, 1995; Leonard-Barton, 1995).

2.2. Catch-up strategy

The literature presents two general suggestions on catch-up strategy: access external resources, and internally developed resources and innovation.

Firstly due to the initial resource-poor situation, it is necessary to access external resources, including the social institutional resources embedded in social context (e.g., Oliver, 1997; DiMaggio and Powell, 1983; Peng, 2003; Suchman; 1995; Scott 2001), the resources embedded in industrial relationships (e.g., Humphrey and Schmitz, 2000; Bonaglia et al, 2007; Lu, 2000, Wesson, 2004; Miesing et al, 2007; Deng, 2009; Kim, 1997; Hobday, 2005; Hu and Mathews, 2008), and those embedded in globalized industrial networks (e.g., Mathews, 2006a; Cantwell and Piscitello, 1999; Best, 2001; Gereffi, 1999; Humphrey and Schmitz, 2000).

Internationalization is a specific type of catch-up strategy. In contrast with traditional theory that stresses on deploying competitive advantages abroad to secure returns and cover additional cost and risk (Buckley and Ghauri, 1999), a latecomer goes overseas for accessing market and technological resources as well as deploying its resources (Bonaglia et al 2007; Zeng and Williamson, 2003; Cantwell and Piscitello, 1999; Best, 2001; Mathews, 2002, 2006a).

Secondly, internal technological catch-up and innovation are highlighted. The technological catch-up process is regarded as a learning process (Kim, 1997). Latecomers often adopt a production-oriented technological catch-up strategy in order to gradually overcome the initial knowledge-poor conditions primarily by “learning by doing”. In respect of how to learn, the literature shows that latecomers initially produce products by using foreign mature technology and local cheap labor and natural resources, then gradually accumulate technology to improve performance and manufacturing capabilities, and eventually get high-level technology. This production-oriented catch-up strategy is empirically supported by the latecomer cases in Eastern Asian countries like South Korea,

China and Taiwan (e.g., Xia et al, 2002; Hobday, 1995; Leonard-Barton, 1995; Lee and Lim's, 2001). Correspondingly, the literature shows that latecomers innovate initially on mature technology and gradually move to front edge of technology, since they don't have the knowledge stock to support the technology frontier innovation (e.g., Kim 1997; Mathews, 2002; Mathews, 2006b).

The literature differs on when and how to innovate technologically. For example, Kim's (1997) research may imply that the latecomers usually do not innovate in early catch-up phase but with duplicative imitation, and he presents a typical process from imitation to innovation. In contrast, Hobday (2005) shows that in some conditions they can innovate with minor improvements to current product design and manufacture process in early catch-up phase. Regarding how to innovate, Kim (1997) and Hobday (2005) observe that latecomers usually start to innovate incrementally through small but sustained step-by-step improvement based on existing technology and products. The organizational innovation and learning underlying the catch-up and innovative activities is also put forward in the literature (e.g., Azadegan and Wagner, 2011; Mathews and Cho, 1999; Kim, 1997).

3. Research method

The analysis method is based on the rich competitive advantage research and existing catch-up literature. It includes three parts: the theoretic basis (which theories are applied), the analysis units (what is analysed), and the analysis framework (how to make the analysis).

3.1. Longitudinal event-based single case study

Considering the "how" and "why" research question, Huawei's unique case and available data, and according to the suggestions of Yin (2008) and Gomm et al (2000), the current research employs longitudinal single case study based on historical events as research method. Yin (2008) suggests that the single case study can be employed with a long time observation. In practice, a single case study can be applied if the case is representative, i.e., the case is highly retrospective and unusually advanced within the group it belongs to (Gomm et al, 2000). As exposed in this article, Huawei's case exhibits these properties. Long time longitudinal event-based study strengthens the single case study.

3.2. Theoretical basis

The resource-base View (RBV), the Network Approach and the Dynamic Capabilities approach are employed to construct the theoretical basis. They have different theoretical focuses and strategic suggestions, but share the assumption of heterogeneity of firms and resources, and are therefore congruent with each other. Moreover, they have potentials to

solve the catch-up related strategic problems. Their integrated application has a comprehensive potential to solve the research question on catch-up.

In fact, there is no approach that fully fits all the latecomers, because “each country has a different history, geography and set of economic opportunities and problems” (Hobday, 1995). Moreover the latecomers in different industrial sectors naturally act and catch-up differently, because of technology intensity (Xiao et al, 2013), product complexity (Odagiri et al., 2010), or industrial structure (Lee and Lim, 2001). Thereby, current research turns to the competitive advantage point of view to reveal “how” and “why” Huawei strategically overcame its initial disadvantages, got competitive advantages, and achieved catch-up.

The RBV and the Dynamic Capabilities approach highlight the role of internal resources and capabilities (Grant, 1991; Amit and Schoemaker, 1993; Makadok, 2001; Ambrosini and Bowman, 2010; Teece, 2010). They are related to the proposition of the catch-up literature “internally developing competitive advantages through technological catch-up and innovation”.

RBV is an approach of competition based upon the heterogeneity of firms and resources (Peteraf, 1993; Lockett et al, 2008). It regards resources as the determinant of distinguishing firms’ competitive advantages and strategies (Rumelt, 1984; Wernerfelt, 1984). The “path-dependence” of the resource generates and enhances differences in resource bases that can hardly be imitated by (potential) rivals (Rumelt’s, 1991; Lockett et al, 2008). The strategic suggestion is to continuously and internally develop superior resources (Dierickx and Cool, 1989) fitting VRIN (valuable, rare, inimitable, and non-substitutable) criterion (Dierickx and Cool, 1989; Barney, 1991) and to build isolating mechanism (i.e., barrier). Therefore the RBV is applied to analyse the resource accumulation and development aspects of catching-up.

The Dynamic Capabilities approach aims at explaining how firms can attain and sustain competitive advantage based on capabilities in order to deal with “the need of change” (Pavlou & El Sawy, 2006; Helfat & Peteraf, 2003; Teece et al., 1997). It stresses that the essential capabilities underpinning sustained competitive advantages are those enabling the firm to fast adapt to fast changing markets. More importantly, the level of dynamic capabilities reflects a firm’s innovative competitive advantages (Leonard-Barton, 1992). The theory figures out a way to explain the catch-up in terms of capabilities and routine building, which is closely linked to evolutionary economics (Winter, 2003). It focuses on and suggests building dynamic capabilities, and hence the routines (especially the dynamic routines) embodying those capabilities. Thereby, the Dynamic Capabilities approach is applied to solve the problem of building superior organizational routines of exploring, creating and exploiting advantages in fast changing markets.

The Network Approach stands on the “relationships” and fits the catch-up literature’s first proposition of accessing external resources. The Network Approach highlights the role of cooperation and co-development (Håkansson and Snehota, 1995), through mutual resource adaptations between firms. The resource interaction is suggested be more or at least as important as the resource per se, because the interaction enables resources utilizing, managing and changing (Baraldi et al, 2012). Firms are complementary and need to access each other’s resources. Through relationships, the resource base of one firm adapts itself to other firm’s resources. The catch-up research adopts a related position that a latecomer firm should fully utilize external resources in order to overcome initial disadvantages. In this way a latecomer can acquire or create new knowledge (Kogut & Zander, 1992; Lichtenthaler, 2009), improve innovative capabilities (Lichtenthaler, 2009; Song et al., 2005), and create greater synergy potential from acquisitions and alliances (Harrison et al, 2001). Mathew’s (2002) “LLL” framework, learning, linkage, and leveraging strategies are all straight connected with external resources and capabilities. Therefore, the Network Approach is employed to analyse the problems of accessing external resources and hence forming its own competitive advantages.

3.3. Analysis units

Our analysis is based analysis units. Three analysis units are defined: U1 - product/market and technology, U2 - relationship, and U3 - routines.

U1 “product/market and technology” is proposed for both theoretical and practical reason: product/market and technology are typical and observable outcomes of resources, and are suitable as catch-up measure. Firstly, product/market and technology are typical and observable outcomes allowing to figure out the underlying resources and competences. Secondly, product/market and technology fit Lee and Lim’s (2001) suggestion for measuring the catch-up progress in terms of technological catch-up. U1 reflects Huawei’s competitive advantage growth and catch-up progress in terms of resource base’s improvement, upgrade and extension. Practically, product (lines), market expansion, solutions, R&D projects and patents are analysed in the scope of U1.

U2 “relationship” is the research focus of the Network Approach. The stock of relationships reflects a firm’s competitive position, current business focus and perhaps the strategic direction in the future. Analysing U2 conduces to figuring out Huawei’s competitive strategy in terms of relationship management. In current research, U2 includes firm-to-firm relationships and memberships in standard setting organizations.

U3 is the key research object of the Dynamic Capabilities approach. As a latecomer is growing bigger and its business extends, routines are highly required to support and coordinate more complex organizational activities. From a Dynamic Capabilities perspective,

a latecomer must continuously generate and regenerate routines. Further, how Huawei established and changed routines conduces to revealing Huawei's strategic path and style. Thereby, analysing U3 is to analyse what routines and how Huawei got them, what the links of the routines, and further what patterns or preference Huawei exhibits. In current case study, U3 includes operational routines, and dynamic routines impacting on resource bases, and other routines.

3.4. Analysis framework

The analysis framework defines how to analyse the Huawei case by using the historical events as input. The framework includes three steps: events statistics, strategic style analysis by units, and general strategic style and innovation preference analysis.

The first step "events statistics" is to categorize and make statistics of the collected historical events collected. The historical events collected in the database are categorized generally into two: "analysis unit" class, and "non-analysis-unit" class. The second step "strategic style analysis" deals with the preference and pattern (i.e., what Huawei is likely to do) when making and implementing strategies. The last step is to reveal Huawei's general strategic style and its preference of innovation strategy.

4. Case

4.1. Background

Since the end of 1970s, China started its reform from a closed and planned economy to an open market economy.

During two decades since 1980s, "trading market for technology" policy effectively fostered knowledge transfer from foreign firms. In the beginning of 1980s, China was lagged two generations of technologies behind the world: crossbar switches were the most used switches, and step-by-step exchange was largely used. "Trading market for technology" policy was made to access foreign advanced technology, which means licensing only a few Sino-foreign joint ventures to provide network gears in China's large markets. The arrangement secured profits of and thus attracted foreign investments. As a return, China acquired needed technology and knowledge, including: producing component and chips; designing, operating and maintaining a telephone system; marketing and after-sale services, etc.

After China's successful development of SPC based switches (the new generation at that time) in 1991, the knowledge transfer process was accelerated. The JVs, then the state-controlled firms, and at last the private firms successfully developed SPCs. The big gap

between network equipment demand and supply left enough opportunities for domestic firms to sell their product.

During the 1990s, the Chinese government successfully balanced the market oriented policies and industrial protection by technological guidance and administrative interference in favour of domestic enterprises. The protective policy and administrative interference was made to protect and promote advanced technology R&D of both Sino-foreign JVs and native firms. By the end of the 90's, over 80% of newly installed SPCs were provided by domestic firms. The domestic firms were able to produce 2G network equipment and started investing in IP communication R&D. Some Chinese firms, such as Huawei and ZTE, engaged in global competition.

In the new century and under the WTO regime, Chinese telecommunications market has been more opened up to foreign capital and became a competitive market for the equipment suppliers. Domestic firms, like ZTE and Huawei, have made remarkable technology progress and are able to provide a full range of telecommunications products. They actively expanded business globally. By 2012 revenue, Huawei and ZTE were second and fifth largest telecommunications infrastructure vendors in the world.

The existing literature empirically investigates the policy, government roles, and further figured out the Chinese latecomers' characteristics on catch-up in above process over 30 years.

First, the literature finds out that Chinese industrial policies positively affected the industry's catch-up (Harwit, 2008). The policies appropriately synchronized with the industry development, effectively fostered advanced knowledge transferred to domestic latecomers (Peng, 2000; He and Mu, 2012). They benefited Chinese latecomers with promising markets wherein they were encouraged to technologically catch-up, innovate and compete with foreign rivals (Gregory and Tenev, 2001; Mu and Lee, 2005; He and Mu, 2012). Domestic technological innovation has been particularly encouraged in mobile telecommunications (Vialle et al, 2012). Ernst and Naughton (2007) note that the policymakers fast learned from the past and its Asian neighbours, and effectively adjusted national and local policies. After joining WTO and opening the markets, the industrial policies turned to restructuring the telecom industry and promoting technology and innovation (Ernst and Naughton, 2007; Cheung, 2009; Springut et al, 2011).

Second, the literature highlights the important role of the Chinese government in the market system through ownership and regulation (Peng, 2000; Child and Tse, 2001). The effect of the government intervention was generally positive but complex: the positive and negative effects were usually interwoven, particularly in aspects of administrative interference, innovation and internationalization (e.g., Lewin et al, 1999; Nolan, 2001; Kshetri et al, 2011; Xia, 2012).

Third, the literature figures out two catch-up characteristics of the Chinese telecommunications latecomer manufacturers: beginning with the most updated technology, investing heavily in R&D, and internationalizing early for both acquiring and exploiting competitive advantages. The predictable technology trajectory of telephone switches, the huge market, domestic intelligent resources, and knowledge resources transferred allowed Chinese latecomers to access the most updated technology from the beginning and was motivated to invest heavily in technology and product R&D (Mu and Lee, 2005; Ernst and Naughton, 2007; Hu and Mathews, 2008; He and Mu, 2012). Foreign direct investment (FDI) was the most researched internationalization strategy of Chinese telecom latecomers, which occurred in their early ages and usually includes merger and acquisition (M&A), joint venture (JV) and direct expansion (e.g., Di Minin et al., 2012; Gao, 2011; Fan, 2011; Fan, 2006; Deng, 2009; Deng, 2007; Rui and Yip, 2008; Kaartemo, 2007; Child and Rodrigues, 2005). It is a mixed strategy and a self-reinforcing process that combines the overseas-acquired advantages with the in-house developed advantages in order to develop new competitive advantages.

Some other factors conducted to China's telecommunications industry catch-up. National science and technology policies (Von Zedtwitz, 2005; Tang and Hussler, 2011; Springut et al, 2011), low-cost labor assets (Ernst and Naughton, 2007; Banister, 2005), and poor intellectual property system (Odagiri et al, 2010; Xue and Liang, 2010; Fai, 2005) are three most mentioned factors. In a broad view, the three factors are embedded in institutions and conduce, but not specific, to China's telecommunications industry catch-up.

4.2. Huawei's catch-up process

Lee and Lim (2001) propose to measure the catch-up progress by technological capabilities and market shares, or namely technological catch-up and market catch-up. This study divides Huawei's catch-up process into four phases by product lines development: enter telecommunications market (1987-1994), follow and expand (1995-2003), compete within the leading group (2004-2009), and transformation (2011-2011). The criteria is closely related to analysis unit U1 "product/market and technology".

Phase 1: enter telecommunications market (1987-1994)

The first phase of Huawei's catch-up process was from 1987 to 1994. In this phase, Huawei broke into mainstream telecommunications market and expanded product lines in PSTN sector, and initially formed several strategies and routines deeply influencing its following activities.

In 1987, Huawei was founded as a sales agent for Hong Kong Conic Investment Company Ltd producing PBX (private branch exchange) switches. By the end of the first

catch-up phase of 1994, Huawei was able to design and produce high capacity digital telephone switches, by which Huawei became a mainstream PSTN equipment supplier in China. The main achievement is the C&C08 switches R&D and successful introduction in the market. All the products Huawei provides can be traced back to this phase, particularly the C&C08 platform. After C&C08, Huawei expanded business in optical transport system, wireless equipment and chips production. The success of C&C08 platform encouraged Huawei to settle platform development as the basic principle of introducing new products. The function and service integration were the key elements of Huawei's product innovation.

In marketing and industrial relationship management aspects, Huawei formed "encircling the cities" strategy, established relationships with operators and banks for funds and market access, and set up overseas facilities for tracing latest industrial information. "Encircling the cities" strategy refers to enter a market from the easier market segments relying more on localized innovation including technology, function, and services rather than single low price. The "encircling the cities" strategy has been applied by Huawei throughout the whole catch-up process. Huawei co-founded JV with the (local) operators and signed "buyer's Credit Agreement" with Merchants Bank for both raising R&D funds and market access. Exclusive regional distributor and technology licensing were also applied by Huawei, which further indicate both Huawei's financial stress and fast market expansion. Relationships with customers and banks have been the most relationships of Huawei since the initial phase. Additionally, brand marketing within the industry has been highly stressed by Huawei since its first assembled product BH01. Huawei in fact went abroad as early as in 1993 by setting its first overseas facility in Silicon Valley (U.S.) for tracing the newest industrial information.

In managerial practice, Huawei formed several routines in order to cope with intensive R&D investment and lack of managerial and strategic capabilities. Financially, Huawei launched ESOP (Employee Stock Ownership) which was the first form of Huawei's specific ownership arrangement. At the end of the phase, Huawei started adopting proven management systems and frameworks from developed countries.

Phase 2: follow and expand (1995-2003)

Launching 2G mobile communication R&D in 1995 started the second catch-up phase, which was critical in Huawei's catching-up process. Generally speaking, in terms of technology and product development, Huawei followed; and in the product lines and market aspects, Huawei expanded. In this phase, Huawei became the largest Chinese telecommunications vendor.

During this stage, Huawei was able to provide complete set of end-to-end equipments and solutions in PSTN, mobile communication and data communications. It developed its products following mature technology without actually inventing technology or participating in the

technology standard making. Huawei concentrated on product R&D and product line expansion. Its high-end exchange and transport system were at a leading position in China and a competitive position in the world. Its 2G/3G network systems were commercially launched worldwide and at the end of this phase Huawei re-entered terminal (mobile phone) markets. Huawei was young in data communications field, but quickly formed the R&D and manufacturing abilities for both switches and routers. Although the technology and product strategy was to “follow”, localized innovation was also emphasized. For example, the multiple add/drop multiplexer technology and 1 million line capacity C&C08 indicated Huawei’s localized innovation capacity. When developing Quidway A8010 access server and the first domestic video product VP8000, Huawei leveraged its technology capability to foster national product standards.

In marketing and industrial relationship management aspects, Huawei continued the “encircling the cities” strategy, and expanded relationships within the industrial networks for advanced technology as well as strengthening those with the clients and local partners. Huawei internationalized both for acquiring advanced technology and market expansion. It set up R&D centers facilities in China and overseas according to geographically distributed resources, such as Beijing R&D centre focusing on data communication and Bangalore software R&D centre. The overseas market expansion followed the “encircling the cities”, starting from the less competitive and geographically near markets, such as in Asia and Russia. Domestically, Huawei co-founded many JVs with local network carriers. For entering overseas markets, Huawei sought for relationships with local partners, such as in the case of LDCOM in France and of the joint venture case with American 3Com.

Strategically, Huawei concentrated on telecommunications. It for the first time acquired a firm (OptiMight) for advanced technology. Huawei sold its power business under the pressure of the telecom crash, in order to concentrate on telecommunications sector (particularly the 3G product R&D).

Huawei adopted a radical way to form modern management routines, by systematically imitating western management systems through several critical projects. The ITS&P project helped to reform a functional organization structure into a process-based organization structure, and the MaPA project aimed at transforming Huawei from a sales-oriented strategy to market-oriented strategy. CMM, NVQs, ISO9001, ISO 14001, etc. were adopted to improve the operational routines. <Huawei Basic Law> and <Employee Incentive Systems on Patents and Innovation> were published to shape the corporate culture. “Grey theory” and an official statement on innovation were proposed to clarify the management and innovation principle. The “grey theory” emphasized a stable and pragmatic approach in adopting western management system. It actually stabilized the organization and protected the organization from being rigid or in chaos during the dramatic process of management routine building. The “military-like” style of imitating external routines improved Huawei’s management in a short time, but caused serious problems. Moreover, Huawei was still

lacking effective routines of firm-level strategy making, as shown by strategic mistakes on PHS, CDMA and mobile phones.

Moreover, the IPR lawsuit launched by Cisco and (related) cooperation with 3Com were remarkable events in Huawei's history, which deeply influenced Huawei's actions in the following years.

Phase 3: compete within the leading group (2004-2009)

The third phase of Huawei's catch-up process started when Huawei invested in LTE R&D in 2004. This phase was the last stage during which Huawei actually completed its catch-up process. At the end of this stage, Huawei became the world's second-largest telecommunications vendor, and explored markets related to telecommunications.

In technology and product aspects, Huawei advanced and expanded quickly. In the first year of this phase, Huawei initialized LTE R&D, which was at the front edge of mobile communications industry. In this phase, Huawei was able provide products that could compete with those of the international giants: LTE, mobile core network, large capacity end-to-end IP communications transport system and broadband access. The firm submitted a large number of standard documents and patent applications, thus participating with the traditional incumbents in the standards drafting and the cutting edge technology development. Huawei in this phase provided enterprise software/services and submarine communication cable systems through joint ventures. At the end of this phase, Huawei returned to power systems domain and introduced competitive green energy solutions.

As concerns market catch-up, the market performance Huawei became No.2 world largest telecommunications infrastructure vendor. From 2004 to 2009, the compound average growth rate (CAGR) has been 29.1% (see Fig. 1). The overseas income has been stable, around two thirds of overall revenue since the end of this phase, which indirectly indicated Huawei's stabilizing its international position. The Chinese region became equal to other eight overseas regions in Huawei's global region structure.

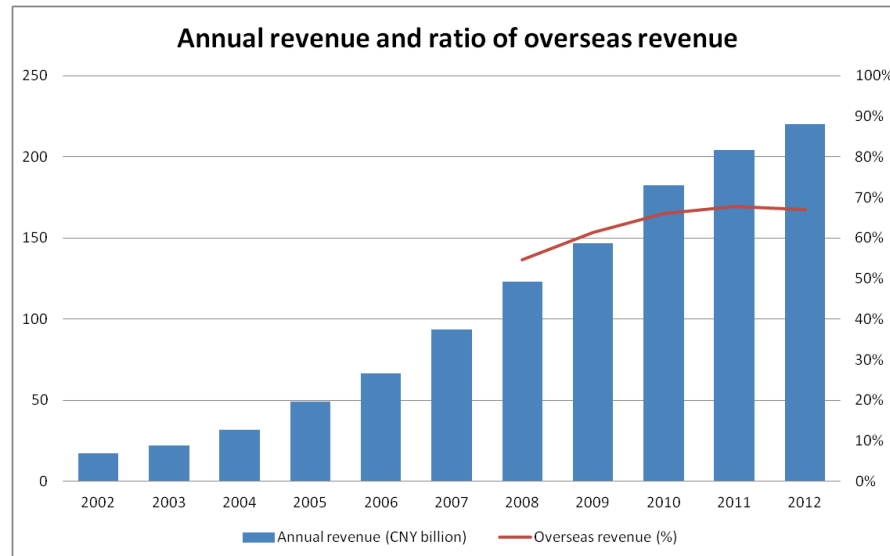


Fig. 1 Huawei's annual revenue and the ratio of overseas revenue

In this phase, a complete modern management system was established. Firstly, the EMT was established as an effective firm-level decision-making body. Secondly, Huawei launched and completed major part of the IFS (integrated finance system) project, to support complex multinational operation and cross-sector expansion. Thirdly, for emphasizing social values that were highly scrutinized by the western society, Huawei set up a supplier social responsibility verification program in order to carry out systematic training of procurers and suppliers on SA8000, TL9000 and ISO14000. At last, Huawei designed and implemented an internal control system based on COSO framework and covering the business and financial processes across all subsidiaries and business units. The internal control system's design implied that Huawei was able to develop its own top-level management system as well as hiring consulting firms.

Huawei acted like a real multinational firm. It provided a wide range of products and services globally, and set facilities all over the world; built strategic relationships with the major telecom operators and other strong vendors; actively participated in the industrial organizations and contributed to the technology progress. Modalities such as acquisition, joint venture, stake sale, outsourcing and spin-off were used in this phase.

Further Huawei at the end of this phase realized the need of and sought for business diversification for increasing profit. It entered new market by joint ventures with Siemens, Global Marine and Symantec to deploy its resources in broader markets.

Phase 4: transformation (2010-2011)

The last two years of the current case study belong to Huawei's transformation phase or "post-catch-up" phase. Huawei applied "diversification" strategy to transform itself from

a telecommunications vendor into an ICT solution provider, instead of moving to technological frontier.

Huawei expanded its products lines and kept introducing front edge product and solutions. Network carrier products were still the most intensively developed products. Huawei effectively leveraged its capabilities of full range of telecommunications products to introduce LTE solutions with high capacity and high compatibility (such as the “Single” solution, GigaSite solution of single site, “5-band 3-mode 1-cabinet solution” and LTE/TDD/FDD/GSM/WCDMA/CDMA end-to-end converged solution). These solutions kept Huawei at a leading position in newly building or/and network upgrading projects. Service business was highlighted in Huawei’s transformation. The SmartCare service solution repackaged Huawei’s service experience and products into specific service for the network carriers, in order to improve end-user experience, service quality and network performance. In Huawei’s traditional competitive transport domain, Huawei developed the leading U2Net architecture and launched the world’s first 10G GPON OAN network. In enterprise markets, Huawei introduced advanced next-generation enterprise network router and terabit processing capacity firewall. Additionally, Huawei launched civil aviation air-ground broadband solutions with partners

Huawei implemented new strategy and organizational structure. Huawei claimed for the first time “cloud-pipe-device” as its strategic direction of business, product lines and innovation. Related principles have been applied: “continuous customer-centric innovation and win-win cooperation” through “coordinated development of ‘cloud-pipe-device’: large capacity and intelligent information networks, variety of smart devices, as well as new-generation business platforms and applications”. The “cloud-pipe-device” strategy clearly indicated Huawei expanded its business from the telecom carrier network field to the enterprise and consumer fields. Correspondingly, Huawei formed a specific corporate governance structure with three major BGs of “Carrier Network”, “Enterprise” and “Consumer”.

In accordance with its new strategy, Huawei also expanded its range of relationships. The cooperative partners involved network operators, ICT vendors, online firms, publishers and governments. It could foster develop products demanded by the markets, expand to up-and/or downstream of the industrial chain and leverage its resource base for new opportunities across industries. For example, Huawei entered marine cable market and civil aviation air-ground communication market by deploying its technological capabilities with the help of partner firms.

Although Huawei successfully kept growing, its expansion in U.S. faced serious regulatory and political problems due to the national security concerns. The failure due to the CFIUS’ regulation of acquiring 2Wire and 3Leaf gave precedence of blocking Huawei to directly acquire American technology. More seriously, the Sprint case in which some U.S.

senators held Huawei out of the telecommunications infrastructure bid made it impossible for Huawei to run its core business in the USA. By contrast, Huawei could acquire a U.K. technology firm and won network contracts in Europe. These cases might critically influence Huawei’s recent decision to give up establishing significant presence U.S. market.

5. Strategic style analysis

5.1. Events statistics

Huawei’s strategic style is first analysed separately in terms of the three analysis units, and then the general style and innovation preference is concluded. 259 out of 290 collected historical events are categorized into one, two or three of the analysis units. 151 events are related to “U1 product/market and technology”, 50 events to “U2 relationships”, and 129 to “U3 routines”.

5.2. U1 “Product/market and technology” Strategic style

Generally, Huawei’s U1 strategic style is summarized as in Fig. 2.

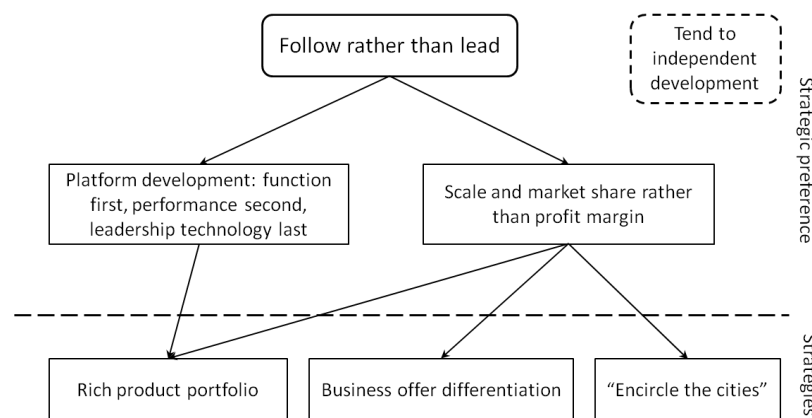


Fig. 2 Strategic style of “product/market and technology”

First of all, “independent development” is Huawei’s general catch-up pattern. It is concluded from the event statistics. Relationship and acquisition were adopted as relatively minor strategies. Huawei developed product/market and technology mainly by itself. The other patterns or principles are related to this more general pattern. About 32 out of 151 (around 21%) U1 category events are also U2 or U3 category event (see Fig. 3). 1 event is of both U1 and U2 but not U3 type. 15 events are of both U1 and U3 but not U2 type. 16 events are of all U1, U2 and U3 type. In total 17 U2 type events (i.e., 1 U1-U2 type events

plus 16 U1-U2-U3 type events) conduce to U1 catch-up, which implies Huawei indeed adopted relationships to develop U1 but much less than self-development.

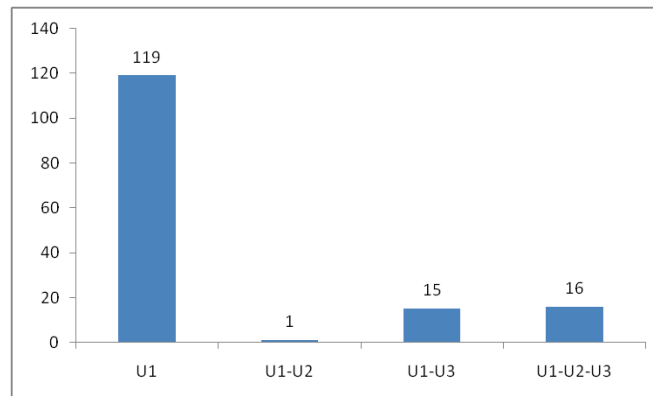


Fig. 3 Exclusive strategic connections of U1 and U2, U3

Secondly, “follow rather than lead” has been a consistent pattern. It refers to following in both product/market and technology rather than lead. “Follow” means Huawei tend to choose proven markets, as well as technologies and products that had been well accepted. Once the decision was made, Huawei quickly reallocated its resources to seek for product breakthrough and market share in a short time. Huawei formed this basic principle due to the difficult experience of failures in Huawei’s young age. The huge R&D loss of JK1000 and CT2’s failures caused a financial crisis for a long time. On the contrary, the C&C08 platform was a great success and its derivative products and new platform contributed to most of Huawei’s profits. The “follow rather than lead” principle was gradually formed and insisted by Huawei, and even had strong influence in Huawei’s transformation phase. In 2006, the front-page article of Huawei’s internal newspaper “Huawei people” published a speech of CEO Ren’s: “in the past 18 years, Huawei hasn’t got one single original invention”⁴, although Huawei had the most invention patents in China that year. The investment difference between GSM and CDMA also illustrates Huawei’s application of the “following” preference: invested only (but fast) in the products and technology for promising markets. In TD-SCDMA’s case⁵, Huawei refused large investment in TD-SCDMA until the market was mature, despite great political pressure (Vialle et al, 2012). After Huawei becoming one of the industrial leaders, there was not much established technologies to follow in its core business. The diversification strategy chosen by Huawei may be interpreted as a further application of this principle.

⁴ Source: <http://tech.sina.com.cn/t/2007-01-05/16391321583.shtml>

⁵ A domestic Mobile 3G standard that met limited market acceptance

Thirdly, “platform development” is derived from the “follow rather than lead” principle. It refers to build first a product platform to produce products with basic functions, and then gradually improve the platform’s technology and manufacturing level in order to improve product performance and enrich product portfolio. New platforms are also developed from existing ones.

Huawei formed this strategic preference from experience of early years. While the JK1000 and CT2 project failed, the platform development path from C&C08A to C&C08B, to C&C08 platform, and at last to SDH equipment and transport platform” brought almost all the profits. In practice, Huawei emphasized basic technological R&D from the beginning, and invested plenty of resources in improving and upgrading its platforms. Huawei launched new product R&D based on the current platform as much as possible, and the incremental developments should be integrated into the platform as basic features as soon as possible. A natural evolution happened while the platforms were continuously improved and eventually technologically upgraded, and new platforms were derived. By looking into Huawei’s product road map and recent product portfolio, Huawei had very clear product structure based on a few platforms which could be traced back to basic technology research at the very beginning.

Fourthly, “scale and market share rather than profit margin” is also derived from the “follow rather than lead” principle. Huawei aimed first at sales volume and market share and second at profit margin. The “follow rather than lead” principle implies Huawei didn’t pursue technological advance and hence the high profit margin as the leaders did, but aimed at sales volume and market share leading to economies of scale. “Scale and market share rather than profit margin” and “platform development” are the two sides of the same “follow rather than lead” coin: market side and product side. “Platform development” allow first to produce products with basic functions that generate normal profit margins. Only large sales can allow paying back the R&D investment, reducing the product cost, and further bringing more profit to improve the platform and enrich the product portfolio. High quality and wide range of products in turn conduce to sales and market share. In strategic practice, Huawei adopted “circle the cities” that is analysed below.

At last, “Rich product portfolio”, “business offer differentiation”, and “encircle the cities” are product/market strategies that guide innovation. They are also the outcomes of “platform development” and “scale and market share rather than profit margin”.

“Rich product portfolio” refers a wide product range. Huawei had complete set of end-to-end network equipment and solutions of fixed, mobile communication and data communications by the end of phase 2. It took another phase to improve them to reach a world class performance. At the end of Phase 3 and in Phase 4, Huawei was capable of developing leading technology and propose full product lines. It demonstrates the “function first, performance second and leadership technology last” of “platform development”.

Huawei became one of the very few vendors that are able to provide full range network equipments, and kept a wide product range covering from low-end to high-end network gear.

“Business offer differentiation” expresses that Huawei employed competitive differentiation through providing flexible business offer, including two aspects: 1) reduce client expenditure: lower pricing and/or financial solution; 2) integrate functions, product, and services. The two aspects were usually mixed into business packages. Reducing client expenditure was perhaps the sharpest strategy of Huawei to penetrate a market. Lowering pricing and providing financial solutions are common strategies. Huawei used them sometimes aggressively but effectively. In the case of SUNDAY contract, Huawei signed an agreement by which Huawei provided a HK\$500 million loan to help SUNDAY pay existing bills and loans. In exchange, Huawei became sole supplier of SUNDAY's 3G network and became the China-first and world-seventh vendor who was able to commercially provide complete WCDMA (3G) system. Huawei leverage large amount of buyer's credit form banks in bids (event 0403, 0916). Since 2004 to 2009, Huawei used up \$ 10 billion buyer's credit line in overseas markets. In 2009 Huawei got another \$30 credits which was even more than the firm's 2009 annual revenue (\$ 22 billion).

Besides lowering client's expenditure, Huawei adopted integration strategy to compensate for performance disadvantage, and to distinguish its products from its rivals' ones. Firstly, Huawei integrated multiple functions in one product in order to compete with the rivals' advanced equipment. Functional integration had been Huawei's product strategy since the first catch-up phase. Secondly, Huawei integrated different products (and technologies) into specific solutions, such as Huawei's end-to-end solutions of IP and mobile communications. In the third and fourth phase, the technology integration was employed as a major competitive strategy. The “Single” strategy that one single site was compatible with several technology standards. It is also observable in the energy saving design of the products which employed Huawei's technology accumulation of mobile communication, chips and power system. Thirdly, Huawei highlighted customer service since BH01 period and usually packaged it into product contracts for free, such as free training and 24*7 field services. High-quality service was stressed when the equipment performance was good enough, and became a competitive advantage. Till the third catch-up phase, quick service response had been settled as a basic principle when Huawei de-centralized its governance structure and authorized to the “front-line” employees more power of making decision and allocating corporate resources.

The last general strategy is “encircle the cities”. “Encircling the cities” is a term describing Mao's military strategy in China's civil war. It refers to first conquer the rural regions, then accumulate strengths and surround the cities, and at last take over the cities and central government. Huawei uses the term to summarize its market catch-up strategy: enter a market first in the easier segments where the profit margin is low and thus to which

incumbents don't pay much attention. It conduces to fast entering the market and increasing market share. As product performance improved, Huawei gradually moved forward to high-competitive and high-margin markets. The strategy was actually applied by all the Chinese firms. However, Huawei adopted this strategy more effectively through "business offer differentiation" and customized products for local conditions. When developing C&C08 for China's rural markets, Huawei adopted optical technology in the transmission module instead of copper-wire based technology and graphic control panel in Chinese language. Huawei used "encircle the cities" in overseas expansion. It started from the less competitive and geographically near markets, such as in Asia and Russia. And then Huawei entered the high-margin and intensive competitive markets, such as Europe.

In summary, Huawei tended to independently develop products and technologies and kept a basic innovation principle of following in product/market and technology rather than leading. Strategically, Huawei preferred developments around platforms, and correspondingly prioritized scale and market share to profit margin. Huawei formed these innovation patterns and principles mainly from its early years' experience which had influenced its decisions till nowadays. As a result, Huawei kept a wide range product portfolio, was good at competitive differentiation through flexible business offer, and tended to first enter the low-margin markets without serious competition from incumbents, and then the high-margin markets.

5.3.U2 "Relationship" strategic style

Huawei's U2 strategic style is summarized as in Fig. 4.

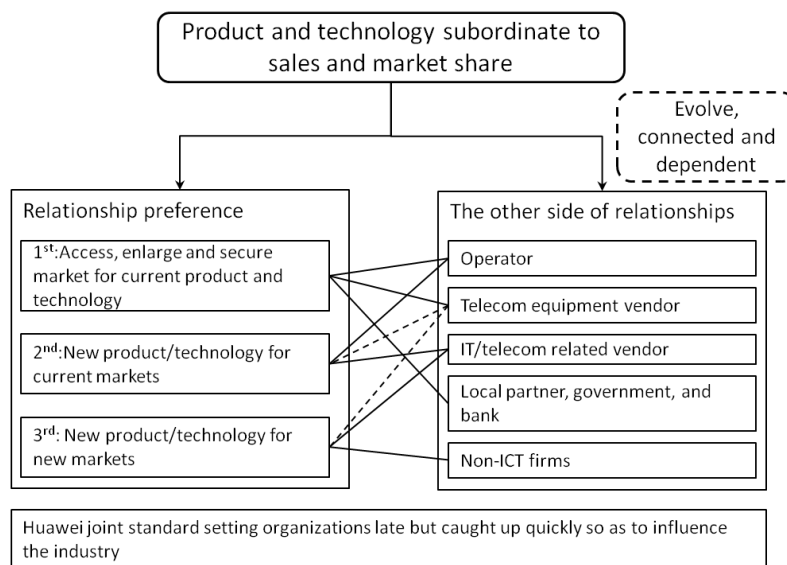


Fig. 4 Strategic style of "relationship"

Relationships are built in order to solve the catch-up problems relevant to routine building and resources. By collected events statistics, 38 out of 51 (about 74%) U2 category events are of U2-U3 type, and 17 events conduce to U1 development (see Fig. 5).

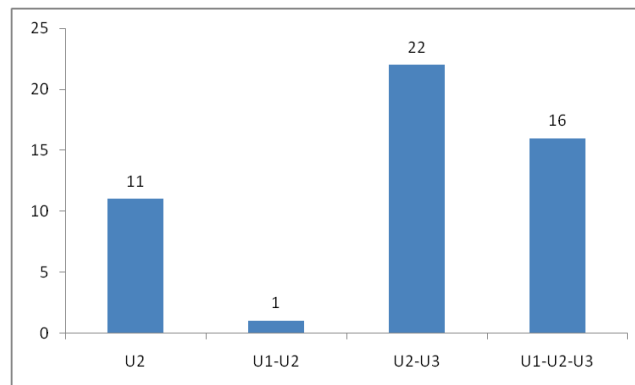


Fig. 5 Exclusive strategic connections of U2 and U1, U3

The relationship differed due to who was the other side (see Tab. 1). For example, Huawei had both resource exchange and co-development relationships with telecommunications vendors, but not as closely cooperative as seemed to be. Comparatively, the cooperation with IT and telecommunications-related vendors were quite good. Relationships with these firms were preferred by Huawei for product and technology R&D reason. Huawei also joined standard setting organizations late, but then quite actively made contributions to reach a more influential position.

Tab. 1 Relationship characteristics and event statistics

With	Relationship characteristics
Operator	<ul style="list-style-type: none"> Firstly and mainly in order to expand and secure market, secondarily to develop new product through cooperation
Telecommunications vendor	<ul style="list-style-type: none"> Not as close cooperation relationships as it seemed
IT and telecom related firm	<ul style="list-style-type: none"> Closer cooperation than with telecommunications vendors
Local partner, bank, and government	<ul style="list-style-type: none"> Mostly for raising funds and accessing market
Non-ICT firm	<ul style="list-style-type: none"> In the transformation period beginning to cooperate with non-ICT firm for exploiting new markets.
Standard setting organization	<ul style="list-style-type: none"> Join late but fast towards a more influential position by technology contribution

The JV events may further confirm the analysis above (see Tab. 2). The JVs with non-telecommunications vendors were successful. On the contrary, the JVs with telecommunications vendors were quite carefully setup and they didn't perform well. One reason may be that Huawei had a complete set of telecommunications product lines, and so it faced direct competition with almost all other telecommunications vendors. But the joint ventures with IT firms, operators and other firms could help Huawei in market, product and technology.

Tab. 2 Huawei's joint ventures

Joint venture	With	Purpose	Ending
Mobeike (1993)	Operator + regulator	Funds, ensure and expand sales	Sold (2001)
Local JVs (1996-1998)	Local operator and local regulator	Ensure and expand sales	Transformed into Huawei's branches (2001)
Beto-Huawei (1997)	Russian Beto (local partner)	Enter Russian market	
Shanghai Yu Dream (2002)	NEC and Panasonic	Develop 3G terminals	Failed to cooperate
Huawei 3Com (2003)	3Com (telecom vendor)	Develop IP product and enter U.S. market	Sold (meanwhile acquire Harbour) (2006)
TD Tech (2005)	Siemens (telecom vendor)	Develop TD-SCDMA	R&D for Huawei (control) and NSN
JV agreement (2006)	Nortel (telecom vendor)	Develop new technology and enter U.S. market	Cancelled because of market risk
Huawei Marine (2007)	Global Marine (IT and telecom related firm)	Diversify in to submarine cable market	
Huawei Symantec (2008)	Symantec (IT and telecom related firm)	Diversify in to enterprise markets	Acquired by Huawei (2011)

Huawei actually improved the relationship if it conduced to market expansion, new product or technology development. Relationships with Siemens, Motorola and IBM demonstrated Huawei's such strategic tendency (see Tab. 3). The cooperation with Siemens

and Motorola were the only real cooperation relationships with telecommunications vendors.

Tab. 3 Relationship evolution with IBM, Siemens and Motorola

Firm	Year	Content
IBM	1997	Set up a joint R&D lab
	1998	Launch the most important management project in Huawei's history by IBM's consultants
	2000	Joint R&D of IP network products
	2011	Co-develop and introduce SmartCare service with IBM and Accenture
Siemens	2004	Provide IP products (Quidway routers and switches) for Siemens enterprise customer solutions
	2005	Found a joint venture, TD Tech Ltd. developing TD-SCDMA technology and products, but the JV was limited
	2006	Won Siemens in acquiring Harbour Networks, which eliminated a rival and strengthened the cooperation with Siemens which had built a partnership with Huawei in IP communication but been seeking for acquiring such technology and capabilities
Motorola	1997	Set up a joint R&D lab
	2002	OEM GSM, GPRS and WCDMA products for Motorola
	2006	Establish joint R&D Center with Motorola in Shanghai to develop UMTS technologies

The relationship with IBM was most typical and important. The relationship begun in 1997 in the form of a joint R&D lab. The real close relationship began in 1998 by a consulting project. It was the most important management project in Huawei's history. Then in 2000, Huawei and IBM microelectronics division reached an agreement of supplying components to Huawei and letting Huawei access IBM's advanced R&D facilities. At that time, Cisco and other western firms controlled almost all the technology and IP of data communications. Under the deal, IBM supplied network-processor (NP) and packet-routing switch technology and ASIC parts for Huawei's routers and optical-transmission systems. The deal enabled Huawei to overcome the disadvantages in technology and IP, and directly access new technology and fast deliver high-end equipment. For IBM, the deal of jointly developing networking gear was a strategic action of leveraging its technological resources in an emerging market to compete with Cisco which was the dominant firm in data communication domain. For Huawei, IBM's technology and collaboration helped it to win

the trust of western customers, and contributed to winning its first European contracts in Germany in 2001. In 2010 Huawei cooperated with IBM and Accenture to introduce SmartCare service solution for network operators.

In summary, Huawei developed relationships with operators, local partners, governments, and banks mainly for accessing, expanding and securing market. Huawei cooperated quite well with the IT and telecom related firms, and less with telecommunications vendors. Huawei joined standard setting organizations late, but quite actively made contributions in order to reach a more influential position. Huawei's relationships building was an evolving process which was connected to dealing with "product/market and technology" and "routines" strategy. The analysis confirms that Huawei indeed improved the relationship to higher level if it conducted to market expansion and new product and technology development.

5.4. U3 "Routines" strategic style

"Routines" strategic style is summarized as in Fig. 6.

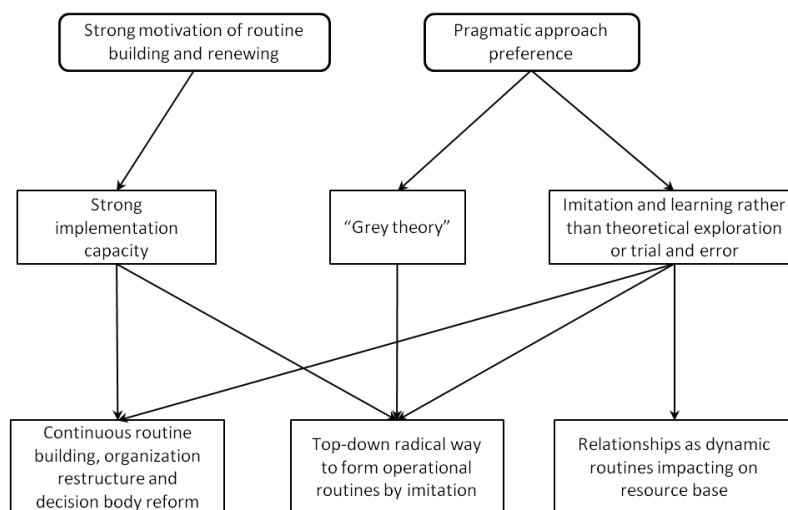


Fig. 6 U3 strategic style

First of all, Huawei formed routines mainly for improving organizational performance and capabilities within the firm, and secondly for external use. By the events statistics, 76 out of 129 (about 59%) U3 category events were exclusively routine forming events. 15 events were of exclusively U1-U3 type. If regarding that the exclusively U1-U3 events indicated the routines improving performance and capabilities of internally developing U1, the statistics (about 70% of the events) shows that Huawei formed routines mainly for improving organizational performance and capabilities within the firm. Furthermore, 38 events were related to building relationships (22 exclusive U2-U3 events plus 16 U1-U2-U3 events). It implies that Huawei formed routines for external relationship reasons.

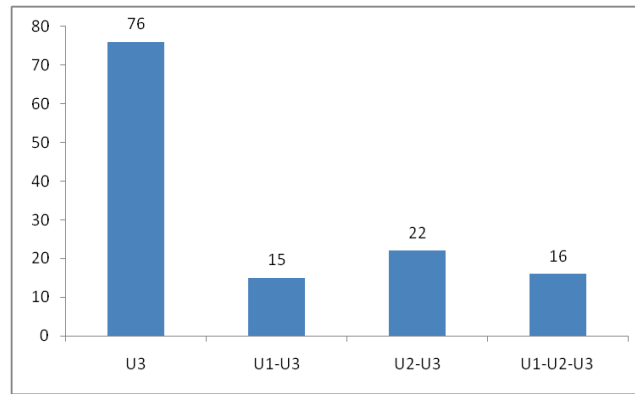


Fig. 7 Exclusive strategic connections of U3 and other unit

Second, Huawei had strong motivation of building and renewing routines. It is directly embedded in the strong implementation capacity for continuously building routines, restructuring organizations and reforming the top decision making body. Since in Phase 1 Huawei realized its disadvantage in routines, Huawei kept forming, improving and renewing routines. New management projects were initialized while others were not finished.

The most significant change is the regularly occurring firm-level restructure and decision body reform (see Tab. 4). Take the decision making body's evolution as an example. Before 2004, the firm-level strategy was in fact made only by CEO Ren, which provided rapid strategic decision with strong personal wills, yet caused mistakes for personal limitations. Although Huawei established an Investment Review Board in 2001 and a Marketing and Engineering Department in 2002 for solving the problem, the two departments failed to fulfill their duty. In 2004, Huawei established Execute Management Team (EMT) under the help of IBM consultants. EMT adopted a rotating COO system, under which each EMT member (CEO, Chairman of the board, and five VP) had a half-year term of leading the EMT. The EMT functioned effectively as the top-decision making body till 2011 when Huawei restructured its business and established three Business Groups (BGs). Each BG has its own EMT. The CEO of each BG was also the director of the BG's EMT. The rotating COO system was inherited and re-designed into a rotating CEO system under the leadership of the BOD (Board of Directors). Eventually, Huawei formed its specific decision body "BG EMTs + rotating CEO" which are under BOD's leadership.

Tab. 4 Organizational structure and decision body reform

Year	Organizational structure and decision body reform
1996	<ul style="list-style-type: none"> Restructure its management system and set up three central departments: "Office of Product Strategy, Research and Planning", "Central Research Department", and "Central Testing Department"

- 2001 • Establish IRB (Investment Review Board) in charge of strategic decisions of product development with a market oriented view rather than technology oriented view
 - 2002 • Found "Marketing and Engineering Department" integrating the functions of strategic investment, strategic cooperation, and market demand analysis to support top managers' strategic decision-making
 - 2004 • Restructure the decision-making team into EMT (Execute Management Team) and formed a management structure with seven major new departments: market and service department, strategy and marketing department, product and solutions department, and operation and delivery department, finance department, strategy and co-operation department, and human resource department
 - 2009 • Reform organizational structure and human resource system so that the "front-line" has more decision-making power and authority.
 - 2011 • Adjust management restructuring and establish three major business groups (BGs) -- Carrier Network BG, Enterprise BG and Consumer BG.
-

Third, Huawei build operational routines in a top-down radical way of imitation. The decision making body decided what routines to imitate, and then imposed its application. Huawei systematically imitated proven operational routines to form its own operational system, mainly through management consulting projects provided by consulting firms. This radical imitation initially brought Huawei severe organizational problems, but quickly formed an efficient operational routine system supporting Huawei's fast catch-up process.

The routine imitation under consulting contracts with IBM and HAY was the most important operational routine building action, and the most representative to demonstrate Huawei's radical style. The series of management projects restructured Huawei's complete management system based on IBM's management knowledge and experience. HAY's NVQs project was a complementary HR management project to IBM's project. It directly impacted on the governance structure and salary system. The radical IBM and HAY projects made remarkable progress but caused serious problem. The response speed of daily operations was slowed down. Many senior employees left with their resources, and even worse they founded firms directly competing with Huawei, such as Harbour.

Facing these problems, Huawei insisted on one hand going on with the management projects; on the other hand it proposed the "grey theory" in 2000: "grey is the zone between black and white. It means never act extremely and only deal with problems in balancing the principle and appropriate degree of flexibility." Through emphasizing the balance between the rigid way of adopting external system and flexibly dealing with routine work and strategic matters, the grey theory actually stabilised the organization and protected it from being rigid or in chaos during the dramatic change.

As a result of two catch-up phase efforts, Huawei eventually formed a complete and efficient operational system through radical imitation. Its 2011 annual report wrote: “Huawei has implemented a dedicated and customer-centric management system since 1997. With long term partnership with the world's top management consulting companies, the Company has aligned its management system with industry's leading practices in respect of R&D, supply chain & procurement functions, sales & customer services, human resources management, financial management, quality & business operations and IT management, etc.”

Fourth, Huawei kept a pragmatic attitude when forming and improving routines. It didn't ask for help from theories or apply trial and error method. Instead, Huawei searched for and adopted existing practical solutions through imitation and learning. The direct reflection in routine building was: 1) almost the entire operational system was formed through imitation; 2) Huawei routinized building relationships into dynamic routines impacting on resource base; 3) Huawei proposed management a principle called “grey theory”.

In summary, Huawei had strong motivation of building and renewing routines, and preferred a pragmatic approach to achieve the goal: imitation and learning rather than generating new routines by theories or by trial and error method. The motivation provided dynamics and strong implementation capacity to continuously form and optimize routines, and led to a radical way to systematically imitating operational system. Practically, Huawei proposed grey theory; imitated routines, restructured the organization, designed its decision making body under the help of outside knowledge; and routinized building relationships into dynamic routines impacting on resources.

5.5. General strategic style and innovation strategic preference

The general strategic style profiles Huawei's corporate identity. In general, Huawei was a latecomer with strong motivation for catch-up, tending to independent development, and preferring a pragmatic approach to achieve its strategic goals (Fig. 8).

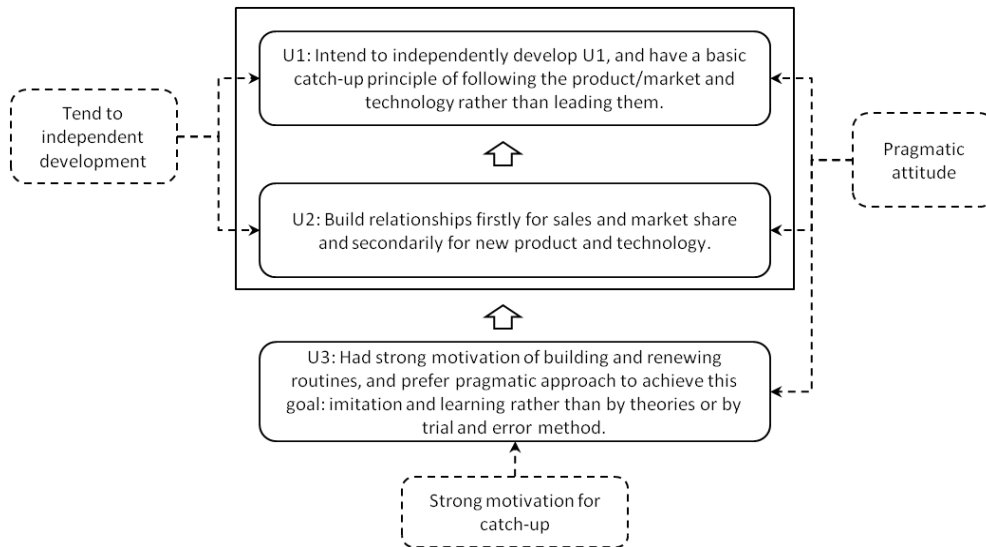


Fig. 8 Huawei's general catch-up strategic style

First, Huawei tended to develop product/market and technology mainly on its own. “Product/market and technology” and “relationship” strategic style analyses give out consistent results that Huawei developed product/market and technology mainly on its own. Relationship and acquisition were adopted as relatively minor strategies. Huawei built relationships primarily considering the sales and market share increase, and then accessing resources for new product and technology development.

Second, Huawei was strongly motivated to catch-up through forcing routine building. In Phase 1 when Huawei had few systematic operational and dynamic routines, the strong motivation for catch-up caused serious strategic and management problems. Since Phase 2, the motivation directly impacted on routines and hence indirectly promoted the catch-up on product/market and technology as well as the relationship building. In other words, the motivation was transformed from “do” in Phase 1 to “how to do” in the following phases.

Third, Huawei kept a pragmatic attitude to catch-up strategy. It didn't ideally attempt to lead the industry but practically chose “follow” both in product/market and technology. It indeed tended to independent development, but still cooperated with firms that were (potential) rivals. When forming routines, Huawei directly asked consulting companies' help to entirely imitate western management system. Even its top decision making body was designed under the help of consultants.

Independent development tendency made Huawei a special latecomer, strong motivation for catch-up provided sustained catch-up dynamics, and pragmatic attitude kept Huawei alive. The general style is like the character of a person, and determines how Huawei decides and hence acts.

How Huawei innovated and what was the preference are actually demonstrated when

analysing U1, U2 and U3 strategic styles. Thereby, Huawei's innovation strategic style is drawn out from above analysis results but not analysed again.

First by the degree of product and technology novelty, Huawei mainly innovated incrementally and architecturally, and in a few cases it adopted modular innovation. Huawei never designed radical innovation.

The preference of incremental and architectural innovation is related to the "follow rather than lead" principle and the "platform development" preference in the analysis of U1 strategic style. Huawei provided products integrating multi-functions for specific market (such as the C&C08 exchanges), and developed specific products by integrating existing components and technology (such as the A8010). Huawei also in some cases developed modular innovation. For example, when designing C&C08C, Huawei employed PHD over optical connection to connect the internal modules, which was the first time in telephone switches in the world. In 1998, Ren, Huawei's CEO, clarified Huawei's attitude toward innovation as: "In new product R&D, Huawei tries to use our own mature technology and accessible technology outside the firm. It is not innovation but a waste if more than 30% technology is newly developed, which only brings more cost and instability." Huawei never designed radical innovation. In 2006, the front-page article of Huawei's internal newspaper "Huawei people" published a speech of CEO Ren's: "in the past 18 years, Huawei hasn't got one single original invention"⁶, although Huawei had the most invention patents in China that year. In Phase 4, Huawei chose a diversification strategy by deploying its existing resources in a broader ICT market. Although it had world-largest PCT application numbers and was able to make efforts for radical innovation, it didn't.

Second by differentiation strategy, Huawei made business offer innovation to distinguish itself from its rivals. Huawei expanded its market share and meanwhile avoided decreasing the price per contract. This innovation is the "business offer differentiation" analysed in U1 strategic style. Huawei integrated for free in its contract plenty of which were usually sold separately at that time. Further, Huawei flexibly designed business contracts that helped clients to solve financial problems. Actually, through this innovation, Huawei expanded market share and avoided decreasing the price per contract.

Third, Huawei was quite innovative in routine building. The most significant organizational innovation is that Huawei built its entire operational system by imitating external western systems and through management consulting projects. Usually the routines were tacit and firm-specific. Even though a routine is well coded, the imitation requires a relatively long time for the organization members to adapt to it. The higher level the routine is, the more difficult to imitate. But Huawei, as a Chinese firm, entirely imitated western management system. The risky but successful organizational innovation effectively underpinned to Huawei's fast catch-up in management aspect. Besides, Huawei formed its

⁶ Source: <http://tech.sina.com.cn/t/2007-01-05/16391321583.shtml>

specific decision structure: “BG EMTs + rotating CEO” under BOD’s leadership was quite innovative.

5.6. Summary

The study findings profile Huawei as a latecomer who has strong motivation, independent developing tendency, and a pragmatic attitude to catch-up. It started making network equipment with assembling PBX but soon leapfrogged to producing the most updated class-carrier exchanges. The strategic mistakes in the early ages caused problems but left experience that deeply influenced Huawei’s strategy and activities. Along the catch-up process, besides the competitive advantages, Huawei gradually formed its specific strategic style, the preference and patterns of making and implementing strategies. In terms of product/market and technology, Huawei insisted on “following rather than leading”. As concerns to the relationships, Huawei was quite selective to who was on the other side. It considered firstly accessing and expanding markets and then accessing product and technology. When forming routines, it showed strong motivation and implementation capacity, and preferred a pragmatic approach to achieve its goals.

6. Discussion

In this study, we have put the emphasis on the firm level, rather than on the country and industry level. We have identified the path of Huawei’s strategic evolution over the years, as well as the strategic style that characterize Huawei’s strategic patterns and principles. However, it must also be stressed that Huawei’s success is also due to specific country factors. Huawei has benefited from accessing the knowledge pool organized by the Chinese policy. The trend of “independent development” that we have identified has only been possible because Huawei has been able to hire Engineers trained in JVs and foreign firms, to get knowledge from partnerships with universities, and to find abundant and cheap well-trained technical manpower on the job market. However, this company has benefited more and did better than its Chinese counterparts. We suggest that the strategic style that we have identified can provide an explanation to this differential performance.

Huawei’s catch-up has both similarities and particularities to those investigated in catch-up literature. The findings are consistent with the existing research on Chinese telecom latecomer: Huawei had a high technological starting level, internationalized early, and invested in R&D heavily. The findings follow the strategic suggestion of general catch-up research that a latecomer should access external resources and act as a follower in product and technology. Yet, the research contributes with arguments and new content to the catch-up research. (Summarized in Tab. 5)

Tab. 5 Arguments and new content to the catch-up research

<p>Product development and innovation relying on technological know-how</p>	<ul style="list-style-type: none"> • It is consistent with Kim's (1997) essential proposition that the technological catch-up process is a learning process. But it shows that it is possible, in certain conditions, to invest in knowledge learning not primarily by imitative "learning by doing", which is different from Kim's research • Technological know-how enables and facilitates a latecomer to innovate in early catch-up stage
<p>Independent development</p>	<ul style="list-style-type: none"> • A latecomer can develop product and technology independently since very early catch-up stage. It doesn't have to directly rely on foreign technology or mass manufacturing for the incumbents.
<p>Management system imitation</p>	<ul style="list-style-type: none"> • A latecomer can operationally catch up through imitating advanced management system rather than by self-generation

First, the study finding "platform development" is consistent with Kim's (1997) essential proposition that the technological catch-up process is a learning process. But it shows that it is possible, in certain conditions, to invest in knowledge learning not primarily by imitative "learning by doing", which is different from Kim's observations.

Kim (1997) summarizes the learning process as the catch-up engine of Korean industry progress. His research implies that the knowledge catch-up underlies the technological catch-up due to the latecomers' initial knowledge-poor situation. Kim distinguishes three phases of Korean firms' catch-up: 1) duplicative imitation stage: simply imitate existing foreign mature products; 2) creative imitation stage: produce products with new features; 3) innovation stage: innovate technology and products. The latecomers in developing countries start technological catch-up primarily by imitative "learning by doing", and then gradually by "learning by research".

The platform development actually means to technologically catch up and innovate relying on technological know-how. Huawei first developed the technological know-how through the knowledge and technology learned from outside and/or self-generated. The technological know-how was embodied in the product platforms, based on which Huawei developed products with imitative and/or innovative features. Huawei indeed introduced its first PBX product by assembling in 1990, but in two years it leapfrogged to the most updated carrier-class telephone exchange C&C08 R&D. Huawei didn't produce it by assembling or imitating the design from others. Although the technical architecture was imitated from

Julong's HJD04 exchange, Huawei self-designed the C&C08 with innovative Chinese graphic operational panel and hardware structure - PDH optical transmission modules. In other words, Huawei first formed technological know-how of the telephone exchange through in-house R&D based outside knowledge, and then developed the C&C08 which was also Huawei's first technology and product platform. Innovation was also made in C&C08. That's to say, Huawei almost started with the creative imitation stage which is the second catch-up stage in Kim's (1997) research.

Second, since Huawei didn't have to get knowledge primarily by "learning by doing", it didn't have a simple production-oriented catch-up stage. The technological know-how enables and facilitates Huawei to innovate in early catch-up stage.

The empirical literature shows that latecomers initially produce products by using foreign technology and local cheap labor and natural resources, then gradually accumulate technology to improve performance and manufacturing capabilities, and eventually get high-level technology. This proposition is actually a production-oriented catch-up strategy, and empirically supported by the latecomer cases in Eastern Asian countries like South Korea, China and Taiwan. For example, the "linear model" or "bottom-up model" describes a typical technological catch-up process from simply assembling goods, to improving the manufacturing capacity for producing components in form of OEM (original equipment manufacturer), to engage in ODM (original design manufacturer), and at last to OBM (original brand-name manufacturing) (Hobday, 1995; Leonard-Barton, 1995). Similarly, Lee and Lim's (2001) research observed that latecomers achieve technological catch-up by a progressing from assembly, to low-tech part development, to high-tech part development, to product design, and finally to product concept creation.

But, Huawei didn't have a mass manufacturing stage before developing the most updated technology and products. Huawei got mass manufacturing capabilities gradually.

The literature differs on when and how to innovate technologically. Kim's (1997) research may imply that the latecomers do not innovate in early catch-up phase but by duplicative imitation. But Hobday (2005) shows that they can start innovation for minor improvements to current product design and manufacture process in early catch-up phase. Some authors argue that technological innovation is a key catch-up factor throughout the catch-up phase (Perez, 1985; Perez and Soete, 1988), particularly for those in technology-driven industries (Badawy, 2009). Regarding how to innovate, Kim (1997) and Hobday (2005) consider that latecomers innovate incrementally through small but sustained step-by-step improvement based on existing technology and products.

The technological know-how facilitates Huawei to innovate in early catch-up stage. The study findings show that Huawei innovated at its early catch-up state. Its innovations were most of the time incremental and architectural innovations, and sometimes modular innovations. For example, the basic optical transport and telephone exchange technology enabled Huawei to introduced world's first exchange with PDH optical transmission modules.

The innovation made Huawei's C&C08 exchanges fitting China's specific rural conditions much better than its rivals, and further helped to generate an optical transport product line. Thereby, Huawei didn't innovate at technological frontier. It innovated based on basic technology and the most updated product technological structure.

It should figure out that the platform development stresses on developing products based on technological know-how, but doesn't necessarily introduce updated products with innovative feature at first. For example in the IP product development case, Huawei launched the project based on the knowledge from text books. But it could only provide low-end imitative IP switches and routers at first.

The "platform development" technological catch-up and innovation strategically support Huawei's independent product and technology development which is the next contribution.

Third, the study findings provide an argument that a latecomer can develop products and technology independently since very early catch-up stage. It doesn't have to directly rely on foreign technology or mass manufacturing for the incumbents. Most of the latecomers, particularly those in Taiwan and South Korean as in Lim and Lee (2001), caught up relying close manufacturing relationship with the incumbents, and followed a process "OEM -> ODM -> OBM" (Lim and Lee, 2001). But Huawei performed quite independently from the beginning. It developed and produced products by and as a result developed in early ages. It actually manufactured products for others. But it was not a major business and it happened after becoming largest Chinese telecom vendor having a complete end-to-end network product lines.

It should be aware that Huawei's independent tendency was in the Chinese specific environment. Huawei's independent technology and product development has three pillars: a good external market and industry environment, an appropriate set of strategy, and a strong catch-up motivation. The first pillar, as discussed in above section, is the specific industrial environment in 1980s and 1990s including the policies, market conditions and rich intelligent resources. This environment distinguishes China with South Korean, Taiwan and other similar Asian developing countries. When Huawei started catch-up, the Chinese telecommunications industry had already leapfrogged to the updated technological level after several year of preparations. Julong's innovative telephone exchange technological architecture was also transferred in China. Therefore, Huawei could access the updated resources from the JVs and Chinese firms, and didn't have to accumulate technological know-how primarily by "learning by doing" such as OEM products for foreign firms. Further the protected markets and rich intelligent resources supported Huawei's independent development. Therefore, the specific China's industrial environment is an external factor pillar that promotes and facilitates technological catch-up. The second pillar is the catch-up motivation, particularly those of the firm leaders. It is the internal dynamic pillar of catch-up. The third pillar is an appropriate set of strategy, which is the internal strategic pillar practicing the catch-up.

Fourth, Huawei's catch-up itself gives an example for latecomers that latecomers can operationally catch up through imitating advanced management system rather than by self-generation. Existing literature rarely pays attention to how a latecomer formed an effective management system that supports its catch-up strategically and operationally. Ernst and Naughton (2007) notice that Huawei relied on foreign consulting firms but without further analysis. Huawei's case may indicate a new catch-up research aspect of management system building. And it provides a successful example: systematically imitation through management consulting projects.

6.1.Limitation

Current research has five limitations.

The first limitation is inherited from the event-based single case study method. The findings provide transferable generalization, and contribute to testing and enriching existing research, but not enough to give theoretical suggestions on what a latecomer should do. Additionally, the current analysis only assumes that the decisions and strategies contributed to building competitive advantages, without establishing any direct relationships between them.

The second limitation is that some important events are excluded by the study method. In pre-analysis, 31 collected events are introduced but not analyzed. Some others are remarkable and influence Huawei's strategic path and style in the following years. For example, the IPR lawsuit with Cisco directly related to Huawei's IPR strategy and pushing forward the joint venture with 3Com. Some events are related to the decision of abandoning the U.S. market recently.

The third limitation is that some factors of Huawei's competitive advantage are hardly analyzed only through the observable events, like relationship functioning and corporate culture building process. Additionally, some events themselves are protected as secrets.

The fourth limitation is the lack of IPR and financial strategy analysis, for the high requirement for specific skills or the business secret reason. Huawei is not a listed firm, and published its first financial report only after 2005. Moreover, the financial indicators given in the reports were general but not detailed.

The last limitation is the lack of direct feedback from the key persons who made decisions in the events, particularly the top rank managers.

7. Conclusion

Current research makes it easier to understand Huawei's past and nowadays behavior and strategies. Huawei is strategically distinctive, but not strange. It has its own strategic character.

Huawei is a latecomer with strong motivation, independent developing tendency, and pragmatic attitude to catch-up. The distinctive strategy led its remarkable catch-up. The case has both similarities and particularities. As a latecomer, it accessed and imitated external resources, and acted as a follower. As other Chinese telecommunications latecomers, Huawei had a high technological starting level, internationalized early in catch-up phase, and heavy invested in R&D. Huawei's catch-up has its particularities. It tended more to independently develop technology and product. The case demonstrates a solution to the initial knowledge-poor situation by investing in direct knowledge learning for technological and managerial know-how. As a result, Huawei didn't have a simple production-oriented catch-up stage. It self-developed products and innovated in early catch-up stage. Huawei also provided a successful catch-up example of entirely imitating advanced operational routines.

The research findings cannot be generalized to suggestions on what a latecomer should do, but it demonstrates an example of what a latecomer can do. As a prominent Chinese telecommunications vendor, its catch-up case conduces to the insights of China's telecommunications industry's catch-up, and to understanding other similar cases.

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