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The more interactive, the more innovative? A case study of South Korean cellular phone manufacturers

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Abstract

This paper shows that there had been a gap in R&D intensity between South Korean and western cellular phone firms in past years, but this gap has closed. South Korean firm R&D efficiency has recently generally been superior to that of European and American competitors. South Korean innovative power came from three sources: interaction with operators, getting service information and applications from service providers, and internal and external competition. After successful experiences in innovating products for the domestic market, South Korean cellular phone makers used customised design with foreign mobile operators and their foreign R&D centres to localise design and make modifications to meet foreign market demand. Therefore, for 3C (computer, communication and consumer) latecomers in developing economies, due to capital, cost and risk issues, they should strengthen their R&D efficiency through these methods in place of prematurely increasing R&D intensity before the firm is large enough.

Keywords: Innovation; Cellular phone industry; R&D efficiency; Developing economy

1. Introduction

The cellular phone is becoming increasingly important in the Information Communications Technology (ICT) industries for global nations. The reason is that cellular phone and related product shipments and value have expanded rapidly. An International Data Collecting (IDC) research report indicates that the production value of cellular phones surpassed personal computers to become the leader in the technology industry (IDC, 2005). However, a common consensus about how to be successful in the cellular industry has not emerged.

How have domestic communications equipment firms in the lately industrialised economies achieved success? One of the answers may be in their innovation ability. Fan (2006) studied the innovation capability development of four domestic Chinese firms—Huawei, ZTE, Datang Telecom (DTT) and Great Dragon Telecom (GDT). Innovation capability and self-developed technologies are key areas for Chinese firms to catch up with multinational corporations. It was found that domestic firms should focus on in-house R&D development in order to build their innovation capability, supplemented by external alliances. Fan (2006) focused on telecom equipment such as base stations and switches and ignored cellular phones.

Latecomers sometimes need new technology from outside firms. Hence, researchers also mentioned that firms in developing counties source their formal or informal technology from outside firms. Thus, their technological innovations have progressed by acquiring mature technology from advanced countries and at the same time have increased the absorptive capacity of these technologies (Gil et al., 2003; Kim, 1997, 1998; Lee et al., 1994). Moreover, the empirical results show that firms prefer in-house R&D strategy to technology purchasing. The firm often uses an inertial R&D strategy that keeps up with historical choice patterns (Cho and Yu, 2000).

Aside from enhancing R&D intensity, increasing R&D efficiency is also a way to increase innovative capability. With increasing pressure to create and sustain competitive

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advantages through technological innovation, technology-based firms increasingly depend on the efficient management of their R&D activities (Bone and Saxon, 2000).

Many research papers have provided useful insights and lessons to explain how South Korean firms have faced the changing global environment and accumulated relatively advanced technological and manufacturing capabilities within a short period. The paper also explains the technological capability development process and creates a model for technological and market "catching-up." In this model, technological capability is determined as a function of both technological effort and the existing knowledge base (Lee and Lim, 2001; Hitomi, 2002).

Most of the previous contributions to this paper's subject lack specialised analysis of South Korea's cellular phone industry. This is especially true for the product innovation subject because these studies relied on standardised products or economy of scale mass produced products such as the DRAM, Flash and LCD. The cellular phone industry is a very special technology management subject because it is a product that integrates the computer, consumer and communications (3C). Therefore, communication industries have a higher need to coordinate the communication standards related to a given local market (Rice and Galvin, 2006).

Rapid technological innovations and increasing market competition have created the pressure to develop and introduce new products. To be successful, companies must provide innovative solutions using effective marketing activities, more demand forecasting and an increase in market attractiveness due to environmental changes and government policy (Ahn et al., 2005). As the requisite capability complexity for participation in mobile telecommunications has increased, the complexity and extent of vertical and horizontal disintegration in the industry has increased. Where firms have been able to internalise all of their design, production and distribution capabilities in the past, the changing nature of products has made this business mode impossible (Rice and Galvin, 2006).

Following second-generation (2G) cellular phone technology, e.g., Global System for Mobile Communication (GSM)—the cellular phone industry has followed consumer electronics products by undergoing dramatic changes fuelled by rapid technological development, innovative applications and more integrated functions. The cellular phone is the most representative of all 3C products. South Korean cellular phone manufacturers have succeeded in catching up with and leapfrogging their previously more advanced western progenitors in global market share, export value and company brand name consumer value.

In the early stages South Korean companies were the same as most latecomers, improving on existing product designs, exploiting their cost-down ability, focusing on their process strengths and competing on the basis of high quality and low cost. Even Samsung at one time believed that as long as international markets for low-cost, high technology hardware continued to expand, they could continue to repeat the "behind the frontier cycle" and play catch up in mobile telephony innovation as they had done before for many years. In this scenario, most South Korean firms have yet to achieve international status, particularly in higher priced, more complex products and systems, capital goods and services (Hobday et al., 2004).

South Korean cellular phone firms are now able to lower the risk and cost of new market creation, R&D expenses and innovative product development. At the same time they have improved in R&D efficiency. Samsung and LG lead in new product creation, especially in higher priced, design-intensive products. Samsung and LG have now surpassed most American, Japanese and European firms in the cellular phone industry. This paper is organised as follows: To review the chronological development, industry supply chain, and innovation process of South Korea's cellular phone industry, we divide this subject into details and examine the know-how of Korean cellular firms.

2. Research methodology

2.1. Variables and definitions

The research variables are defined as follows:

(1) Product type definition (Product Mix): The definition of cellular phones includes the standard system product in GSM, general packet radio service (GPRS), Wide-band Code-Division Multiple-Access (WCDMA) and code division multiple access (CDMA, including IS95A/B, CDMA2000 1X and CDMA2000 1X EVDO).

(2) R&D intensity and R&D efficiency: R&D expenditures and R&D expenditures as a percentage of sales are commonly used to represent a firm's R&D intensity. The number of patents is often used as an indicator of a firm's knowledge stock (DeCarolis and Deeds, 1999). Several efficiency-oriented R&D performance measures such as grant patents per R&D expenditure (Deng et al., 1999), the number of patents granted and R&D spending per patent (Bowonder et al., 2000) are commonly used in the R&D management and finance literature (Lin and Chen, 2005). Moreover, researchers find that R&D intensity has a positive impact on the degree of product diversification (Galan and Sanchez, 2006).

Therefore, this paper uses R&D intensity and R&D efficiency to measure R&D performance, whereby R&D intensity is measured as R&D expense as a percentage of sales, and R&D efficiency is measured as the number of patents that the firm receives divided by its R&D expenses (in millions of US dollars).

(3) Average Shipment Price (ASP): Due to the national policy on mobile cellular phone subsidies, if we use the Average Selling Price at the retail level to measure the price of cellular phones, there may be some mistakes