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Entry and competitive dynamics in the mobile telecommunications market

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Abstract

We propose an extension of the Gans–Stern [Gans, J.S., Stern, S., 2003. The product market and the market for "ideas": commercialization strategies for technology entrepreneurs. Research Policy 32 (2), 333–350] framework that includes entry by existing firms. An incumbent firm possessing complementary assets and strong appropriability is in a formidable position [Teece, D.J., 1986. Profiting from technological innovation: implications for integration, collaboration, licensing, and public policy. Research Policy 15 (6), 285–305]. However, a de alio entrant can leverage complementary assets to enter along a new technological trajectory, and then develop appropriability. We illustrate how several mobile telecommunications firms (Ericsson, Nokia and Samsung) pursued this strategy to catch up with the market leader (Motorola). We also identify several shortcomings in Motorola's approach: it was too inward-looking in developing technologies, but ironically not inward-looking enough in exploiting its most valuable patents.

Keywords: Patent citations; Knowledge flows; Mobile telecommunications; Intellectual property; Complementary assets

1. Introduction

In this paper, we explore the role of intellectual property, complementary assets and knowledge flows in enabling several entrant firms to catch up with Motorola, the early leader in the mobile telecommunications market. Motorola initially enjoyed strong appropriability over intellectual property (through patents) and possessed the necessary complementary assets (manufacturing, distribution, access to customers, branding and services). Based on Teece (1986), this meant Motorola was in an enviable position to capture the returns from its innovations. It is therefore surprising that other firms including Ericsson and Nokia were subsequently able to challenge and even overtake Motorola in the mobile telecommunications market. Why did Motorola stumble, and what strategies did these firms use to compete against it? What lessons does this hold for managers and scholars?

We take the entrant's point of view to consider one strategy by which a challenger might catch up with (and possibly overtake) an incumbent controlling both intellectual property and complementary assets. While a de novo firm will find it difficult to compete, a de alio entrant can leverage its complementary assets to enter along a new technological trajectory, then use this beachhead to strengthen its intellectual property position. Building upon the knowledge of incumbent firms and other exter-

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Table 1
Global market share of mobile phones (%)

	1996[a]	1997	1998	1999	2000	2001	2002	2003	2004	2005
Motorola	27.0	28.8	23.2	16.9	14.6	14.8	15.3	14.5	15.0	17.9
Nokia	21.0	20.1	24.3	26.9	30.6	35.0	35.8	34.7	29.7	31.8
Ericsson[b]	12.0	16.2	14.4	10.5	10.0	6.7	6.7[c]	5.1[c]	6.1[c]	6.0[c]
Samsung	1.0	3.6	4.2	6.2	5.0	7.1	9.8	10.5	12.4	12.2

Source: Deutsche Bank (for 2001), IDATE Mobile (for 2004, 2005), Gartner Dataquest (for all other years).

[a] Market share data is not available prior to 1996. However Motorola dominated both mobile phones and infrastructure prior to the period shown (Steinbock, 2003, Chapter 8).

[b] Ericsson overtook Motorola in mobile infrastructure around 1996. Market share data for mobile infrastructure is not available. However, we found rankings of mobile infrastructure market share for a number of years: 1997 (Ericsson, Motorola, Nokia, Lucent, Nortel); 1999 (Ericsson, Lucent, Motorola, Nokia, Nortel); and 2005 (Ericsson, Nokia, Siemens, Motorola, Nortel). *Source*: Burnham (2002) and IDATE (2006).

[c] For Sony-Ericsson.

nal sources is a key ingredient to this strategy, so that the attacker can rapidly develop a defensible intellectual property position.

To illustrate this strategy, we present a case study of the mobile telecommunications market, which includes the manufacture and sale of handsets and infrastructure equipment for mobile telecommunications.[3] Ericsson overtook Motorola in terms of mobile telecommunications infrastructure around 1996, while Nokia overtook Motorola in the mobile handset market around 1998 (see Table 1). Samsung is a successful recent entrant: while it held only 4.2% of the global market for mobile handsets in 1998, by 2004 it had become the third largest firm in terms of market share. Our study uses both quantitative analysis of intellectual property development and qualitative analysis of overall firm strategy (Yin, 1994). In particular, our qualitative research (based on news and company reports, books and a handful of interviews) suggests that the challengers relied initially upon complementary assets to enter the market. This intuition is reinforced by our quantitative analysis of US patents granted to these firms between 1976 and 2004, which shows that the attacking firms only began to patent aggressively *after* they had become major threats to the incumbent, implying that they initially relied on complementary assets and other means to catch up, rather than building a strong arsenal of intellectual property to challenge the incumbent. The quantitative analysis also shows that attacking firms relied heavily on knowledge spillovers from the leader and other external sources to create their own patented innovations, and that only after becoming a leader did the attacking firm begin to reduce its reliance on the former leader and to develop a strong patent portfolio.

Motorola's failure to sustain its leadership position is often blamed on its failed attempt to commercialize its Iridium mobile network based on satellite technology (e.g. see Finkelstein and Sanford, 2000 and Lashinsky, 2004) as well as on fears of cannibalization and organizational issues (Macher and Richman, 2004). Through our regression analysis, we offer additional reasons for why Motorola might have lost its market leadership position. Firstly, Motorola was more inward-looking in developing its technology than its key competitors. This is reflected by Motorola's high self-citations rates, even after controlling for its larger share of mobile patents. As such, Motorola may have been less sensitive towards the latest technical change and its competitors' moves. Secondly, Motorola was paradoxically *not inward-looking enough* where its own high impact patents are concerned. Ericsson and Nokia generated many inventions that built upon Motorola's core patents, and seemingly more so than Motorola: many of Motorola's most valuable patents were cited more heavily by its competitors than by Motorola itself. If self-citation is an important indicator of a firm's capability to appropriate the returns from its inventions as suggested by Trajtenberg et al. (1997), Motorola did not do enough to exploit its core technologies.

Our results lead us to suggest refinements to existing management models. In industries such as telecommunications, it is difficult to compete head-on with the existing market leader. One possible strategy for a challenger to pursue is to leverage its complementary assets to exploit a new technological trajectory (e.g. during the transition from 1G to 2G in mobile telecoms), and then

[3] Our study focuses on the mobile telecommunications market, rather than on the broader mobile telecommunications industry, which also includes upstream semiconductor suppliers, downstream carriers and service providers (e.g. AT&T) and firms specializing in content and multimedia. In 2005, the global mobile phone market was estimated at US$ 110 billion, while the mobile network equipment market was around US$ 34 billion (*source*: IDATE, 2006).