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# Intellectual property rights, strategic technology agreements and market structure

## The case of GSM

Rudi Bekkers<sup>a</sup>, Geert Duysters<sup>a,\*</sup>, Bart Verspagen<sup>b</sup>

<sup>a</sup> Eindhoven Centre for Innovation Studies (ECIS), Eindhoven University of Technology, P.O. Box 513, NL-5600 MB Eindhoven, The Netherlands

<sup>b</sup> ECIS and MERIT, Maastricht University, Maastricht, The Netherlands

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### Abstract

This paper investigates the role of intellectual property rights (IPRs) in shaping the GSM (global system for mobile communications) industry. This industry is an example of a high-tech industry in which standards play a large role. In the process of designing the GSM standard, a lot of attention has been given to IPRs, mainly to avoid a situation in which a single IPR holder could hamper or even totally block the development of the standard. Nevertheless, the ultimate GSM standard contains a large amount of so-called 'essential IPRs', i.e. IPRs without which the implementation of GSM products is impossible.

The GSM case provides an interesting example of how (essential) IPRs ownership and alliance networks influence each other, and how both of them affect market structure and market shares. The play with the essential GSM IPRs, and the strategy of Motorola in particular, is found to have dramatically changed the standardization processes in the telecommunications industry. Where IPR was considered a non-issue in this sector for many decades, it is now among the main issues to be resolved for any new standard, as has recently been shown with the standardization of third-generation mobile networks. Our findings with respect to alliances reveal that timing of the emergence of strong network positions is in line with the findings on essential IPRs. We found for three of the four dominant network players that their position in the network is based on ownership of essential IPRs. The relationship between market power (inclusion in the top-5 equipment suppliers) and the two variables of our main interest (essential IPRs and network centrality) is found to be a positive one with some notable exceptions. © 2002 Elsevier Science B.V. All rights reserved.

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### 1. Introduction

The notion of the knowledge economy implies that knowledge has become a firm's primary means of

generating profits. The large body of literature on the subject (for an overview see, e.g. Boisot, 1998) seems to point to the important conclusion that the extent to which a firm can generate and exploit economically useful knowledge depends on factors that include (strategic) management decisions as well as external factors. How these factors influence the link between (un)successful knowledge accumulation and market exploitation differs greatly between technology fields

\* Corresponding author. Fax: +31-40-2474646.

E-mail addresses: r.n.a.bekkers@tm.tue.nl (R. Bekkers), g.m.duysters@tm.tue.nl (G. Duysters), bart.verspagen@merit.unimaas.nl (B. Verspagen).

or sectors, however. It is the aim of this paper to investigate, analyze and describe this link between knowledge generation in firms and external factors in the specific context of mobile telecommunications, more specifically the development of the GSM (global system for mobile communications) system.<sup>1</sup>

We chose the GSM industry because it provides an example of a successful technological and market standard. With the increasingly important role of standards in the telecommunications industry (we will discuss this in more detail below), the understanding of how a successful standard can be set also becomes increasingly important. The crucial aspect in the standard setting process with regard to knowledge lies in intellectual property rights (IPRs). Especially so-called essential IPRs (without which products adhering to the standard cannot be manufactured), play an important but complicated role. Obviously, there is some tension between the private character of IPRs, and the public interest that a standard wants to foster.<sup>2</sup>

As will be argued in the next section, this gives rise to a complicated process of negotiations, of which the GSM case was one of the first to take place in Europe within the information age. Drawing lessons on the relation between ownership of essential IPRs and other technology-related intangible assets thus seems to be of importance, both from a policy and scientific point of view.

With multiple firms owning (essential) IPRs embodied in a standard, strategic technology alliances are of crucial importance. Holders of essential IPRs may cross-license to each other, or engage in (partly) other than licensing agreements. Firms without the access to essential IPRs may use strategic technology alliances in order to gain access to such knowledge, although they may be in a relatively bad position to do so. However, (essential) IPRs are obviously not the only factor having an impact on strategic alliances. Manufacturing

capabilities, (tacit) knowledge not laid down in IPRs, or previously obtained market positions are all examples of other factors that may influence the degree to which a firm is able to attract partners.

Although relatively neglected in the traditional literature, co-operative agreements have now become an important and recurrent issue in strategic management, international business, industrial economics as well as in organization studies. Scholars in the field of innovation studies (e.g. Nooteboom, 1999; Hagedoorn and Schakenraad, 1993, Archibugi and Pianta, 1996) have observed a declining importance of large in-house R&D laboratories, and a simultaneous increase in interfirm co-operation. Although, the innovation literature has been rather neglecting the ex-post innovative performance effects of strategic alliances, an increasing number of publications has shown that strategic alliances do indeed contribute significantly to the innovative performance of companies (for an overview see e.g. Duysters and Hagedoorn, 2000). Innovation can therefore, no longer be seen as the sole outcome of internal accumulation of know-how. In today's turbulent business environment innovation comes about by the interplay of two distinct but related factors: endogenous R&D efforts and (quasi) external acquisition of technology and know-how. It is often noted that a firm's capability to absorb externally generated knowledge by means of strategic alliances is to a large degree dependent on the degree of knowledge in a specific field. Therefore, we might argue that if the core of a company's technology base is not sufficiently developed or adapted to the new technology, then the absorption of newly acquired external technological knowledge within the technological core of a company is very difficult.

The research question that we are therefore interested in with regard to the GSM industry can thus be formulated as follows. How do the ownership of essential IPRs, the position of a firm in the overall structure of the network of strategic technology alliances, and the market position of a firm interact? From the answer to this question, we are interested in drawing more general conclusions for the process of technological standardization and the relationship between technology assets and firm success in high-tech markets where standards are important.

The main variables in our research question are interwoven in a complex pattern of causality. For

<sup>1</sup> Originally, the acronym GSM stood for *Groupe Spécial Mobile*, named after an early group concerned with developing the standard.

<sup>2</sup> GSM has been the first case where a serious clash between IPR and standards occurred. Later, other clashes have followed, like those with the VESA local bus (VL-bus) for PC graphic cards, the MPEG2 compression standard for storing and transmitting video and audio content, with the DVD standard for storing video content and, more recently, with UMTS. For MPEG2 problems, see Iversen, 1999, p. 96. For the VESA local bus, see Bekkers and Liotard, 1999, p. 65 and Iversen, 1999, p. 96.

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