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Organizational behavior in the R&D process based on patent analysis: Strategic R&D management in a Japanese electronics firm

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Abstract

In the previous study [Tsuji, *Org. Sci.* 33 (2000) 62], the author showed that Canon's patent acquisition strategy effectively promotes their research and development (R&D). In the present study, the author investigated Canon's R&D process from the viewpoint of organizational behavior, paying particular attention to researchers' behavioral patterns, the significance of their patent acquisition strategy, and the role of the Patent Section. Patent application data reflecting performance of researchers in R&D activity relating to inkjet printers were analyzed. The results show that: first, Canon's R&D practice is mainly carried out by teams of researchers; second, each team usually focuses its research effort on a single specified element of technology or device; finally, at times, several teams combine to form larger groups, corresponding to certain stages of product development. Such flexible team behavior exemplifies a new type of unification–regulation system that effectively promotes the R&D process. The author also discusses the useful method of selecting key patents from medley patent gathering for organizational studies. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Patent acquisition strategy; Researchers' behavior; Team aggregates

1. Introduction

It has become more important for firms to acquire patents in order to maintain superiority in product development over the competition or to facilitate technological cooperation and obtaining technical licenses from other companies in the electronics industry. Many firms have come to consider patents as the source of competitive power and therefore put much stronger emphasis on their acquisition part of business strategy. This is especially so in the electronics industry, where most firms regard patent acquisition as a key strategic factor in maintaining their product advantage in the market over their competitors. While the electronics industry used to offer their patents to their competitors in exchange for small royalties or grant them in cross-licensing deals, recently,

they have tended to retain them for their own use and become more reluctant to grant cross-licenses as product development competition has intensified. Ownership of important or attractive patents not only assures companies of their product superiority in the market, but also allows for better negotiation opportunities for business cooperation.

This change in strategy may be attributed to two trends that are presently prevailing on a global scale, namely a shift toward to pro-patent policy and intensified patent disputes. In the mid-1980s, some influential countries, the United States to name one, began to adopt a pro-patent policy under which acquiring patents became easier for patent applicants than during the previous anti-patent policy period. Moreover, it has become more important to hold basic patents as disputes over patents have increased.

Most studies on patents so far have centered on their importance as econometric indices to show firms' R&D strength or each country's governmental patent policy. Few have concentrated attention on strategic viewpoints.

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For example, although Teece (1987) discussed the meaning of patents in terms of their ‘appropriability’ and von Hippel (1988) referred to them in his discussion of product development, these authors failed to analyze patent strategy. This lack of a strategic viewpoint may arise from the conventional notion that patent application is only an *ex post facto* process following inventions in R&D [Fig. 1(a)]. This kind of ‘passive’ patent strategy may suffice if patents merely involve a limited number of technologies and products as in the case of the pharmaceutical industry. In the present-day electronics industry where diversified and complex technologies are involved and each of them continuously progresses, the patents to be applied are accordingly various. As a result, electronics firms must control the traffic of those patents so that they effectively function as a whole industry, avoiding conflict of interest with each other. Under such circumstances, the ‘passive’ patent strategy does not seem appropriate.

In the author’s previous study on Canon’s R&D process relating to inkjet printers (IJPs), the author showed that they carry out their patent application policy from a missing strategic viewpoint in the previous studies (Tsuji, 2000). That is, they first design a plan in which they decide on their target patents necessary for particular products to be developed. They then start their actual R&D activity. In this way, they are able to acquire effective patents and form an adequate functioning portfolio. Moreover, in their examination of a series of technologies to be developed, the selection of research themes is made so that they effectively compliment others already in the comprehensive group of patents. This seems to be more ‘active’ than the conventional strategy [Fig. 1(b)] and confers characteristic features on their organizational R&D behavior. The questions of how researchers practice in their actual R&D process and how R&D processes are organized in relation to the stage of product development are the subjects of the present study. In addition to focusing on organizational behavior, researchers’ characteristics, and changes in the R&D process, the author also discusses the role of the Patent Section that effectively promotes such characteristic R&D behavior and the new method for selecting

necessary information from a large number of medley patents.

2. Case study

2.1. Short history of IJPs

Since the concept of IJPs was first introduced 100 years ago, a large number of firms in many countries of the world have made great efforts to market products because of the theoretical advantages of silent operation and superior color printing in comparison with conventional dot-matrix printers. However, because of technological difficulties only a few firms could manufacture finished products up to the middle of the 1980s. However, around 1990 three firms, namely Canon, Hewlett-Packard and Seiko Epson, which had made major efforts in their R&D activity, achieved remarkable inventions and introduced reliable and high performance IJPs. At first, only monochrome capability was offered, but soon through intensive R&D efforts, printers were produced that could print full-color at high speed and resolution. As a result, a rapid increase in the number of IJPs sold occurred all over the world, and the market has continued to expand since then. The three firms had the major market share by the middle of the 1990s and by fiscal 1997 the market size had a retail volume of US\$5 billion and approximately 31 million printers were shipped to customers. The author chose IJPs for the theme of the present study because:

1. For more than 20 years, many firms in the world, especially in Japan and the United States, have targeted IJPs for their R&D activity.
2. Recently, radical innovation has occurred in this particular area of technology in attempts to expand the size of the market.
3. The number of patents applied for by each firm with reference to this technology is significant enough for us to survey R&D behavior concerning IJPs.

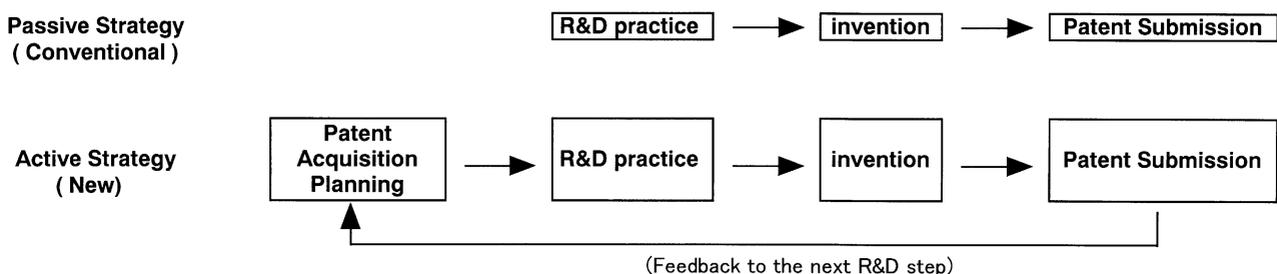


Fig. 1. Flow chart of R&D process: passive and active strategies (Tsuji, 2000).

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