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Exploring Potential Users of Patents for Technology Transfer: Utilizing Patent Citation Data

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Abstract

The purpose of this study is to examine whether potential users of technology can be identified by patent citation analysis. Previous research relied on patent's keywords, and as a consequence it was difficult to implement in practice where organizations retain huge number of patents to transfer. In this study, we attempt to use IPC instead of keywords. Our approach is to identify dominant IPC and sub-classes of an organization by applying co-classification analysis, and explore firms that cited the patents in the dominant IPC. Our view is that the organizations explored in this process can be potential users of technology. To verify our view, we examined the patents and technology transfer cases of K Research Institute's Division A. The results show that our view was right only for the field with co-classification of B01J and C07C, and it was not possible to confirm our argument for other classes. We suppose that the reasons may stem from technological characteristics and firm size effect. Therefore, we suggest that there should be further research considering technological characteristics and firm size.

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1. Background

Recognizing the strategic importance of science and technology in global economy, firms, organizations, and national governments have put emphasis on R&D during the last a few decades. Countries such as Israel, Japan, and Finland spend over 3% of GDP on research and development activities, and Korea in 2014 topped in this field as its R&D expenditure touched 4.29% of GDP. The overall amount of R&D investment also

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increased rapidly over to 60 billion dollars. As the investment increased, the performance of Korean firms, research institutes, and universities has increased dramatically.

However, whilst the amount of technologies developed increased, the use and commercialization of technologies are still unsatisfactory. For instance, Korea's 24 public research institutes produced 9,656 patent applications in 2014, but the number of technology transfer in the same year was only 1,557. According to a government report[1], about 83.9% of patents are left unused despite successful application.

Until now, a number of studies have addressed the issue of technology transfer. Yang and Kim[2] argue that the difficulties in technology evaluation, lack of experts or dedicated teams for technology transfer, insufficient information about technology user firm and the firms' future strategies. KIBO[3] mentions that the information asymmetry between users and suppliers are the major sources of difficulties in technology transfer. Especially, they argue that the difficulties in identifying user of technology are major challenge in technology transfer. Even in the US, estimating market demand for specific technology is one of the main hurdles for US Federal Research Institutes' technology transfer[4]. Therefore, identifying the needs and potential users of technologies may be critical issue for successful technology transfer.

2. Previous Literature and Our Method

There are a number of approaches to identify potential users of technologies. Firstly, potential users can be found by survey. For instance, Lee et al.[5] identified SME's technological needs for IT products by conducting a survey, and many other studies also rely on survey. Secondly, there have been attempts to match between technology fields and industries. OECD constructed technology-industry concordance table[6], and Europe also attempted similar approach[7]. A Korean study[8] linked International Patent Class(IPC) with Korean Standard Industry Classifications, and utilized the result for identifying technology users. Thirdly, there is an approach of text-mining techniques. For instance, Seo et al [9] identified potential use of patents, and matched the uses with company names by text-mining.

However, the approaches above have some limitations. Survey sheets are randomly distributed, so respondents may be limited, and response rate may be low. For this reason, some significant or critical user needs may be omitted. In the case of concordance table, it is questionable whether industrial and technological evolution can be well reflected in the method. Lastly, text-mining techniques used by [9] is too time-consuming, therefore it is lacking practical utility.

For this reason, Seok et al.[10] suggested patent citation network analysis for technology transfer. The logic of their argument is as following. Technology citation is basically past information, so it may not be direct measure for present or future technological needs. However, it should be considered that technological progresses are characterized by technological paradigms, trajectories, and path dependencies[11, 12], and patent citation information can be used as proxy for path dependencies[13]. Then a firm that cited a patent in the past may still be in need of same sorts of technologies.

Seok et al.'s approach was much simpler to use, and their method was directly used for a research institute's technology marketing (according to an interview with one of the authors). However, the problem of their method is that it relies on keyword based search. It can be powerfully used when it is used for a single patent, but it is hard to implement at large organizational level. While large research organizations such as public research institutes usually retain a huge number of patents, the method requires keyword search for each patent. This makes the method still messy to implement in large organizations.

Therefore we suggest using patent class (e.g. IPC) instead of keywords. If an IPC can represent the overall technologies of an organization, taking the IPC instead of a huge number of keywords may make matters much simpler. However, just a single IPC may be too broad to identify a technology field. For this reason, we also

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