

# Chapter 60

## Patent Infringement Risk Analysis Using Rough Set Theory

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### ABSTRACT

*Patent infringement risk is a significant issue for corporations due to the increased appreciation of intellectual property rights. If a corporation gives insufficient protection to its patents, it may loss both profits from product, and industry competitiveness. Many studies on patent infringement have focused on measuring the patent trend indicators and the patent monetary value. However, very few studies have attempted to develop a categorization mechanism for measuring and evaluating the patent infringement risk, for example, the categorization of the patent infringement cases, then to determine the significant attributes and introduce the infringement decision rules. This study applies Rough Set Theory (RST), which is suitable for processing qualitative information to induce rules to derive significant attributes for categorization of the patent infringement risk. Moreover, through the use of the concept hierarchy and the credibility index, it can be integrated with RST and then enhance application of the finalized decision rules.*

### INTRODUCTION

Patent infringement litigation occurs when a firm detects other firm's action to imitate or duplicate an invention without acquiring a license to do so. This legal issue has attracted a great deal of at-

tention due to the increased importance of formal intellectual property rights protection, as well as the changing economic and legal importance of different instruments for such protection. These have created significant challenges for U.S. intellectual property rights policy (Graham and Mowery, 2003). Due to the high cost of research

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and development for a new patent application and for the patent maintenance fees, it is critical for a company to categorize the infringement risk for each patent development process. In addition, for the patent assignee, early provision of patent risk categorization aims at maximizing recoverable infringement damages during litigation (James, 2005). These patent damage awards have become an increasingly important feature of business strategy in the USA over the past 20 years (Jerry and Gregory, 2006).

Previous of patent studies have analyzed patent information and citation number, for example, patent analysis (Levitas *et al.*, 2006; Breitzman and Thomas, 2002), patent classification (Lai and Wu, 2005; Makarov, 2004), patent management (Stembridge and Corish, 2004; Reitzig 2004), and patent strategy planning (Knight, 2001; Gelle and Karhu, 2003). In addition some studies have attempted to analyze patent litigation cases. For instance, Lai and Che (2009) proposed a revolutionary valuation model for the monetary legal value of patents. Juan (1997) studied patent infringement, focusing on an index of patent rights. Some other studies have compared patent counts and patent citations to R&D expenditures and/or survey data in order to assess the efficacy of patent indicators (Acs and Audretsch, 1989; Duguet and MacGarvie, 2005). Technology licenses and publications have been utilized to a lesser extent as comparable measures of knowledge diffusion (Andrew, 2009). However, none of these studies categorized the infringement risk for each patent. In addition, qualitative information may involve in the patent documents. For example, inducing significant attributes and decision rules based on patent titles or property claims may be useful information for categorization.

To categorize patent infringement, this study focuses on analyzing historical patent documents to derive significant attributes from infringement patents and induce decision rules for the current patent development process. The rough

set approach, which is suitable for processing qualitative information (Tseng and Huang, 2007), derives significant attributes and induce rules through the analysis of patent infringement cases. However, the previous RS approach does not handle attributes that are involved in the concept hierarchy, and also does not measure the evidence level of the credible index for the reduct.

In this study, a heuristic approach based on rough set theory is developed that creates credible infringement risk categorization by analyzing infringement patent information.. The proposed solution approach, first, analyzes attributes related to hierarchical information from the collected data sets and selects the highest class by calculating the modified credible index. Second, at the reduct generation stage, aggregation of the attributes and outcomes and induction of the decision rule are performed. Finally, at the rule extraction stage, the significant attributes and decision rules are inducted to categorize the infringement risk.

The rest of this study in this chapter is organized as follows. The “Background” section reviews the literatures in patent infringement and rough set theory, while the “Solutions and Recommendations” section proposes the solution approach. A study demonstrating the proposed approach to support risk-management and patent infringement is illustrated in the “Case Study” section and the “Conclusion” section summarizes the study. Using the aforementioned approach, a corporation can categorize patent risk for the possibility of infringement and reduce lost profits due to patent infringement. Moreover, the decision rules of patent infringement risk can also be developed. Business industry can utilize these rules to determine which patents have higher probability of being infringed, which patents are highly competitive, and which patents and categories require major capital investment for research and development.

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