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Patent filings versus articles published: A review of the literature in the context of Multicriteria Decision Aid

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ABSTRACT

The objective of this work is to conduct a comparative study of the patents indexed in the base Derwent Innovation Index and the articles published in the ISI Web of Science database related to multicriteria. The results pointed to 10,643 articles and 209 patents on multicriteria. While universities were more prominent in the publishing of articles, companies stood out in patent applications. This work points to a misalignment between the articles published and the filing of patents, initiating an important discussion that could contribute to the production of innovation and guide future research about the subject.

Contents

1. Introduction

Arrow [1], Roy [2], Fishburn [3], Saaty [4], Changkong and Haimes [5], Zeleny [6] and Roy and Shalka [7] consider multiple criteria for decision making in complex environments, giving rise to what has been conventionally called Multicriteria Decision Aid (MCDA).

According to Roy [8], two currents can be identified in the study of multicriteria: Multicriteria Decision Making (MCDM) and Multicriteria Decision Aid (MCDA). MCDM refers to the application of robust mathematical models, without subjectivity, ambiguities and uncertainties. MCDA, on the other hand, can be used for the modeling of problems that have some subjectivity, uncertainty and

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ambiguity, which makes this alternative come closer to real situations.

Roy [8] emphasizes that if, on the one hand, the MCDA methods relinquish axiomatic validations, on the other, such methods invest in the analysis of consistency, identifying and treating ambiguities and conflicts in the decision-making process.

An increase in the number of studies that seek to map the production of articles within the field of MCDA is observed, as one can be seen in Mexas et al. [9], Figueira et al. [10], Miranda Victorio et al. [11] and Nepomuceno and Costa [12]. The same effort, however, cannot be seen in the mapping of patents in this field.

This work seeks to contribute to fill this gap by establishing a comparative analysis between the publication of scientific articles and the registration of patents regarding MCDA.

Because of the importance of the multicriteria field for corporate decision-making, including decisions on the development of innovations, a systematic review of the literature was performed to analyze the profile of the scientific (articles) and technological (patents) contributions in this field of study.

In addition, the choice for the multicriteria subject to guide the search was made because of the greater accessibility of the authors in relation to the field and the considerable increase in the number of publications in recent years in this field of research.

The main objective of this paper is to compare the number of papers against the number of patents, under the following aspects: the countries of origin; the most representative institutions, authors/inventors, and the fields of knowledge of the articles and patents.

This article is a descriptive and exploratory study that involved the search for patents and articles on multicriteria and was performed by searching the databases of Derwent (patent documents) and ISI/Web of Science (articles), both accessed from the Capes Portal.

2. Conceptual framework

In this section, it follows a brief explanation is given about the concepts that sustain the present work: patents and technology transfer.

In the international scenario, the World Intellectual Property Organization (WIPO) is the institution responsible for issues related to intellectual property. It was created in 1967, has an intergovernmental nature and is headquartered in Geneva, Switzerland. The objective of the WIPO is: protect intellectual property; ensure the administrative cooperation between the intellectual property associations; and accelerate economic, social and cultural development [13].

A national innovation system is formed mainly by the interaction between research institutes, academia and industry [14,15]. In Taiwan, companies have obtained great benefits through the interaction between the government and the national research institutes [16]. In the United States, universities are considered strategic elements for the economic and technological development of the country. As such, after the Second World War, as a way to recover economically, the United States invested in university research and in the interactions between universities and businesses [17].

According to Hsu [16], the innovation process requires different sources, including companies, universities, laboratories, and research & development institutes, among others. The university is considered to be fundamental for the technological innovation system as it trains human resources and is a source of technological knowledge. For this reason, the Government seeks to encourage the interaction between the university and the business, enabling technology transfer [18,19].

The modern university should be concerned not only with education and research, but with economic and social development. Technology transfers, continuing education programs and public lectures should be normal activities for a university [20].

Universities are important strategic actors in the knowledge economy and are essential for the development of the National Innovation System [21]. The interactions between the university and the business are seen more often in the United States, France, Japan, United Kingdom and Israel, among others, and they benefit both the academic and the private sector as demonstrated [18,22–26]. Universities are benefited, for example, through the diversification of funding sources, and businesses reduce risks, distribute costs and carry out exploratory research in new fields [18,22].

Mansfield [27] says that the university-business interaction can stimulate the development of new studies. However, according to Brito Cruz [28]; Fontana, Geuna and Matt [29]; and Wang et al. [30], the differences between the objectives of companies and universities entail many conflicts of interest between the parties. While the business is looking for practical and fast solutions, the university is concerned with the improvement of theories and the development of investigations, which do not necessarily fit into the business profile.

Patenting has faced many problems in universities because there are enormous challenges to market the results of academic research [31]. Among other reasons, this occurs because developing countries tend to invest little in R&D, resulting in little incentive for companies or universities [20].

The patent market has been expanding significantly, with an increasing number of patents. Most studies on the licensing of patents have focused on modes of licensing, the assessment of the patented technology and price negotiations [32]. The university-business interaction should be part of a long-term strategy, where businesses and academics can work together on joint projects for the development of teaching programs targeting the identified skills gaps [24,33,34].

The technology transfer of patent processes is one of the most important mechanisms for companies to innovate their processes and increase their competitive advantage. In order for the chances of technology transfers to increase, it is necessary to evaluate the feasibility of patents in an optimized way, selecting the most appropriate patent in accordance with the real manufacturing situation [35,36].

3. Methodology

This is a descriptive and exploratory study with a quantitative approach based on the execution of a systematic review of the literature in the ISI/Web of Science and Derwent Innovation Index (DII) databases, using descriptive statistics tools. More specifically, this study was structured according to the following steps:

Step 1. Search for records (articles and patents): In order to selection the articles, a search was carried out in the ISI/Web of Science and Derwent Innovation Index databases, as shown in Tables 1 and 2. In both searches no limit was included for the period time. In such way the searches covered records from 1945 (for the articles) and 1963 (for the patents). The set of keywords used in the query performed in ISI/Web of Science database is similar to that used in DII database, in order to reduce provide better results in the comparison analysis.

Step 2. Statistical analysis of the selected material (articles and patents): In this step, the selected materials were analyzed under the following aspects: