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Review

A bibliometric-based survey on AHP and TOPSIS techniques

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ABSTRACT

In recent years, the employment of multiple criteria decision analysis (MCDA) techniques in solving complex real-world problems has increased exponentially. The willingness to build advanced decision models, with higher capabilities to support decision making in a wide range of applications, promotes the integration of MCDA techniques with efficient systems such as intelligence and expert systems, geographic information systems, etc. Amongst the most applied MCDA techniques are Analytic Hierarchy Process (AHP) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The development of a comprehensive perspective on research activities associated with the applications of these methods provides insights into the contributions of countries, institutes, authors and journals towards the advancements of these methods. Furthermore, it helps in identifying the status and trends of research. This in turn will help researchers in shaping up and improving future research activities and investments. To meet these aims, a bibliometric analysis based on data harvested from Scopus database was carried out to identify a set of bibliometric performance indicators (i.e. quantitative indicators such as productivity, and qualitative indicators such as citations and Hirsch index (*h*-index)). Additionally, bibliometric visualization maps were employed to identify the hot spots of research. The total research output was 10,188 documents for AHP and 2412 documents for TOPSIS. China took a leading position in AHP research (3513 documents; 34.5%). It was also the leading country in TOPSIS research (846 documents; 35.1%). The most collaborated country in AHP research was the United States, while in case of TOPSIS it was China. The United States had gained the highest h-index (78) in AHP research, while in TOPSIS it was Taiwan with h-index of 46. Expert Systems with Applications journal was the most productive journal in AHP (204; 2.0%) and TOPSIS research (125; 5.2%), simultaneously. University of Tehran, Iran and Islamic Azad University, Iran were the most productive institutions in AHP (173; 1.7%) and TOPSIS (115; 4.8%) research, simultaneously. The major hot topics that utilized AHP and will continue to be active include different applications of geographic information systems, risk modeling and supply chain management. While for TOPSIS, they are supply chain management and sustainability research. Overall, this analysis has shown increasing recognition of powerful of MCDA techniques to support strategic decisions. The efficacy of these methods in the previous context promotes their progress and advancements.

1. Introduction

Multiple criteria decision analysis (MCDA) is a full-grown branch and a useful resource within operations research and management sciences (Behzadian, Otaghsara, Yazdani, & Ignatius, 2012; Govindan & Jepsen, 2016). It is appropriate for addressing complex decision problems which are featuring conflicting objectives, diverse forms of data, multi interests and high uncertainties (Wang, Jing, Zhang, & Zhao, 2009). In practice, it is concerned with the evaluation of a collection of possible courses of action or options and this evaluation could be in the form of selecting a most preferred option, ranking options from the best one to the worst one or sorting the options into ordered classes (Durbach & Stewart, 2012). It can be perceived as a procedure which is valid to evaluate real-world cases based on diverse quantitative and/or qualitative criteria in environments characterized by certain/uncertain/risky decision making in order to find a convenient course of policy/strategy/action/choice among several obtainable options (Kumar, 2010). In everyday practices, the application of MCDA is crucial in allocating the finite resources between competing alternatives and interests (Diaby, Campbell, & Goeree, 2013). It is very useful in cases, there is a need to integrate hard data with subjective preferences, to do trade-offs between desired outcomes and to include multiple decision makers (Dolan, 2010). Through designing computational and mathematical tools, it is having a high potential to assist in the subjective evaluation of performance

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