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## 50 Years of Fuzzy Set Theory and Models for Supplier Assessment and Selection: a Literature Review

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**Abstract.** Supplier assessment and selection mapping as an essential component of supply chain management are usually multi-criteria decision-making problems. Decision making is the thought process of selecting a logical choice from the available options. This is generally made under fuzzy environment. Fuzzy decision-making is a decision process using the sets whose boundaries are not sharply defined. The aim of this paper is to show how fuzzy set theory, fuzzy decision-making and hybrid solutions based on fuzzy can be used in the various models for supplier assessment and selection in a 50 year period.

**Keywords.** Fuzzy set theory, supplier assessment, supplier selection, fuzzy logic, uncertainty, logistics, supply chain

### 1 Introduction

Supply chain management and strategic sourcing are among the fastest growing areas of management. Most companies in production and manufacturing industries are seeking the most appropriate supplier to improve economic efficiency. Phenomenon of globalization and rapid development of logistics, at the same time, is in details presented in [1]. Enterprises have recently become more dependent on suppliers, and direct and indirect consequences of poor decision-making become more severe. Supplier selection is an important aspect of competition and it determines the fate of an enterprise.

Fifty years ago, in 1965, Zadeh introduced fuzzy set theory to cope with the imprecision and uncertainty which is inherent to human judgment in decision making processes through the use of linguistic terms and degrees of membership. A fuzzy set is a class of objects with grades of membership. These grades present the degree of stability to which certain element belongs to a fuzzy set [2].

Therefore, it is economically sensible for an enterprise decision maker to use fuzzy set theory, one of the artificial intelligence (AI) techniques, which have limited use in

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