Accepted Manuscript

Three-way decisions based on neutrosophic sets and AHP-QFD framework for supplier selection problem

Mohamed Abdel-Basset, M. Gunasekaran, Mai Mohamed, Naveen Chilamkurti

PII: S0167-739X(18)31085-9
DOI: https://doi.org/10.1016/j.future.2018.06.024
Reference: FUTURE 4286

To appear in: *Future Generation Computer Systems*

Received date : 7 May 2018
Revised date : 25 May 2018
Accepted date : 10 June 2018

Please cite this article as: M. Abdel-Basset, M. Gunasekaran, M. Mohamed, N. Chilamkurti, Three-way decisions based on neutrosophic sets and AHP-QFD framework for supplier selection problem, *Future Generation Computer Systems* (2018), https://doi.org/10.1016/j.future.2018.06.024

Three-Way Decisions Based on Neutrosophic Sets and AHP-QFD Framework for Supplier Selection Problem

Mohamed Abdel-Basset[1], M. Gunasekaran[2] ,Mai Mohamed[1] and Naveen Chilamkurti [3]
[1]Department of Operations Research, Faculty of Computers and Informatics, Zagazig University, Sharqiyah, Egypt.
[1]E-mail: analyst_mohamed@yahoo.com; E-mail: mmgaafar@zu.edu.eg
[2]University of California, Davis, United States
E-mail: gmanogaran@ucdavis.edu
[3] Department of Computer Science and Computer Engineering, LaTrobe University, Melbourne, Australia
E-mail: n.chilamkurti@latrobe.edu.au

ABSTRACT

The neutrosophic set is an excellent tool for dealing with vague and inconsistent information effectively. Consequently, by studying the concept of three-way decisions based on neutrosophic set, we can find a suitable manner to take a reasonable decision. In this article, we suggest two rules of three-way decisions based on three membership degrees of neutrosophic set. A new evaluation function is presented to calculate weights of alternatives, for choosing the best one. We also study a supplier selection problem (selecting suppliers to obtain the indispensable materials for assisting the outputs of companies). The best suppliers need to be selected to enhance quality, service, to reduce cost, and to control time. The most widely used technique for determining the requirements of a company is the Quality Function Deployment (QFD). Since traditional QFD technique does not prioritize stakeholders' requirements and fails to deal with vague and inconsistent information, this research also integrates it with Analytic Hierarchy Process (AHP) depending on neutrosophic environment. A case study is presented to illustrate the effectiveness of the proposed model.

KEYWORDS Three-Way Decisions; Neutrosophic Analytic Hierarchy Process; Quality Function Deployment; Neutrosophic Set; Supplier Selection; Stakeholders.

1. Introduction

The three-way decision theory is proposed based on the classifications of a finite set of objects into three parts, called positive, negative and boundary regions. These regions are viewed as acceptance region, rejection region and not sure region. According to these regions, one can determine rules for acceptance, rejection and uncertainty. The three-way decisions are used in real life fields, such as management [1,2], medical and engineering decision making [3-5], social judgments [6], or