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Assessment on author contribution in publication: A tool for decision-makers

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Abstract

In this paper, an assessment model that incorporated with fuzzy preference relations is proposed to assess the contribution of each author that is involved in publication work. A case study is conducted to demonstrate the ability of the proposed methodology in distinguishing and reflecting the actual contribution of individual author through peer assessment. Results revealed the fuzzy preference relations are capable to provide indices to reflect authors' contribution in a team, and subsequently rate them accordingly with appropriate individual mark. The mark for authors in a team is computed by their associated individual contribution factor scores and the journal rank mark set by the university. The methodology can be further deployed as a standardized method to quantify co-authors' contributions in multi-author papers, and subsequently become a supplement evaluation tool for the university's decision maker to grade or reward the authors.

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Keywords: fuzzy preference relations; peer assessment; journal rank mark; author contribution

1. Introduction

Publication is an important task for both academics and universities as it appears as an index of performance [1]. Assessment in publication achievement is generally classified as a combined judgment on quality of the publication and extent of involvement or contribution of the author. The quality of the publication can be due to several metrics, e.g. journal impact factor, journal rank and number of citations; however, it is difficult to assess the individual involved in a team [2-4]. According to [5], a team score is often assigned to all the authors, whereas in [6], single-authored equivalent (SAE) number is credited to each individual author. SAE number is counted by dividing each publication by the number of authors.

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Nevertheless, both methods do not provide a fair reflection of each member's effort. Peer assessment (PA) could be a solution to tackle the challenge. It is a method in evaluating and providing feedback on the work of peers [7]. Various researchers had reported the use of peer assessment method to evaluate individual contribution in a team [8-12]. Hastie et al. proposed a rubric model with peer assessment to evaluate the effective teamwork skills of the students. They assumed the skills can help students to cultivate a good personal behavior [13]. Gielen and De Wever reported a peer assessment in a computer-supported collaborative learning environment in higher education. Pretest and posttest were completed by the students before and after the assessment for comparison [14].

Fuzzy set theory can be used to deal with linguistic terms in the peer grading assessment [15]. It has been commonly integrated into various assessment tasks, such as fuzzy multi-criteria decision making model for criterion-referenced assessment [16], peer assessment on students-centered learning assignments [17], occupational safety risk assessment on construction sites [18], and recently in data envelopment analysis (DEA) to compare the inputs/outputs and evaluate their relative efficiency [19]. Nevertheless, there is a lack of detailed fuzzy research on individual author contribution in multi-authored publications. In this paper, an assessment model using fuzzy preference relation is suggested to investigate the contribution of each author. All authors who contributed in the publication are requested to participate in a questionnaire. The weighting that measures the individual contribution is computed using fuzzy preference relations. Eventually, the practicality of the proposed methodology is evaluated with a case study.

2. Fuzzy peer assessment

A survey on the selection of the assessment grading type, namely numerical values or linguistic terms would be firstly carried out. Both grading types were found acceptable from the respondents. The analytic hierarchy process (AHP) would then be employed to deal with this decision making problem. AHP classifies the decision as target hierarchy and performs the pairwise comparison of criterions at different levels of the hierarchy. Table 1 shows a grading scale of peer assessment. It is a reduced set of Saaty's scale as presented in [20].

Table 1. Reduced Saaty's scale

Contribution	Relation
Equally contribute	1
Significantly contribute	3
Huge / Strong contribution	5

Consider a team $T = (a_1, a_2, \ldots, a_n)$, where a_1 is the first author, a_2 is second author and a_n is the last author in a publication. Each author would become an assessor in T to provide $n - 2$ pairwise preference relations. The proposed fuzzy preference relations model can be obtained in accordance to the six steps as follows:

Step 1. Convert the assessment grades, i.e. linguistic terms to numeral values. A function $u_{i,j}$ of multiplicative preference relations is defined as follows: