ISSN:3026-0442

Proceedings of the 1st International Conference on Education, Science Technology And Health (ICONESTH 2023 Universitas Bina Bangsa Getsempena, Dec 12-14, 2023, Banda Aceh, Indonesia)

USING FUZZY ANALYTICAL HIERARCHY PROCESS TO PRIORITIZE MEASUREMENT INDICATORS OF EMPLOYEE WELL-BEING IN ORO KOPI GAYO COMPANY

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ABSTRACT

The need to measure complex dimensions of social and humanitarian problems such as quality of life, welfare, and health which cannot be measured using classical techniques, provides an opportunity for the fuzzy logic approach to solve these problems thanks to its ability to work within a framework uncertainty, ambiguity, and unclear information. This research aims to prioritize indicators for measuring employee well-being at the Oro Kopi Gayo company in conditions of uncertainty. Using Chang's Extent Analysis Method in the Fuzzy Analytical Hierarchy Process, this paper evaluates five main components of employee well-being: work satisfaction, organizational respect for the employee, employer care, positive/negative emotions, and intrusion of work into private life. It is hoped that the results of this research can be used as a reference in further research to determine the influence of these five criteria on employee well-being at the Oro Kopi Gayo company.

Keywords: *employee well-being; measurement indicators; prioritization; Fuzzy Analytical Hierarchy Process. Extent Analysis Method.*

INTRODUCTION

The issue of employee welfare in a company is something that deserves to be known and researched and requires good management. Employees are the main capital in every company. As capital, employees need

to be managed to remain productive. However, managing employees is not easy, because they have heterogeneous thoughts, feelings, status, desires, and backgrounds. Therefore, companies must be able to encourage them to remain productive in carrying out their respective tasks and responsibilities, namely by providing something that creates satisfaction in employees, so that the company can retain employees who have high loyalty and dedication and have experience and potential in their field of work. Companies and employees essentially need each other, employees are company assets because without human resources the company will not be able to run, and employees will also not be able to support their welfare without the company as a place to earn a living and support themselves. out of the discipline. So employees must pay attention to their welfare and not just demand their responsibilities with various workloads, as well as employees who do not just demand their rights but their work and responsibilities as employees are not completed. To prevent employee actions that are not desired by the company, company management must fulfill employee demands by providing fair and wise welfare, all of this is done for the sake of creating employee welfare and company welfare.

According to the [1], the term 'well-being' can be defined as a state of comfort, health and happiness. Employee well-being means the physical, psychological, and emotional health, comfort, and happiness of employees. In general, employee well-being is defined as the comprehensive experience and functioning of an employee from the perspective of physical and psychological dimensions [2]. He defines employee well-being from the perspective of employee experience in general and aspects of work in particular. [3] explain that welfare has two important philosophical aspects: the first is hedonism, which is oriented towards happiness, while the other is eudemonism, which is related to the realization of human potential. [4] their study shows that employee welfare is gradually becoming more important on the business agenda as more and more employers begin to realize the benefits of enacting policies related to employees and welfare. The World Health Organization (2013) provides a comprehensive definition by trying to capture the common themes that exist throughout the above definitions of employee well-being, namely the state of each employee to understand his abilities, to manage the normal stresses of life, to work productively and to be able to contribute to his community. [5] and [6] refer to employee well-being as the quality of work life or work-related quality of life. [7] referred to psychological well-being (PWB) as the overall well-being of an employee in their study. Often employee well-being is defined as an employee's overall well-being as they perceive it to be influenced by work and workplace interventions [8]. Interestingly, [9] observes the concept of employee well-being and mentions it in the literature with different terms such as "quality of working life', 'work well-being', 'quality of work life', and so on. [10] argue

that employee well-being has three major dimensions, namely life well-being, workplace well-being, and psychological well-being or PWB. Workplace well-being has been studied based on two main components: job satisfaction and work-related affect. From the definition above, it can be concluded that the concept of employee welfare is dynamic and multidimensional. Therefore, in developing measures of well-being at work, it is clear that much effort is needed to overcome generalizability.

Well-being is a complex construct that is often difficult to measure given its variation within individuals (i.e., across time due to aging) and across contexts. There is no universality in the meaning of having well-being and, therefore, this gives rise to the idea that well-being is relative and often depends on a series of external variables (e.g. cultural bias; [11]. Previously, [12] analyzed the dimensions of well-being and proposed a multidimensional model. This model highlights three main dimensions of well-being: psychological well-being (PWB), social well-being, and emotional well-being. [13] identified five domains that encompass overall well-being and concluded that career well-being is possible is the most important domain for most people [10] suggests looking at employee well-being which includes psychological experiences and health status related to work and non-work. Job satisfaction is also often used to measure employee well-being [14], but this aspect is still biased [15] highlighting the definition of employee well-being from the aspect of well-being in the workplace. [16] highlights employee well-being as it relates to life. [17] believe that there are four main components of employee well-being: the presence of positive affect, the absence of negative affect, life satisfaction, and job satisfaction.

Employee welfare is not only emphasized in the fields of psychology and organizational behavior, but also intersects with various scientific disciplines, including sociology [18], economics [19], and computer science information systems [20]. A new impetus in research requires socio-economic surveys that provide indicators of multiple dimensions of well-being and techniques capable of measuring the complexity that arises from not limiting ourselves to just one dimension of well-being. [21] analyzed the content of employee well-being using the analytical hierarchy process (AHP), which revealed four different factors related to the construct of employee well-being. These factors are psychological well-being (PWB), social well-being, well-being at work, and subjective well-being or SWB. PWB as an important dimension of employee well-being has previously been theorized by [22] and [10]. Social welfare was previously conceptualized by [2] and [23]. Workplace well-being has previously been theorized by [24]; and [10]. SWB was previously proposed by [24]; [10], and [25].

Based on existing literature, the author considers measuring employee welfare to be something complicated and unclear, where the dimensions of company employee welfare are generally still unresolved and not unified, besides that there are still many differences in terms of employee welfare in various literature. In other words, the concept of company employee welfare can be said to be dynamic and multidimensional. And another fact is that academics are enthusiastic about measuring company employee welfare variables. Economists, mathematicians, and other scientists have attempted to analyze social problems using, beyond econometric approaches, new mathematical tools such as soft computing techniques. [26] have used a fuzzy expert system to measure child welfare. [27] have used a fuzzy method to measure job quality in a multidimensional view. [28] have examined two relevant dimensions of well-being: health and social interactions between children and parents. They have provided an assessment of how, by applying fuzzy logic, the complexity of well-being in various dimensions can be preserved and measured. It is reasonable to believe that measuring employee well-being is complex and unclear, and cannot be precisely defined or expressed with clear values. In this case, the Author treats employee well-being measurement as a fuzzy problem and introduces the idea of multi-criteria decision-making (MCDM). The fuzzy-based AHP approach is a more effective solution for solving problems related to multi-criteria decision-making because of its strong ability to handle imprecise and uncertain data. Additionally, it supports decision makers to assign linguistic variables in the form of numerical values to express their judgments and can incorporate incomplete, irretrievable, and non-quantifiable information into decision models in a fuzzy environment [29]. [30] have applied fuzzy-based AHP to determine the weight of each factor that influences readiness to implement knowledge management. [31] proposed a new integrated approach based on the EFQM model using Fuzzy Logic, the Analytical Hierarchy Process (AHP) technique, and the Operations Research (OR) model to increase the level of organizational excellence by improving the quality of business performance evaluation and determination of high-priority improvement projects. [32] developed an effective performance evaluation framework based on the Balanced Scorecard (BSC) and Fuzzy Analytic Hierarchy Process (FAHP) to analyze the suitability of outsourcing organizational strategic decisions in alignment with organizational performance for Indian coal mining organizations. [33] identified the most important performance indicators for measuring the performance of construction companies in Iraq using the Fuzzy-AHP technique. [34] identified and prioritized the adoption of knowledge management in financial institutions using the fuzzy AHP method. The results show that human resources are a priority and organizational management, technological factors, and cultural factors are the next priority. In essence, the trend of using FAHP in published research continues in many

scientific disciplines on various topics, although its application in terms of evaluating employee welfare in coffee sector companies is still limited.

In this research, FAHP is designed for situations where ideas, feelings, and emotions that influence the decision-making process can be measured using a numerical scale. Furthermore, the author proposes an area analysis method, which is the most commonly used method in a series of FAHP applications (for example [35], [36], & [37]). In this method, fuzzy numbers are used to measure "area". In analyzing the area of each object, a fuzzy synthetic degree value can be obtained based on the fuzzy value. The novelty of this research is threefold. First, this research captures attributes rarely explored in measuring employee well-being indicators, especially in Oro Kopi Gayo companies. Second, developing a framework for measuring the welfare indicators of Oro Kopi Gayo company employees which is characterized by quantitative and qualitative assessments of decision makers. Third, the entire framework has been designed and measured using the Microsoft Excel® 2010 platform which is a distinct feature of the proposed approach compared to other expensive software implementations.

METHODS

The evaluation procedure for measuring the indicators of employee well-being in Oro Kopi Gayo company are involved four stages include the interview survey, the calculation weights of criteria, the questionnaire design and collection of data, and the measurement of the priority. A commission consisting of the company manager and employees, all of whom had more than 5-10 years of experience, was organized to have a deep interview and was asked to compare the main criteria and sub-criteria in the scope of this study. The questionnaire for experts was adopted from the Workplace Wellbeing Questionnaire or WWQ [38] and the Scale of Positive and Negative Experience or SPANE [39]. The WWQ enables those who are employed, or recently employed, to gauge their level of well-being on dimensions of (1) work satisfaction, (2) organizational respect for the employee, (3) employer care, and (4) intrusion of work into private life. The SPANE generates positive/negative effects and creates a balanced score. These experts need to make pairwise comparisons of the relative importance of two criteria. Here, the word 'expert' refers to people who have extensive experience in coffee companies. Each element in a level is compared in pairs with other elements at the same level, against the criterion elements at a higher level. The entire questionnaire is based and developed to determine the relative importance of the main criteria and to determine the relative importance of the sub-criterion measurements for each criterion. Experts were asked to make pairwise comparisons among criteria in the form of linguistic variables. The experts' descriptive assessments in the form of linguistic

variables then need to be transformed into a triangular fuzzy scale to construct a comparison matrix for each level with n criteria; $\tilde{A} = \{\widetilde{a_{ij}}\}$ represents the relative importance of criteria *i* to *j*. Table 1 shows the linguistic scale and the triangular numbers used in this paper to express the relative importance of one criterion over another. And, the linguistic terms are shown in Table 2:

Table 1. Triangular fuzzy numbers for importance comparison of two criteria

Linguistic terms	Triangular fuzzy scale	Triangular fuzzy reciprocal scaling
Absolutely more important	(5/2,3,7/2)	(2/7,1/3,2/5)
Very strong	(2,5/2,3)	(1/3,2/5,1/2)
Strong	(3/2,2,5/2)	(2/5,1/2,2/3)
Weak	(1,3/2,2)	(1/2,2/3,1)
Equally important	(1/2,1,3/2)	(2/3,1,2)
Just equal	(1,1,1)	(1,1,1)

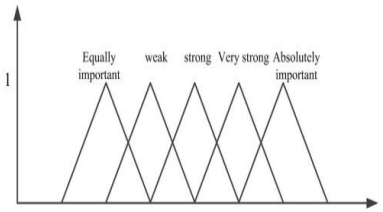
For example, if the decision maker states that criterion i is much more important compared to criterion j, then $\widetilde{a_{ij}} =$ (3/2, 2, 5/2), if not $\widetilde{a_{ij}} =$ (2/5, 1/2, 2/3); here, n(n–1)/2 pairwise comparison judgments require levels with n elements to build the comparison matrix; Comparison matrices need to be created for the main criteria and sub-criteria for each main criterion.

Table 2. Linguistic variable and its semantics for rating the criteria

Linguistic terms	Triangular fuzzy scale
Very low (VL)	(0,0,0.25)
Low (L)	(0. 0.25, 0.5)
Average (A)	(0.25, 0.5,0.75)
High (H)	(0.5,0.75,1)
Very high (VH)	(0.75,1,1)

Among several techniques used in FAHP, [40] suggests an extent analysis method and carrying out comparisons using triangular fuzzy numbers to obtain alternative priorities from pairwise comparisons. This method has become popular because of the simplicity of the steps and their clarity and successful application in many fields [41]. It evaluates the probability of different weight values obtained by different decision-makers using a pairwise comparison matrix, which includes the corresponding triangular fuzzy numbers. This research was completed to convert linguistic scales into fuzzy

numbers by utilizing a triangular fuzzy conversion scale ranging from very low (1) to very high (5), and is presented in Figures 1 and 2.



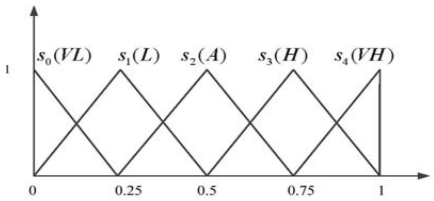


Fig 1. Linguistic scale for relative importance & **Fig 2**. Linguistic term set of five labels with its semantics

RESULTS

Well-prepared tables and or figures must be of significant feature of this section, because they convey the major observations to readers. Any information provided in tables and figures should no longer be repeated in the text, but the text should focus on the importance of the principal findings of the study. In general, journal papers will contain three-seven figures and tables. Same data cannot be presented in the form of tables and figures. After evaluation by expert decision-makers against the main criteria and sub-criteria, each assessment is combined as a matrix. The pair-wise comparison matrices collected from the experts were shown in Tables 3-7. We use Chang's extent analysis method and the fuzzy evaluation matrix of five criteria in Table 3 to calculate the local weights in response to the goal.

Table 3. Pair-wise comparison matrix of criteria and local weights

	Cr_1	Cr_2	Cr_3	Cr_4	Cr_5	Weight
Cr_1	**(1, 1, 1)**	(1/2,2/3,1)	(1/2,2/3,1)	(1,1.5,2)	(3/2,2,5/2)	0.23
Cr_2	(1,1.5,2)	**(1, 1, 1)**	(1,1.5,2)	(3/2,2,5/2)	(3/2,2,5/2)	0.25
Cr_3	(1,1.5,2)	(1/2,2/3,1)	**(1, 1, 1)**	(1, 1, 1)	(1,1.5,2)	0.33
Cr_4	(1/2,2/3,1)	(2/5,1/2,2/3)	(1/2,2/3,1)	**(1, 1, 1)**	(2/3,1, 2)	0.12
Cr_5	(2/5,1/2,2/3)	(2/5,1/2,2/3)	(1/2,2/3,1)	(1/2,1,3/2)	**(1, 1, 1)**	0.07

The local weights for the sub-criteria are calculated, the result in Tables 4-7.

Table 4. Pair-wise comparison matrix of cr_1' sub-criteria and local weights

	Cr_{11}	Cr_{12}	Cr_{13}	Cr_{14}	Cr_{15}	Weight
Cr_{11}	**(1, 1, 1)**	(1/2,2/3,1)	(2/5,1/2,2/3)	(2/5,1/2,2/3)	(2/5,1/2,2/3)	0.09

Cr_{12}	(1,3/2,2)	(1,1,1)	(1/2,2/3,1)	(2/3,1,2)	(1/2,2/3,1)	0.20
Cr_{13}	(3/2,2,5/2)	(1,3/2,2)	(1,1,1)	(2/3,1,2)	(2/3,1,2)	0.24
Cr_{14}	(3/2,2,5/2)	(1/2,1,3/2)	(1/2,1,3/2)	(1,1,1)	(2/3,1,2)	0.23
Cr_{15}	(3/2,2,5/2)	(1,3/2,2)	(1/2,1,3/2)	(1/2,1,3/2)	(1,1,1)	0.24

Table 5. Pair-wise comparison matrix of cr_2' sub-criteria and local weights

	Cr_{21}	**Cr_{22}**	**Cr_{23}**	**Cr_{24}**	**Cr_{25}**	**Weight**
Cr_{21}	**(1, 1, 1)**	(3/2,2,5/2)	(1,3/2,2)	(3/2,2,5/2)	(3/2,2,5/2)	0.31
Cr_{22}	(2/5,1/2,2/3)	**(1, 1, 1)**	(1/2,2/3,1)	(1/2,2/3,1)	(2/3,1,2)	0.01
Cr_{23}	(1/2,2/3,1)	(1,3/2,2)	**(1,1,1)**	(1,3/2,2)	(1,3/2,2)	0.22
Cr_{24}	(2/5,1/2,2/3)	(1,3/2,2)	1/2,2/3,1)	**(1,1,1)**	(2/3,1,2)	0.25
Cr_{25}	(2/5,1/2,2/3)	(1/2,1,3/2)	(1/2,2/3,1)	(1/2,1,3/2)	**(1,1,1)**	0.21

Table 6. Pair-wise comparison matrix of cr_3' sub-criteria and local weights

	Cr_{31}	**Cr_{32}**	**Cr_{33}**	**Cr_{34}**	**Weight**
Cr_{31}	**(1, 1, 1)**	(3/2,2,5/2)	(3/2,2,5/2)	(1/2,1,3/2)	0.38
Cr_{32}	(2/5,1/2,2/3)	**(1, 1, 1)**	(1/2,2/3,1))	(2/5,1/2,2/3)	0.07
Cr_{33}	(2/5,1/2,2/3)	(1,3/2,2)	**(1, 1, 1)**	(2/5,1/2,2/3)	0.17
Cr_{34}	(2/3,1,2)	(3/2,2,5/2)	(3/2,2,5/2)	**(1, 1, 1)**	0.38

Table 7. Pair-wise comparison matrix of cr_5' sub-criteria and local weights

	Cr_{51}	**Cr_{52}**	**Cr_{53}**	**Weight**
Cr_{51}	**(1, 1, 1)**	(1,3/2,2)	(1,3/2,2)	0.43
Cr_{52}	(1/2,2/3,1)	**(1, 1, 1)**	(2/3,1,2)	0.27
$Cr_{5}3$	(1/2,2/3,1)	(1/2,1,3/2)	**(1, 1, 1)**	0.37

Using weights of the criteria and local weights of sub-criteria, global weights for the sub-criteria are calculated in this step. Global sub-criteria weights are computed by multiplying the local weights of the sub-criteria with

the weights of the criteria to which it belongs. The global weights of all sub-criteria are shown in Table 8.

Table 8. Global Weights for Sub-criteria

Main Criteria	Weight	Sub-criteria	Weight Local	Weight Global
Work Satisfaction	0.23	work brings a sense of satisfaction	0.09	0.0207
		work increases sense of self-worth	0.20	0.046
		work allows to recraft work to suit the strengths	0.24	0.0552
		work makes feel the self is flourishing	0.23	0.0529
		work offers challenges to advance skills	0.24	0.0552
Company Respect for the Employee	0.25	Trust the senior people in the company	0.31	0.0775
		Believe in the principles by which the company operates	0.01	0.0025
		Feeling content with the way the company treats its employees	0.22	0.055
		Feeling that the company respects the staff	0.25	0.0625
		Believe in the worth of the company	0.21	0.0525
Employer Care	0.33	The boss is willing to lend an ear at a difficult time	0.38	0.1254
		Feeling that the boss is empathic and understanding about the work concerns	0.07	0.0231
		The boss treats workers as would like to be treated	0.17	0.0561
		The boss shoulders some of the workers' worries about work	0.38	0.1254
Positive/Negative emotions	0.12	Feeling happy/sad	1.00	0.1200

Intrusion of Work into Private Life	0.07	Feeling stressed about organizing work time to meet demands	0.43	0.0301
		Feeling excessively pressured at work to meet targets	0.27	0.0189
		Feeling that can separate easily from work when leaving for the day	0.37	0.0259

DISCUSSION

Although the criteria used in this study are all important, the results of the study show that Cr_3 (employer care), Cr_2 (company respect for the employee), and Cr_1 (work satisfaction) are the most important criteria compared with other criteria. Therefore, these criteria are the key factors that should be considered for Oro Kopi Gayo managers. The criteria of Cr_5 (intrusion of work into private life) is of low importance, including feeling stressed, excessively pressured, and feeling can separate themselves easily from work. The results of sub-citeria of employee well-being indicate that Cr_{31} (the boss is willing to lend an ear at a difficult time) and Cr_{34} (the boss treats workers as would like to be treated) have the highest score (0.1254). It means that is important for the boss to care for workers. In addition, Cr_{21} (trust the senior people in the company) has the highest weight (0.775) under the criterion of Cr_2 (company respect for the employee). The second highest weight (0.0625) is Cr_{24} (feeling that the company respects the staff). Cr_{13} (work allows to recraft work to suit the strengths) and Cr_{15} (work offers challenges to advance skills) have the highest weight (0.0552) under the criterion of Cr_1 (work satisfaction). The proposed hierarchy structure allows the analysis of employee well-being at several levels of criteria. From the viewpoint of management, the hierarchical framework developed in this study provides an improved understanding of how workers assess the well-being criteria in Oro Kopi Gayo company. The five main criteria contain the common aspects of employee well-being measurement. These criteria can be applied to other companies to estimate the important criteria of employee well-being and be aware of performance levels and employees' perceptions. In addition, the developed hierarchical model in this study included 18 sub-criteria reflecting specific aspects of well-being. Therefore, company management practitioners can utilize these criteria to analyze their measurement process at different levels, and this helps practitioners improve management strategies and the specification of daily employee well-being. This provides a more detailed and specific method of application to various levels of employee well-being of Oro Kopi Gayo company than the prior studies. The important weight of criteria in the hierarchical framework can help practitioners identify the most

and the least important dimensions in the measurement of employee well-being. Based on the detailed importance of criteria, practitioners can prioritize the employee well-being dimensions for the enhancement of company performance. In addition, the evaluation result can provide the practitioners the feedback on the perceived importance of criteria; practitioners should correct the management strategies and develop tactics to improve the employee well-being based on the results. For criterion Cr_4 (positive/negative emotions), we only propose one sub-criterion, namely happy/sad feelings. The research results show that this criterion has a low priority based on its importance as an indicator of employee welfare at the Oro Kopi Gayo company with a weight of 0.12, but is more important than the Cr_5 criterion. It may be that the emotions or perceptions of respondents at the Oro Kopi Gayo company when filling out the well-being measurement questionnaire, the majority were in normal condition. We also agree that it is reasonable to assess positive/negative emotions in employee well-being measures separately given the correlation between the two. Because based on [42] which states that positive and negative emotions can be experienced at the same time but in unusual circumstances.

CONCLUSION

Companies are becoming more worker-oriented and making efforts to improve their well-being and company performance. Therefore, measuring the criteria for employee well-being and assessing the importance of indicators is critical for Oro Kopi Gayo company managers. In this paper, we present a hybrid approach based on fuzzy AHP and Chang's area analysis method for prioritizing measurement indicators of employee well-being. This research concludes that currently, the criteria of employer care is the priority (the most important criteria) in employee well-being indicators in Oro Kopi Gayo company, followed by the criteria of company respect for the employee in the second priority, and the criteria of work satisfaction in the third priority, and the fourth priority is the criteria of intrusion of work into private life. This research concludes that currently, the criteria of employer care are the priority (the most important criteria) in employee well-being indicators in Oro Kopi Gayo company, followed by the criteria of company respect for the employee in the second priority, and the criteria of work satisfaction in the third priority, and the fourth priority is the criteria of intrusion of work into private life. Meanwhile, "the boss is willing to lend an ear at a difficult time", and "the boss shoulders some of my worries about work" as a significant sub-criterion. The fuzzy-AHP technique provides a good solution to help decision-makers take the right actions. The results of this research can serve as a guide for coffee companies to plan strategy and innovation, helping them build an employee well-being evaluation system. In addition, coffee companies that focus on workers can utilize the results of this research to understand worker

needs and adapt to those needs. Therefore, from the perspective of a company manager, the results of this research provide insight not only to decision-makers in coffee companies but also to similar companies presented in one paragraph without numerical form of expression.

ACKNOWLEDGMENT

The researcher would like to thank the Head of the Institute for Research and Community Service (LP2M), Langsa State Islamic Institute (IAIN Langsa) for providing a research permit to speed up the researcher's research and community service process. Researchers also express their deepest gratitude to the Management of Oro Kopi Gayo for the data provided and for the quick response, as well as for the critical input that helped the research process and refinement of this paper, as well as for increasing the visibility of this paper.

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