

The Fuzzy AHP Method Approach is the Basis for Awarding Sales Marketing for the Achievements of Trading Companies

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Abstract

The success for every company from many field of businesses is depend from their work values. In various type of companies, strategies and performance of marketing division have a large influence in addition to quality, service, productivity etc. The purpose of this study is to know the marketing performance based on weighting criteria on Performance Evaluation with Fuzzy AHP method. In addition, it also aims to determine the rewards given by the company to achievement achieved based on weighting criteria based on performance appraisal. The data collection process in this study consists of four sources, namely interviews, direct observations, external data and literary sources. The Marketing performance evaluation process in this study carried out using the Fuzzy AHP method in two subcriteria groups, namely "Performance" and "Behavior". The CR (Consistent Ratio) value of two selected criterion groups is CR group ≤ 0.1 ("Performance" = 0.058; "Behavior" = 0.057), so the data in the questionnaire is consistent Multiplication of weighting criteria with local weighting criteria, so that the global weighting sub-criteria can be obtained. Giving gifts to marketing has a positive impact on marketing performance.

Keywords — Marketing performance, performance appraisal, fuzzy AHP, marketing achievement, award.

I. INTRODUCTION

Economic activity is divided into two categories namely goods and services. The goods manufacturing industry is agriculture, mining, manufacturing and construction. Services such as banking, communications, wholesale and retail trade, all professional services such as engineering, computer software development, medicine, nonprofit economic activity, all consumer services, and all government services, including defense and justice administration [1]. The success of every company in every business competition can be seen from the existing value. An example of a higher value than a company with quality, service and others is from its marketing strategy and capabilities. Marketing division has an important role in the company's business to consistently create a sustainable competitive advantage. The Direct Compliance in 2016 decided to

change its strategy and recognition. This is in line with the recognition that businesses are no longer the beginning but the established SMEs (Small and Medium Enterprises) and adjustments need to be made with employees to build a high performance culture and increase engagement. Over 600 employees have moved to Public a since it was founded last year. A staff study conducted in January 2018 found that 84% respondents responded positively to the new reward program [2].

In the context of organization, employee has an important asset to achieve the organization's goal and objectives. Employee performance is usually defined as the extent to which an organizational member contributes to achieving the goals of the organization [3]. Several reasons of formal performance appraisals are to stay in organizations. Based on this, formal appraisal is a must to justify a wide range of human resource decisions such as pay raises, promotions, demotions, terminations, etc [4]. Performance appraisal involves an employee knowing about what is expected of him and remain focused with the help of the supervisor to motivates the employees toward the good performance [5].

Current performance growth in evaluations tends to be far from control and maintenance, especially based on a more focused approach to motivation and development issues [6]. Beside that, the history of performance appraisal is can be traced in the early 20th century according to Taylor's pioneering time and motion studies. The performance appraisal system start in practiced in the 1940s mainly and in line with the help of this system, merit rating was used for the first time near the World War II as a method of justifying an employee's wages [7].

A company that distributes pneumatic and hydraulic components that does business to business. Distributing pneumatic & hydraulic components to industries such as pulp and paper industry, automotive industry, manufacturing, chemicals, textiles and others. The business type for this company requires a strong and good performance from Marketing division. Achievements at the marketing division of 2016 did not reach the annual target. Achievements in quarterly are up and down and there is not consistency in achieving sales.

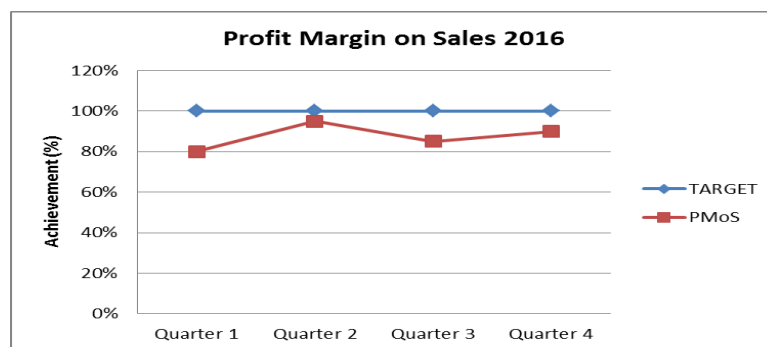


Fig 1: Sales achievement in 2016

The graph in **Fig 1** shows the achievement of Marketing division in the 1st quarter to the fourth quarter of 2016. There is no target achieved in 2016 and the results are variable. Fluctuating achievements under these targets will be boosted so that the marketing team's sales achievement will reach the targets.

MCDS model (Multi-Criteria Decision Support Model) has been successfully applied to the Benisagar reservoir in Madhya Pradesh (India), comprising 36 sub-watersheds for priority areas requiring land conservation measures. The MCDS model has been developed based on the fuzzy hierarchical hierarchy process (FAHP) by calculating the weight of nine erosion hazard parameters (EHPs). Based on the final priority grouping, the sub-watershed has been categorized into four priority groups, which are very high, high, medium, low and very low for land and water conservation measures [8]. An integrated approach to decision making in the selection of machine tools. This paper focuses on the integration of the AHP (Analytical Hierarchy Process) and COPRAS Fuzzy Complex (COPRAS) strands consistent to make the decision making of various properties in choosing the most appropriate machine tool. Fuzzy AHP output is imported into blur COPRAS method to evaluate alternatives via distance coefficients. Presentation of proposed model proposals is provided by numerical examples based on data collection through questionnaires and from literature [9]. FAHP method to overcome the uncertainties and inaccuracies that exist in the multi criteria criterion process. The algebraic operation of a fuzzy triangle number is used to calculate the fuzzy matching index of all alternatives. The level analysis method is used to calculate the possible priority level between the fuzzy suitability index. In addition, two principles are laid out to solve various critical decision problems in a blurred decision environment. Principle I provides

partial pre-partial, and Principle II provides the order number in the possibility of an alternative order [10]. Analytical Hierarchy Process (AHP) is the measurement theory used to find the scale of the ratio by performing a pair of comparisons between factors [11]. AHP method with fuzzy or known as FAHP (fuzzy AHP) is a method that was first introduced by Chang as an extension of the traditional AHP method consisting of matrix elements represented by fuzzy numbers [12]. This FAHP expansion method is considered to be better in explaining or describing fuzzy results than just the AHP method. Since the AHP policy does not include ambiguity for personal judgment, it has been enhanced by the benefits of the blurry logic approach. In F-AHP, a pair of critiques and alternative comparisons are performed through linguistic variables, represented by triangles. One of Fuzzy AHP's first implementation was done by van Laarhoven and Pedrycz [13]. They define the function of triangle membership for a comparable pair of comparisons. The FAHP method can demonstrate the relative strength of the factors found in the criteria associated with creating a blurred decision matrix through the fuzzy scale scale in this method. The end result of this method is the relevant alternatives presented in the form of fuzzy numbers [14]. The AHP method allows preparing effective decisions in some complex situations. In This research, Expert Choice is used as software to calculate all mathematical calculations of AHP method on the Human Resource Management system in the company [15].

FAHP was originally used to compare the fuzzy ratios described by the triangle function. Chang introduces this approach with a triangular fuzzy number (TFN) name which is a set of fuzzy set theory in terms of subjective subjective assessment of language or linguistics [16].

Table 1
Triangular Fuzzy Number [14].

Statement	TFN
Absolute	7/2, 4, 9/2
Very Strong	5/2, 3, 7/2
Fairly Strong	3/2, 2, 5/2
Weak	2/3, 1, 3/2
Equal	1, 1, 1

The FAHP method is used as this method assumes uncertainty and doubt and minimizes subjective judgments on the level of importance of the

criteria set by the decision maker, with the existence of intervals in each rank, so that it can be used to decide complex or multicriteria [17].

The fuzzy conversion process to AHP in this study uses the method which developed by Güngör et al., 2009 FAHP Pairwise Comparison Matrix [18].

$$\tilde{A} = (\tilde{a}_{ij})_{n \times n} = \begin{bmatrix} (1,1,1) & (l_{12}, m_{12}, u_{12}) & \dots & (l_{1n}, m_{1n}, u_{1n}) \\ (l_{21}, m_{21}, u_{21}) & (1,1,1) & \dots & (l_{2n}, m_{2n}, u_{2n}) \\ \vdots & \vdots & \ddots & \vdots \\ (l_{n1}, m_{n1}, u_{n1}) & (l_{n2}, m_{n2}, u_{n2}) & \dots & (1,1,1) \end{bmatrix} \dots\dots\dots(1)$$

Where $\tilde{a}_{ij} = (l_{ij}, m_{ij}, u_{ij}) = \tilde{a}_{ij}^{-1} = (1/u_{ji}, 1/m_{ji}, 1/l_{ji})$ (2)
for $i, j, = 1, \dots, n$ and $i \neq j$.

This comparative matrix operation is performed using Triangular Fuzzy Number (TFN) in accordance with **Table 1** which is a special class of fuzzy numbers represented by three real numbers expressed as (l, m, u) in accordance with criteria and subcriteria. From this background, marketing achievement assessment based on sales target with gift will be done by Fuzzy AHP method to confirm unclear decision in gift.

II. METHODOLOGY

In this research, we do the performance evaluation of the employees based on some criterias that covers 2 criteria groups namely "Performance" and "Behavior". In this criterion we also measured the value of weight priority. Sub criteria for "Performance" criteria group consists of: approach to work, technical capabilities, work quality, target handling and deadline, and communication skills. While the "Behavior" Sub-Criterion comprises interpersonal skills, a desire to grow, and personality. In both weighting criteria conducted to employees in the Marketing section. The data collection process in this study consists of four sources, namely interviews, direct observations, external data and literary sources. The interview

process was conducted with HRD manager, and marketing manager of PT XYZ. The interview technique was selected for obtaining data on employee performance evaluations directly from relevant employees. The interview process includes the criteria selected earlier. From the results of this interview, internal company data consists of Marketing employee data, job assignments or employee responsibilities, assessment forms used, and performance appraisal scales. In addition to the second data source is through direct observation at PT XYZ by knowing the circumstances, conditions and problems that occurred to the employee during the observation. In addition, this observation process is also undertaken to collect other support data for data analysis and further processing.

In the third data source which uses external data via PP No. 10 of 1979 (regarding: employee performance appraisal criteria) and Head of BKN Circular No. 02/SE/1980 on the assessment of the implementation of civil servant employment. Finally, the third data source uses Literature Data to get data and theories related to employee performance appraisal and decision selection. The literature data used in this research came from books, papers, journals, theses and others.

Performance Appraisal				
Name of Appraisee:		Appraisal Date:		DOJ:
No. id:		Appraiser's Name:		Designation:
Good covered for this appraisal		From:	To:	
Poor 1	Satisfactory 2	Good 3	Very Good 4	
SECTION-A (Performance) (Weightage-60%)				
No	Rating Factors	Self Ass.	Ass. RO	Comments(Optional)
Approach to work:				
	Follows instruction			
	Accepts constructive criticism			
	Flexible adaptable			
Technical skill:				
	Job knowledge Application of skill			
	Follows procedures & standards			
	Learning New Skills			
Quality of work:				
	Accuracy			
	Consistency			
	Follow-through and follow-up			
Handling target and dead line				
	Completing of work on-time			
	Ability to work under pressure			
Communication skills:				
	Oral written expression			
	Speaking in English			
	Shares information/knowledge willingly			
	Reporting			
SECTION-B (Behavior) (Weightage-20%)				
Interpersonal skills:				
	Relationship with colleagues			
	Cooperation			
	Coordination			
	Team work			
	Problem-solving			
Willingness to learn and develop skills:				
	Seeks training and development			
	Open to ideas			
Personality				
	Enthusiastic, Fair and mature			

Fig 3: Performance Appraisal Form PT. XYZ

Table 2
Group Criteria and Sub-Criteria "Performance" Employees

Criteria	Sub-Criteria
Approach to work	Follow the instructions
	Acceptance in criticism / suggestions
	Flexible and Adaptation
Technical Capability	Application of capabilities
	Follow Procedures and Standards
	Learning new abilities
Job Quality	Accuracy
	Consistency
	Follow Up
Handling targets and deadlines	Timeliness of work
	Ability to work under pressure
Communication ability	Written and oral communication
	English ability
	knowledge sharing ability
	Reporting

Table 3
Group Criteria and Sub-Criteria "Behavior" Employees

Criteria	Sub-Criteria
Interpersonal ability	Relationships with colleagues
	Cooperation
	Coordination
	Team work
	Solution to problem
Desire for self-development	Training
	Idea
Personality	Enthusiasm

The performance assessments will be compared against the sales target for 1 year, so that the resulting inquiry can be used by the Marketing Division in assessing employee performance. Performance evaluation also seeks to determine the rewards given by the company to the achievement achieved based on the weighting criteria based on performance appraisal. With appropriate performance appraisal, employee productivity can be judged based on its performance. So the incentives accepted by employees will be in line with the performance of the Kariawan on the achievement of the sales it produces.

III. RESULT AND DISCUSSION

This study explains marketing performance based on the measurement of Performance Appraisal

criteria with Fuzzy AHP method to validate the unclear results in the award.

A. Define Priority Vector Value

In both the criteria of "Performance" and "Behavior" criterion groups are made up into a matrix pair so the 5x5 (Performance) matrix and 3x3 commands are formed.

Matching matrices for performance criteria comprise five criteria, namely the approach for work (B), technical capability (T), work quality (M), target handling and end date (D), communication skills (K). Criteria data is then summarized and divided into each data so that the weight value of the priority vector is obtained.

Table 4
Performance Criteria Group on Priority Vector Values

	B	T	M	D	K	Priority Vector
B	0,206	0,243	0,166	0,263	0,394	0,254
T	0,068	0,081	0,100	0,159	0,043	0,090
M	0,617	0,405	0,498	0,368	0,390	0,456
D	0,041	0,027	0,071	0,053	0,043	0,047
K	0,068	0,243	0,166	0,158	0,130	0,153
Total	0,891	0,730	0,763	0,790	0,827	1,000

Table 5
Behavior Criteria Group on Priority Vector Values

	I	P	B	Priority Vector
I	0,158	0,273	0,149	0,193
P	0,053	0,091	0,106	0,083
B	0,790	0,636	0,745	0,723
Total	1,000	1,000	1,000	1,000

While for paired matrices, the Behavior criteria consists of three criteria, namely interpersonal ability (I), Self Development (P) and Personality (B).

B. Determine Eigen Values and Local Weight Criteria

Determining the value of eigenvalues begins by multiplying the matrix values over the priority

vectors and dividing the entries from the weight number vectors to the priority vector paired entries so the weight of the preference (eigenvalues) is obtained.

Table 6
Performance Criteria for Eigen Value and Local Weight Criteria

Priority vector	Entries are multiplied by vectors	Priority weight (eigen value)	Criteria Weight
0,254	1,375	5,409	0,206
0,090	0,459	5,085	0,193
0,456	2,458	5,394	0,205
0,047	0,244	5,188	0,197
0,153	0,800	5,235	0,199
	total	26,313	1,000
	priority average weight (λ_{max})	5,263	

Table 7
Behavior Criteria for Eigen Value and Local Weight Criteria

Priority vector	Entries are multiplied by vectors	Priority weight (eigen value)	Criteria Weight
0,193	0,588	3,042	0,331
0,083	0,251	3,014	0,327
0,723	2,273	3,141	0,341
	Total	9,198	1,000
	priority average weight (λ_{max})	3,065	

C. Determining Consistent Ratio (CR)

To get a consistent ratio value starts with calculating the consistency index (CI) value by using the comparison of λ_{max} value with n (number of criteria).

$$CI = \frac{\lambda_{maks} - n}{n - 1} \dots\dots\dots(3)$$

Then to obtain the consistency ratio (CR) by dividing CI based on Random Index (RI) [19].

$$CR = \frac{CI}{RI} \dots\dots\dots(4)$$

Table 8
Random Index [19]

n	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51	1,48	1,56

The achievement criteria group uses five criteria (n = 5) so the value of RI is 1.12 (according to **Table 9**).

Because of CR values from two CR criteria ≤ 0.1 (Performance = 0.058; Behavior = 0.057), the data in the questionnaire is consistent.

Table 9
Performance Criteria in Consistency Ratio

CI	0,065
CR	0,058

Tabel 10
Behavior Criteria in Consistency Ratio

CI	0,033
CR	0,057

D. Sub-Criteria Weighting of Each Criterion

After all, we have determined the weight of the criteria so that we calculate the sub criteria, by multiplying the weight of the criteria by locating the local criteria so that the global sub-criteria can be obtained according to **Table 11** and **Table 12**. By gaining the global weight of sub criteria, it confirms the unclear decision in giving credit to marketing.

While in the group behavior criteria with three criteria (n = 3) have RI value equal to 0,58.

Table 11
Criteria Weight and Sub-Criteria "Performance"

Criteria	Criteria Weight	Sub-Criteria	Local Weight Sub-Criteria	Weight of Global Sub-Criteria
Approach to work	0,206	Follow the instructions	0,597	0,123
		Acceptance in criticism/ suggestions	0,058	0,012
		Flexible and Adaptation	0,534	0,110
Technical Capability	0,193	Application of capabilities	0,523	0,101
		Follow Procedures and Standards	0,425	0,082
		Learning new abilities	0,368	0,071
Job Quality	0,205	Accuracy	0,585	0,120
		Consistency	0,302	0,062
		Follow Up	0,195	0,040
Handling targets and deadlines	0,197	Timeliness of work	0,152	0,030
		Ability to work under pressure	0,208	0,041
Communication ability	0,199	Written and oral communication	0,171	0,034
		English ability	0,277	0,055
		The ability to share knowledge	0,106	0,021
		Reporting	0,491	0,097
Total Weight				1

Tabel 12
Criteria Weight and Sub-Criteria "Behavior"

Criteria	Criteria Weight	Sub-Criteria	Local Weight Sub-Criteria	Weight of Global Sub-Criteria
Interpersonal ability	0,331	Relationships with colleagues	0,372	0,123
		Cooperation	0,411	0,136
		Coordination	0,305	0,101
		Team work	0,378	0,125
		Troubleshooting	0,698	0,231
Desire for self-development	0,327	Training	0,217	0,071
		Idea	0,217	0,071
Personality	0,341	Enthusiasm	0,416	0,142
Total Weight				1

Some PT XYZ awards for marketing in achieving sales targets:

- Marketing gets a fixed bonus with monthly target > 100%, earning a bonus of 3% of total sales achievement.
- Marketing gets a bonus rate of three months or Rp 1,000,000 / month (if it reaches target > 100%), maximum IDR 3,000,000 / quarter.
- Marketing gets a semester bonus, with a target of achieving a target of two and a quarter or six months worth of Rp 2.000.000 / semester, maximum of Rp 4,000,000 / 2 semesters

(excluding fixed bonus, excluding quarter bonus and excluding annual bonus)

- Earn an annual commission or bonus of 1% of total target achievement (excluding fixed or monthly bonuses).
- Marketing get rewarding overseas travel tickets with a budget of Rp 5,000,000 / person if it achieves an annual target of above 100% of the minimum target of 3 billion / marketing

After the implementation of the worker's award in 2017, a significant increase was achieved against sales targets in 2016.

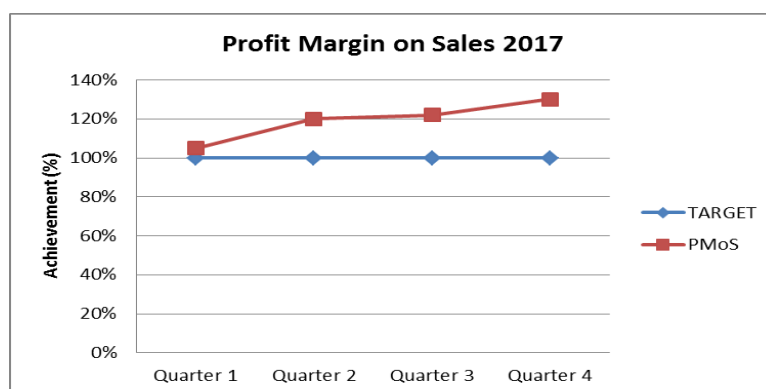


Fig 4: Sales achievement of PT XYZ in 2017

The marketing division's achievement in 2017 spiked and increased quarterly. Quarter 1 has 105% that increased by 20% at 120%, after that sales rebounded in the third quarter by 125% and by the end of the year reached 130%.

IV. CONCLUSION

This study explains marketing performance based on weighting criteria on Performance Evaluation using Fuzzy AHP method. This method is to confirm the unclear decision of the grant. The CR value of both CR group ≤ 0.1 (Performance = 0.058; Behavior = 0.057), so the data in the questionnaire is consistent. The multiplication of weighting criteria with the weight of the local criteria and obtaining the value of global devaluation. In addition to rewarding marketing has a positive impact on marketing performance. The marketing division's achievement in 2017 spiked and increased quarterly. Quarter 1 105% increased by 2% at 120%, rebounded in the third quarter by 125% and by the end of the year reached 130%.

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