



Using AHP for Annual Excellence Rewards: A Case Study of Manufacturing Companies

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Paper ID: 12A3F

Volume 12 Issue 3

Received 24 October 2020
Received in revised form 28 December 2020
Accepted 05 January 2021
Available online 09 January 2021

Keywords:

Analytical Hierarchy Process; MCDM; Performance evaluation; Multicriteria reward; Reward management system; Manufacturing; Pair-wise comparison; Employee management; Cost consciousness; Processes improvement; Innovation; HR process; Quality improvement; Safety consciousness; Customer-centricity.

Abstract

Performance evaluation and rewards are an important human resource management process that enables in attracting, motivating, and retaining talents. An objective and systematically developed reward system would be considered as a fair and justifiable method to allocate rewards. The purpose of this study was to develop a multi-criteria-based annual excellence reward system for a large-size manufacturing company in India. In this case study, top management identified six criteria for annual excellence rewards, i.e. cost consciousness, improvement in processes, innovation, improvement in quality, safety consciousness, and customer-centricity. Analytical Hierarchy Process (AHP) was used to analyze the pair-wise comparison of these criteria and to prioritize them based on the weights. The results of this study can be used to objectively identify and recognize high-performing employees. This would not only bring transparency to the system but also motivate the employees to deliver on the results that matter to the organization. Administering AHP was a unique opportunity to demonstrate its application in human resource management systems in manufacturing organizations.

Disciplinary: Management Science (Human Resource Management).

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Cite This Article:

Sahai, S., and Ciby, M. A. (2021). Using AHP for Annual Excellence Rewards: A Case Study of Manufacturing Companies. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 12(3), 12A3F, 1-9. <http://TUENGR.COM/V12/12A3F.pdf> DOI: 10.14456/ITJEMAST.2021.48

1 Introduction

Organizations spend considerable time and effort in motivating employees for superior performance (Van Iddekinge et al., 2018). Reward systems are human resource management practices that have a significant role in motivating the employees to perform. An effective strategic human resource policy develops a reward system to recognize employee performance (Victor &

Hoole, 2017). Effective reward systems can improve the performance of organizations (Rai et al., 2018). On the other hand, poorly designed reward systems may result in demotivating the employees and teams, and it may even worsen the performance of organizations. When employees perceive a close relationship between performance and rewards, they are motivated to put sustained efforts into their jobs (Campbell et al., 1998; Rai et al., 2018). Researchers have concluded that an effective reward system can attract, motivate and retain employees (Hafeez et al., 2020; Ismail & Abd Razak, 2016; Obicci, 2015; Sarkar, 2018).

It is crucial to ensure that employees perceive organizational justice in their performance evaluation and reward systems. Reward systems that are based on objective performance criteria are perceived to be fair and just and thus can motivate employees to direct energies in attaining organizational goals (Ismail & Abd Razak, 2016), based on the implemented key performance indicators (KPIs) to reward employees in organizations. One of the critical challenges in using KPIs for performance evaluation and reward systems is to select and prioritize from the plethora of available KPIs. However, existing studies lack critical analysis for prioritization of KPIs for rewarding the employees. This is because the process of selection and prioritization of KPIs for rewarding the employees is a complex and subjective process, which can also be fogged by judgment errors and biases. Therefore, it is necessary to have a performance evaluation and reward system that can scientifically ascertain the weights and assign comparative importance to individual KPIs. There is a dearth of systematic methods that can streamline the process of reward systems and present a scientific solution to the organization. We intend to address this gap.

Analytic hierarchy process (AHP) is the most widely used technique for prioritizing multi-criteria decision making (MCDM) in various areas of management (Ho & Ma, 2018). But, its application in performance evaluation and reward is limited. Hence, this study aims to develop a multi-criteria performance-based annual excellence reward system using AHP. This study contributes to the existing literature by demonstrating the application of AHP in performance-based annual excellence reward systems. We first present a brief review of literature on performance and reward criteria and steps in the implementation of AHP in MCDM. We then present the case study demonstrating application of AHP in prioritizing KPIs (criteria) for a manufacturing organization. We hope that this will encourage the application of AHP in various other human resource management practices.

2 Literature Review

Classical equity theory emphasizes the importance of allocation of rewards that are equitable to efforts, as a means to motivate employees (Adam, 1963). Researchers have found that fairness perception of performance evaluation influences employees' job performance (Setiawati & Ariani, 2020), organizational commitment (Setiawati & Ariani, 2020), employee retention (Sarkar, 2018), and organizational citizenship behavior (Ajilouni et al., 2021; Lim & Loosemore, 2017). Hence, it is important to have objective criteria in performance-based reward systems to ensure

fairness perception among the employees. Studies have examined various performance criteria for reward management. Nurhayati (2019) identified five criteria for performance evaluation namely work performance, work attitude, potential, ability, and personality. Aminudin et al. (2018) suggested that teamwork, discipline, behavior, experience, and attendance criteria can be evaluated to determine employee performance. Kirovska and Qoku (2014) identified fifteen employee performance evaluation criteria such as initiative, quality of work, reliability, attitude, and integrity. Customer orientation has also been identified as a critical criterion that has a strong impact on employee performance evaluation and rewards (Kealesitse et al., 2013; Paarlberg, 2007). Hristov et al. (2021) in a systematic review indicated the importance of environmental drivers in performance management systems. These studies have suggested numerous performance indicators that are essential for reward management. However, there is a lack of prioritization of criteria in these studies. It is pertinent to have scientific methods to prioritize the objective criteria for a performance-based reward system.

Armstrong (2009) emphasized the importance of an evidence-based approach rather than a subjective approach to reward management. Such an evidence-based approach for managing reward systems can then increase the employee perception of organizational justice in the reward system and positively impact organizational outcomes (Moon, 2017). AHP can be used as an evidence-based approach to develop an objective MCDM for performance evaluation and reward system.

AHP is one of the popularly used MCDM methods for analyzing problems involving complex decisions. This approach helps organizations to make judgments transparently. It helps decision-makers to systematically derive priorities rather than randomly assigning them. The use of this method will lead to transparency in the decision-making process with explicit demonstrations of the importance of various criteria (Dolan et al., 1989). Both subjective and objective criteria are important for performance-based rewards (Kerr, 1985). This is possible through AHP as it includes both quantitative and qualitative approaches in the decision-making process (Saaty, 1990). The qualitative approach is used to understand the problem, decompose it into criteria and develop a structured decision hierarchy (Cheng & Li, 2001). In the quantitative approach, a pairwise comparison of the criteria is used to conduct the consistency test and validate the responses. The following steps are involved in AHP (Saaty, 1990):

1. The problem is defined.
2. Criteria of the problem are identified.
3. Data are collected to develop the pairwise comparison matrices of the criteria using a 1 to 9 scale by Saaty (1990) (Table 1).
4. Priority weights are computed for each criterion.
5. On the basis of priority weights, ranks are assigned.
6. Consistency ratio is derived to verify the consistency of the responses.

The application of AHP is evident in various areas of management to address a number of MCDM problems like occupational safety and health (Jilcha et al., 2017), supply chain (Butdee & Phuangsalee, 2019), road accidents (Temrungsie et al., 2015), selection of value-added technology (Charoensuk et al., 2020); strategic action plans (Chiarini, 2019). AHP has been used even in human resource management practices like recruitment (Nawzad & Top, 2019), performance evaluation (Lidinska & Jablonsky, 2018; Nurhayati, 2019), and training (Lucas et al., 2017). With the successful application of AHP in numerous areas, it can be considered a powerful decision-making method.

Table 1: Saaty Scale for pairwise comparison

Scale	Compare factor
1	Equally Importance
3	Moderate importance
5	Strong Importance
7	Very Strong Importance
9	Extreme Importance
2, 4, 6, 8	Intermediate values in adjacent scale

Scholars have attempted to use AHP to systematically prioritize criteria to ensure fairness and transparency in employee reward and recognition programs. Badri and Abdullah (2004) demonstrated the use of AHP in awards of excellence in higher education. AHP was used to make decisions on giving annual rewards (bonuses) based on employee performance (Syaif & Riandari, 2020). Aksakal and Dağdeviren (2014) used AHP for developing a reward management framework.

For manufacturing industries, identifying and prioritizing criteria for employee reward and recognition is an important decision. AHP can be utilized to develop a systematic ranking of important criteria. In the current study, we demonstrate the use of the AHP technique to identify the relative importance of multiple criteria that are involved in performance-based annual rewards and recognition programs in a manufacturing company.

3 Case Study of Manufacturing Company

A large-size manufacturing company in India with 3000 employees working at various operational levels was facing an issue with their reward system. The company had implemented total quality management (TQM) two years ago. Reward practices can serve to increase the effectiveness of TQM practice (Bowen & Lawler, 1992; Talib, 2013). An annual excellence reward program was thereby introduced to motivate the employee and facilitate the TQM journey. Annual employee satisfaction survey results revealed that the employees were dissatisfied with their annual excellence reward system. The employees speculated that the current performance evaluation system lacked clarity and objectivity. Employees perceived that the annual excellence reward system was biased. To remove this perception, the organization was interested in developing a well-defined criteria-based annual excellence reward system. The company needed a systematic measurement method that can incorporate both objective and subjective criteria into

the evaluation system. A new system was needed to ensure fairness and transparency in the performance evaluation and reward system.

This issue can be considered as a MCDM problem and a multi-criteria reward system using AHP can address this issue. Researchers explained and convinced the top management about the benefits of using AHP in MCDM problems. With the consent of top management, the researchers further analyzed this issue with a methodology of this study to give critical findings.

4 Methodology

This study was conducted in three stages: (1) identification of important criteria for performance-based annual excellence rewards, (2) data collection, and (3) analysis of data using AHP.

Stage one: Based on the problem identified in the employee survey, management wanted to identify criteria for performance-based annual excellence rewards. A brainstorming session was held with top management to identify various criterions for the same. By the end of the session, a consensus was built that the annual excellence rewards should have six criteria: cost consciousness, improvement in process, innovation, improvement in quality, safety consciousness, and customer-centricity. A detailed description of the criteria is mentioned in Table 2.

Table 2: Criteria and Description

S. No.	Criteria	Description
1	Cost Consciousness	Exhibits Cost Consciousness
2	Improvement in Processes	Shows Considerable Improvement in Process
3	Innovation	Introduces New Ideas
4	Improvement in Quality	Reduces Rejections
5	Safety Consciousness	Highly Conscious of Safety at work
6	Customer Centricity	High Orientation to Customer Complaints

Stage two: A self-administered questionnaire was used to gather expert opinions on pairwise preferences of the criterion (identified in stage one). Experts in the study were seven members of the senior management team of various verticals (operations, maintenance, quality, marketing, finance, human resource, and information technology).

Stage three: AHP Excel template (Goepel, 2013) was used for data analysis to compute pairwise comparison matrices, their weights, and consistency ratio. Based on the inputs from data collection (stage two), a pairwise comparison of each criterion given by each expert was collated. Next, the collated opinions were transformed into integers in a pairwise comparison matrix based on the preference scale defined in Table 1. Later, all the pairwise matrices of seven experts were consolidated into a matrix. After normalization of the consolidated pairwise matrix, criteria weights were determined and the consistency ratio was calculated. An acceptable consistency ratio for MCDM problems having more than five criteria is less than 0.1; it reflects reliability in prioritizing criteria identified for decision problems (Saaty, 2000; Kabir & Sumi, 2010; Kabir & Hasin, 2011). If the consistency ratio is more than this value, it reflects inconsistency within the matrix (Saaty, 2000).

5 Results and Discussion

The consolidated pairwise comparison matrix of all the expert opinions is presented in Table 3. This shows the criteria that are more dominating than the other in the pairwise comparison. From the consolidated pairwise comparison matrix, criteria weights were calculated and are presented in Table 4. These criteria weights indicate the comparative priority of each criterion in relation to the other. The ranking of the criteria based on the criteria weights is also presented in Table 4. Ranking of the criteria (including weights) in the descending order are - rank 1: improvement in quality (42.06%), rank 2: cost consciousness (29.97%), rank 3: improvement in processes (10.30%), rank 4: customer-centricity (7.79%), rank 5: safety consciousness (6.67%) and rank 6: Innovation (3.22%). The consistency ratio for the pairwise comparison for this study was 0.098, which is acceptable (Saaty, 1990).

Table 3: Consolidated Pairwise comparison matrix

	1	2	3	4	5	6
1	1	3	6	0.5	4	9
2	0.33	1	4	0.14	2	2
3	0.17	0.25	1	0.14	0.5	0.14
4	2	7	7	1	4	7
5	0.25	0.5	2	0.25	1	1
6	0.11	0.5	7	0.14	1	1

Table 4: Results obtained from AHP computations

S. No.	Criteria	Description	Weights	Ranking	CR
1	Cost Consciousness	Exhibits Cost Consciousness	29.97%	II	9.8%
2	Improvement in Processes	Shows Considerable Improvement in Process	10.30%	III	
3	Innovation	Introduces New Ideas	3.22%	VI	
4	Improvement in Quality	Reduces Rejections	42.06%	I	
5	Safety Consciousness	Highly Conscious of Safety	6.67%	V	
6	Customer Centricity	High Orientation to Customer Complaints	7.79%	IV	

Note: CR- Consistency Ratio

The results from AHP indicate that there is consistency of judgment in prioritizing the criteria (consistency ratio < 0.1). Consistency in judgment indicates the validity of the priority in judgment (Saaty, 2000). Hence, the suggested priority weights and ranking from this study can be considered reliable and valid for evaluating the annual excellence rewards of this company. The ranking of the criteria weights indicates that improvement in the quality is the most important criteria in annual excellence reward, followed by cost consciousness, improvement in processes, customer centricity, safety consciousness and innovation.

This case study is an attempt to integrate AHP in a complex decision making that is involved in human resource management processes. Future research can also be conducted to integrate AHP into various other areas of human resource management like prioritizing recruitment and selection criteria, training and development criteria, and employee engagement methods. Kafabih and Budiyo (2020) have demonstrated the applicability of fuzzy topsis in performance evaluation.

Future research can apply fuzzy topsis to the MCDM problems in the areas of human resource management.

6 Conclusion

This paper presents the application of AHP for a multi-criteria decision-making problem for prioritizing the criteria for employee annual excellence reward system. It first identified multiple criteria that can evaluate the performance of employees and then applied AHP to prioritize the criteria using the judgment of experts. The results of this study can be used to objectively identify and recognize high-performing employees. This would not only bring transparency to the system but also motivate the employees to deliver on the results that matter to the organization. AHP application explained in this current study could be extended to other organizations for similar tasks. The process will be the same; however, the criteria and their priority weights might change.

7 Availability of Data and Material

Data can be made available by contacting the corresponding author.

8 Acknowledgment

The authors appreciate and acknowledge top management and experts of the manufacturing organization for active participation in this study.

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