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Application of Analytic Hierarchy Process (AHP) in Selecting the Best Employee: Comparing and Integrating Public and Private Organizations' Approaches in the Framework of Reward and Multi-Criteria Decision Making

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ABSTRACT

Selecting the best employee, as one of the fundamental challenges of human resource management, plays a decisive role in improving productivity and achieving organizational goals. In competitive environments of the private sector and bureaucratic structures of the public sector, this process is often accompanied by bias and subjective judgments. The present study, by integrating the two approaches presented in the studied articles, examines the application of the Analytic Hierarchy Process (AHP) method in selecting the best employee. The main issue is the need for a scientific and transparent framework for multi-criteria evaluation that can simultaneously consider hard criteria (education, experience, technical skills) and soft criteria (honesty, responsibility, innovation, organizational cultural values). The importance of this issue lies in its ability to reduce bias, create healthy competition, and support the employee reward and motivation system. The structure of the research includes a literature review, explanation of the AHP steps, comparison of its application in the public and private sectors, and presentation of an integrated model. The research findings show that AHP, using pairwise comparison, calculation of relative weights, and sensitivity analysis, enables objective and reliable selection of the best employee. The results indicate that the proposed integrated model can be used both in government organizations to strengthen the reward system and in private companies to improve productivity.

Introduction

Selecting the best employee in organizations, whether in the private or public sector, is one of the fundamental issues of human resource management that has a direct impact on productivity, service quality, and the achievement of strategic goals. Similar to the issues of location and establishment of facilities, which require the optimal selection of a location based on a set of various criteria, selecting a superior employee is also a multi-criteria decision-making problem. In this process, the decision-maker must balance various and sometimes conflicting criteria such as education, work experience, communication skills, innovation, responsibility, and the cultural values of the organization.

The main problem of this research is the lack of a scientific and transparent framework for evaluating and selecting superior employees; in a way that can prevent mental biases and decisions based on personal relationships. The aim of solving this problem is to design a model based on the Analytic Hierarchy Process (AHP) that allows for accurate and objective evaluation of employees by using pairwise comparisons and calculating relative weights. The importance of this issue is that the correct selection of the best employee not only increases motivation and healthy competition among employees, but also helps to improve the quality of human resource management, improve organizational performance, and achieve macro goals in both public and private sectors.

The application of this issue in practice is to create a fair and scientific evaluation and reward system that can lead to strengthening administrative reforms in public organizations and to increasing productivity and competitive success in private companies. Thus, selecting the best employee with a multi-criteria approach, similar to choosing the optimal location in location discussions, is considered a strategic and vital decision for organizations.

2.Problem classification:

According to the content presented in the abstracts of the two articles, the following classifications can be considered for the issues raised in them:

 -2-1First article:

Main topic: Analytic hierarchy process (AHP) for selecting the best employee: reward implementation strategy in government organizations

 -2-1-1Macro level (main research objective)

•Improving the human resource management system in government organizations

o by selecting the best employee as part of the reward and empowerment system.

 -2-1-2Intermediate level (key dimensions of the problem)

•Bureaucracy and administrative reforms

o Achieving good governance, transparency, efficiency.

•Employee reward and motivation system

o Creating healthy competition, increasing loyalty and organizational commitment.

•Employee evaluation and selection methods

o Comparing traditional evaluation (by managers) with peer assessment.

•Multi-criteria decision-making tools

o Using AHP to reduce bias and increase objectivity.

-2-1-3Micro level (criteria for selecting a superior employee)

Based on the ministry's work culture (5 main indicators):

Integrity
•Professionalism
•Innovation
•Responsibility
•Exemplary
-2-1-4Operational level (research implementation method and assumptions)
•Data collection tool: Self-assessment and peer assessment questionnaire.
•Analysis method: Analytical Hierarchy Process (AHP) including the following steps:
.1Building a hierarchical model
.2Designing a paired comparison questionnaire
.3Weighting criteria
.4Consistency check
.5Final selection of a superior employee • Main assumptions:
o Using AHP increases objectivity and fairness in selecting superior employees.
o Peer evaluations are less biased than manager evaluations.
o Selecting superior employees using five criteria will increase motivation and the quality of organizational performance.
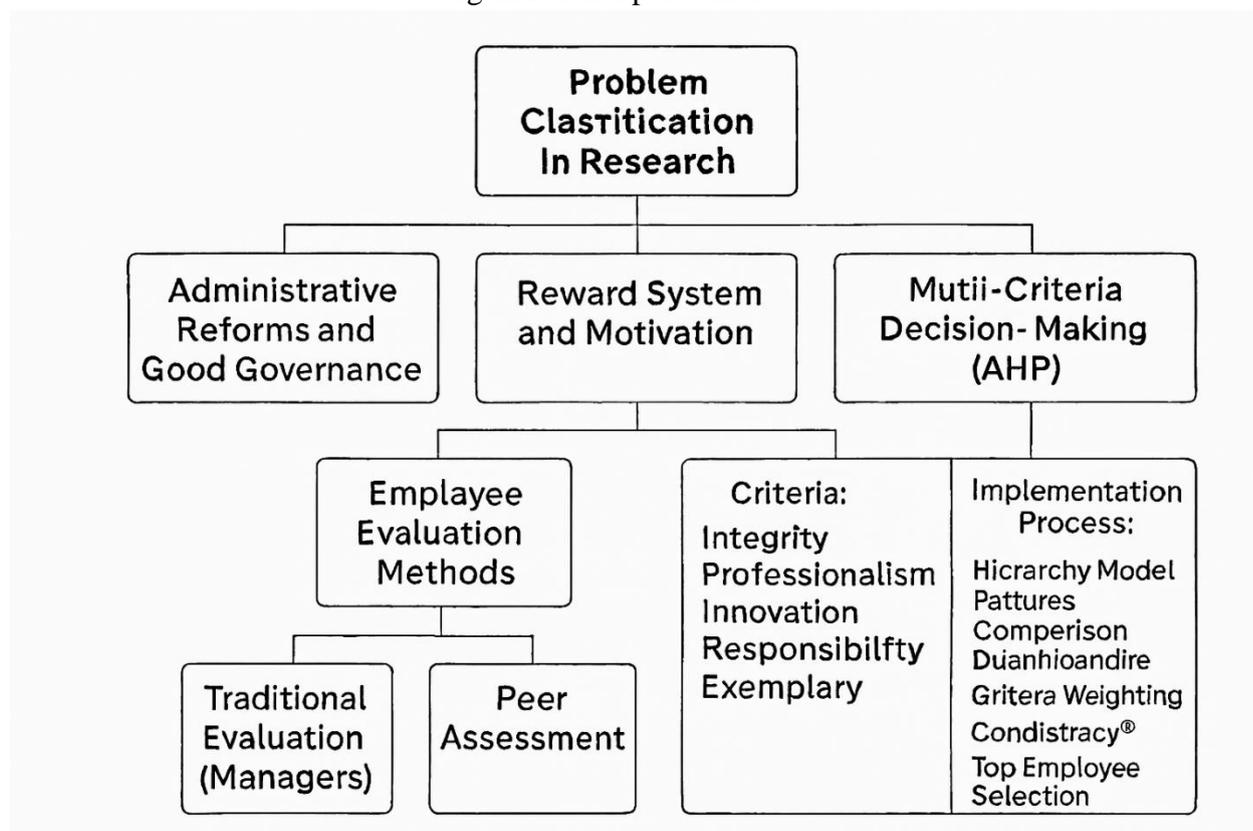
2-2Second article:
Main topic: Integrating the AHP method in selecting the best employee: a multi-criteria decision analysis approach to decision making
Main assumptions of the research problem
-2-2-1The nature of decision making
Selecting the best employee is a multi-criteria decision-making problem.
The criteria are diverse and sometimes conflicting (education, experience, communication skills, organizational cultural values)
-2-2-2Problem solving method

Using MCDA with emphasis on AHP for weighting and comparing criteria.

It is assumed that the data are valid and the pairwise comparisons are consistent.

-2-2-3Hierarchical Structure

First level: Objective (selecting the best employee)

Second level: Main criteria (education, experience, communication skills, innovation, adaptability)

Third level: Sub-criteria (e.g., bachelor's, master's, PhD; years of experience; presentation and report writing ability)
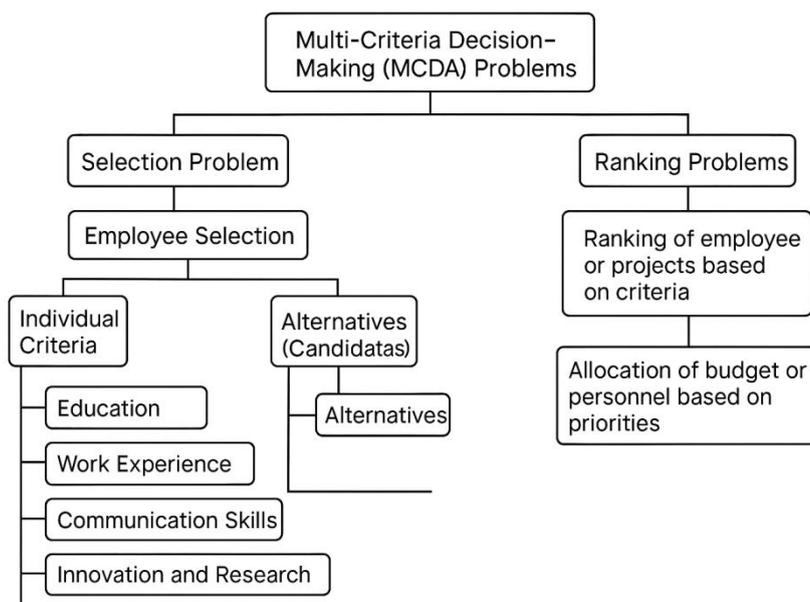
Fourth level: Options (different candidates)

-2-2-4Conclusion and validation

The best employee is selected based on the final score.

The accuracy of the results depends on the quality of the data and the consistency of the comparisons.

Sensitivity analysis is possible to examine the change in weights.

Mathematical Modeling:

 3-1First Article

-3-1-1Introduction of Decision Parameters and Variables

  I= {1, 2,...,N}: Set of employees (selection candidates)

  K= {1,2,...,5}: Set of evaluation criteria including:

Integrity

Professionalism

Innovation

Responsibility

Exemplary

  R={1,2,...,R}: Set of evaluators (colleagues)

  $a_{r,ik}$: Score of evaluator r to employee i in criterion k.

  S_{ik}: Final score of employee i in criterion k after aggregating opinions.

  W_k: Weight of criterion k extracted from AHP pairwise comparison matrix.

  Z_i: Overall score of employee i based on the weighted sum of criteria.

xi∈{0,1}: Top employee selection variable (if selected, it takes the value 1)

$$S_{ik} = \frac{1}{R} \sum_{r=1}^{R} a_{r,ik}$$

$$z_i = \sum_{k=1}^{5} w_k \cdot S_{ik}$$

-3-1-2First step: Calculating the final score of each employee

-3-1-3Step 2: Extracting the weights of the criteria from the AHP pairwise comparison matrix

The pairwise comparison matrix A∈R5×5 contains the preferences between the criteria. To extract the weights:

Geometric mean of rows method:

$$w_k = \frac{\left(\Pi_{j=1}^{5} A_{kj} \right)^{1/5}}{\sum_{k=1}^{5} \left(\Pi_{j=1}^{5} A_{kj} \right)^{1/5}}$$

Compatibility Check:

$$CI = \frac{\lambda_{max} - 5}{4}, \quad CR = \frac{CI}{RI}$$

where RI is the standard random value for n=5 (about 1.12). If CR<0.1, the matrix is acceptable.

4-1-3-Step Three: Top Employee Selection Model

Objective: Select an employee with the highest overall score

$$\max_{x_i} \sum_{i=1}^{N} x_i \cdot z_i$$

With restrictions:

$$\sum_{i \in اداری} x_i = 1, \quad \sum_{i \in پژوهشی} x_i = 1$$

-3-1-5Important points in modeling

Normalizing scores to prevent bias.

Possibility of weighting evaluators in case of differences in their credibility.

Using different scenarios to check the stability of the choice.

Adding diversity and fairness constraints in the final choice.

-3-1-6Brief introduction to other modeling methods

♦ Fuzzy methods (Fuzzy AHP)

In this method, preferences between criteria are expressed as fuzzy numbers (triangular or trapezoidal) to take into account uncertainty in judgments. Suitable for decision-making environments with high ambiguity.

♦ Multi-criteria ranking methodsTOPSIS, PROMETHEE

These methods operate based on proximity to the ideal option or preferred flow and can be combined with AHP weights. They are suitable for complete ranking and sensitivity analysis.

♦ Data Envelopment Analysis (DEA)

In this method, the relative efficiency of employees is measured according to inputs (effort,

time) and outputs (results, performance). Suitable for evaluating productivity and comparing relative performance.

 3-2Second article:

Introducing decision sets, parameters and variables

Set of criteria:

C={1,2,…,m}

Sub-criteria for each criterion c:

Sc={1,2,…,sc}

Set of options (candidates):

K={1,2,…,n}

Matrix of Pairwise Comparisons of Criteria (AHP):

$$A \in R^{m \times m}, \quad a_{ij} > 0, \quad a_{ij} = \frac{1}{a_{ji}}, \quad a_{ii} = 1$$

Matrix of pairwise comparisons of subcriteria for each criterion c:

$A^{(c)} \in R^{sc \times sc}$

Performance score of option k in subcriterion (c,s):

$r_k^{(c,s)} \in [0,1]$

Weight of criteria (criterion level):

$$w_c \geq 0, \quad \sum_{c \in C} w_c = 1$$

Weight of sub-criteria within each criterion:

$$y_k \in \{0, 1\}, \quad \sum_{k \in K} y_k = 1$$

Total score of option k:

$$Z_k = \sum_{c \in C} w_c \sum_{s \in S_c} v_{c,s} r_k^{(c,s)}$$

Basic model: simple weighted sum

Objective function: Maximize the score of the selected option

$$\max \sum_{k \in K} Z_k y_k$$

Unique selection constraint:

$$\sum_{k \in K} y_k = 1, \quad y_k \in \{0,1\}$$

Definition of the total score of each option:

$$Z_k = \sum_{c \in C} w_c \sum_{s \in S_c} v_{c,s} r_k^{(c,s)}$$

Explanation: In this model, the weights wc and vc,s are given (by experts or organizational policy), and the selection is made based on Zk. This basic model is useful for understanding the

structure of criteria aggregation.

Basic AHP Model: Extracting Weights from Pairwise Comparisons and Consistency Check

Extracting Weights of Criteria and Sub-Criteria

Standard Eigenvector Method AHP:

$$A w = \lambda_{\max} w, \quad w \geq 0, \quad \sum_c w_c = 1$$

$$A^{(c)} v^{(c)} = \lambda_{\max(c)} v^{(c)}, \quad v^{(c)} \geq 0, \quad \sum_s v_{c,s} = 1$$

Logarithmic least squares method (robust alternative):

$$\min_{w > 0} \sum_{i < j} \left(\ln a_{ij} - \ln \frac{w_i}{w_j} \right)^2 \quad \text{با نرمال‌سازی} \quad \sum_c w_c = 1$$

$$\min_{v^{(c)} > 0} \sum_{p < q} \left(\ln a_{pq}^{(c)} - \ln \frac{v_{c,p}}{v_{c,q}} \right)^2, \quad \sum_s v_{c,s} = 1$$

Decision maker compatibility control

Incompatibility index and compatibility ratio:

$$CI = \frac{\lambda_{\max} - m}{m - 1}, \quad CR = \frac{CI}{RI(m)}$$

Acceptable condition:

$$CR \leq \tau \quad (\text{معمولاً } \tau = 0.1)$$

Similarly for each A(c):

$$CI^{(c)} = \frac{\lambda_{\max(c)} - s_c}{s_c - 1}, \quad CR^{(c)} = \frac{CI^{(c)}}{RI(s_c)} \leq \tau$$

Aggregate the options scores

Total score of option k:

$$Z_k = \sum_{c \in C} w_c \sum_{s \in S_c} v_{c,s} r_k^{(c,s)}$$

Final choice:

$$\max \sum_{k \in K} Z_k y_k \quad \text{با} \quad \sum_k y_k = 1, \; y_k \in \{0,1\}$$

Or directly:

$$k^* = \underset{k \in K}{\arg\max} Z_k$$

Application Developments: Thresholds, Grouping, and Incomplete Data

Minimum Performance Thresholds:

$$\sum_{s \in S_c} v_{c,s} r_k^{(c,s)} \geq \alpha_c \quad \forall c, \forall k \sqcup y_k = 1$$

Which can be applied with implicit constraints:

$$\sum_{s} v_{c,s} r_k^{(c,s)} + M(1 - y_k) \geq \alpha_c$$

Group consensus (multiple decision makers):

If we have D decision makers and each of them provides a matrix A[d], then geometric integration:

$$\bar{a}_{ij} = \left(\prod_{d=1}^{D} a_{ij}^{[d]} \right)^{1/D}$$

Then the weights are extracted from A‾.

Handling incomplete/non-scale data: Use linear or vector normalization for rk(c,s) and transform towards cost-based metrics:

$$r_k^{(c,s)} = \frac{x_k^{(c,s)} - \min\limits_{k} x_k^{(c,s)}}{\max\limits_{k} x_k^{(c,s)} - \min\limits_{k} x_k^{(c,s)}}$$

And for negative criteria:

$$r_k^{(c,s)} = \frac{\max\limits_{k} x_k^{(c,s)} - x_k^{(c,s)}}{\max\limits_{k} x_k^{(c,s)} - \min\limits_{k} x_k^{(c,s)}}$$

Problem Solving Method:

4-1First Article:

Research Objective:

Selecting the Most Objectively Superior Employee in the "Semarang Religious Research and Development Department" Using the Analytic Hierarchy Process (AHP) as Part of the Reward System Strategy in Government Organizations.

Problem Solving Method (AHP):

-4-1-1Forming a Hierarchy Model:

      Main Objective: Selecting the Best Employee.

      Criteria: Five Work Cultures of the Ministry of Religious Affairs:

      Honesty

      Responsibility

      Professionalism

      Role Model

      Innovation

      Options: 38 employees (9 administrative and 29 researchers)

-4-1-2Questionnaire Design:

      Scoring scale from 1 to 5 for pairwise comparison of criteria.

      The questionnaire was designed based on paired combinations of criteria (10

combinations).

-4-1-3Determining the weight of the criteria:

Survey of structural officials (head of department and heads of departments)

Calculation of the paired comparison matrix and normalization matrix.

Weighting results:

Honesty (35.41%) > Responsibility (33.77%) > Professionalism (15.13%) > Role model (9.02%) > Innovation(6.68%) 4-1-4-Consistency Check:

Calculation of the consistency index (CI) and consistency ratio (CR).

The value of CR = 0.0840 (< 0.1) indicates acceptable consistency of opinions.

4-1-5-Process of selecting the best employee:

Peer evaluation by all 38 employees.

Calculating the priority of each employee in each criterion using AHP.

Selecting the best employee from the administrative and research departments separately.

Making the final selection from the top three researchers in different fields.

Results:

Top administrative employee: code A-1 with a score of 23.16%.

Top research employee: code MT with a score of 40.39%.

The AHP method was recognized as an objective, participatory and reliable tool in performance evaluation.

Advantages of the method used:

Objectivity: Evaluation by peers instead of superior evaluation.

Participation of all employees: Increased interaction and motivation.

Transparency: Reduce bias and personal relationships.

Limitations:

Possibility of bias in assessments based on personal relationships.

Need to train employees to understand the criteria correctly.

Overall conclusion:

AHP as a systematic and objective method can be used in selecting the best employee in government organizations and help improve human resource management and enhance the quality of management.

4-2 Second article:

Problem: Selecting the best employee for the position of "Project Manager" using the AHP method (Analytical Hierarchy Process) within the framework of Multi-Criteria Decision Analysis (MCDA).

Solution Steps:

-1-2-4Identify Criteria and Sub-Criteria:

The main criteria included:

Education(%30)

Work Experience(%25)

Communication Skills(%20)

Commitment to Research and Innovation(%15)

Compatibility(%10)

Each criterion was divided into more detailed sub-criteria.

-2-1-4Create Hierarchy:

The criteria, sub-criteria, and options (candidates) were organized in a hierarchical structure.

-3-1-4Paired Comparison of Criteria:

A scale of 1 to 9 was used to compare the relative importance of the criteria and sub-criteria.

-4-1-4Calculate Relative Weight:

Using the comparison matrix, eigenvalues and relative weights were calculated.

-5-1-4Evaluate Compatibility:

The Compatibility Index (CR) was calculated and verified that the comparisons were compatible.

-6-1-4Calculating the final score of candidates:

Each candidate's score was obtained by multiplying the weight of the criteria by the candidate's score in each criterion and adding them up.

-7-1-4Ranking and selection:

Candidate A was selected as the best with a final score of 0.774.

Conclusion:

The AHP method is a suitable tool for selecting the best employee due to its structure, objectivity, and multi-criteria analysis capability, provided that the data is accurate and the comparisons are valid.

Literature Review

5-1 Article One:

5-1-1-Part One: Review of Selected Articles

Article Summary:

This article addresses the problem of objective selection of a superior employee in a government organization (Semarang Religious Research and Development Department). The modeling approach is based on the Analytic Hierarchy Process (AHP). The solution method consists of five main steps: building a hierarchical model, designing a questionnaire, determining the weight of the criteria, checking compatibility, and final selection. The results showed that AHP was able to select two superior employees (one administrative and one researcher) more objectively and with peer participation. The proposed future research area is to generalize this method to other government organizations and combine it with other decision-making methods.

Critique of Strengths and Weaknesses:

Strengths:

Using peer assessment instead of superior assessment, which increases objectivity and participation.

Providing a clear step-by-step presentation of the implementation of AHP in a real field study.

Pay attention to the context of the government organization and align the criteria with the ministry's work culture (honesty, accountability, etc.)

Weaknesses:

Small statistical population: only 38 people, which limits the generalizability of the results.

Lack of in-depth examination of the risk of bias: Although the bias of personal relationships is mentioned, no effective practical solution is provided to reduce it.

Lack of comparison with other methods: The performance of AHP was not compared with conventional methods of selecting superior employees (such as evaluation by superiors) to quantitatively demonstrate its superiority.

Ambiguity in criteria: Criteria such as "honesty" and "role model" are inherently qualitative and interpretable and may be perceived differently between evaluators.

Related article (Yani & Yuniarti, 2019)

Article summary:

This article examines the problem of selecting new employees in a higher education institution (STMIK Atma Luhur). The modeling approach is AHP. The solution method involves identifying competency criteria (such as technical skills, personality, experience), assigning them weights, and ranking candidates. The result was a more objective hiring decision support system. Future work suggests developing a software system to automate this process.

Critique of strengths and weaknesses:

Strengths:

Focus on another application area of AHP in human resource management (recruitment)

Attempt to objectify the selection process, which is usually subjective.

Weaknesses:

The criteria may not be the same for all job positions.

The paper focuses more on the technical aspect of AHP and discusses less on organizational impact or implementation challenges.

Related article (Lestari et al., 2020)

Abstract of the paper:

This paper addresses the issue of measuring organizational performance of a health service center by combining two methods: Balanced Scorecard (BSC) and AHP. The approach is hybrid. Solution: First, performance indicators are defined in the four BSC perspectives, then they are weighted with AHP. The result was to prioritize performance indicators and identify the organization's strengths and weaknesses. The future field is to implement this framework in other similar organizations.

Critique of strengths and weaknesses:

Strengths:

Innovation in combining two powerful methods (BSC and AHP) for a more comprehensive assessment.

A holistic view of the organization's performance, not just one department.

Weaknesses:

The complexity of the combined model may make it difficult for organizations without expertise to implement it.

It requires collecting diverse and sometimes costly data from multiple perspectives. 5-1-2-Part Two: General Critique of the Literature and Future Research Areas

General Critique of the Literature:

The existing literature generally emphasizes the technical capabilities of AHP in structuring multi-criteria decision-making problems in the field of human resources (from selection to evaluation and reward). The common point of the articles is the attempt to reduce subjective bias and increase objectivity in management processes. However, there are significant gaps:

Lack of longitudinal studies: Most articles (including the main article) are cross-sectional and do not measure the long-term impact of AHP implementation on motivation, organizational culture, or overall organizational performance.

Neglect of organizational context: The impact of factors such as organizational climate, level of trust between employees, or resistance to change on the success of AHP implementation has been less studied.

Focus on "objectivity" without considering "perceived fairness": Even if AHP is mathematically objective, whether employees perceive the outcome as fair is a separate issue that needs

research.

Lack of comparative research: Systematic comparison of the effectiveness of AHP versus traditional methods in various public and private organizations is very limited.

Interesting research areas for the problem of "selection of the best employee with AHP":

Combining AHP with more democratic methods: such as collective deliberative methods or voting to increase the legitimacy and acceptance of the results.

Designing hybrid systems: combining AHP with artificial intelligence (such as natural language processing for qualitative analysis of peer opinions) or with objective performance data (such as the degree of goal achievement).

Examining psychological and organizational consequences: studying the impact of this evaluation system on relationships between colleagues, a sense of organizational belonging, or competitive/cooperative behaviors.

Developing a framework for moderating social biases: such as designing mechanisms in AHP to identify and reduce the impact of popularity or informal relationships on scores.

Examining ethical dimensions: investigating raters' privacy, transparency versus confidentiality, and the fit of criteria with organizational values.

Main Hypothesis of the Research Problem	مقاله Muzayanah et al. (2023)	Yani & Yuniarti (2019)	Lestari et al. (2020)	Other related articles in the literature
1. AHP can reduce subjective bias in employee evaluation.	✓ (With peer review mechanism)	✓ (in selection)		✓ (e.g. in Arisandy, 2017 on the combination of KPI and 360-degree assessment)
2. Peer-based evaluation is more objective than evaluation by superiors.	✓ (Main hypothesis of the study)	-	(Focuses on organizational performance)	✓ (Educational studies such as Arifin et al., 2018)
3. Qualitative criteria (such as honesty) can be quantified and weighted with AHP.	✓ (Five work cultures)	✓ (soft skills)		✓ (Most applications of AHP)
4. Implementing AHP increases employee participation and commitment.	✓ (Mentioned as a result)	-	-	Needs more research
5. Objective selection of superior employees leads to improved quality of human resource management.	✓ (Overall conclusion)	-	✓(BSC quality indicators)	Needs more research and longitudinal evidence

5-2 Second article:

Part One: Critique of selected articles

Abstract: This article deals with the problem of selecting the best employee (specifically for the position of project manager). This selection is considered a complex multi-criteria decision-making (MCDA) problem. The modeling approach uses the Analytic Hierarchy Process (AHP)

method to structure and solve the problem. The solution method includes the standard AHP steps including identifying criteria and sub-criteria, pairwise comparisons, calculating relative weights, checking compatibility, and calculating the final score of candidates. The results show that by applying this method, candidate A is selected as the best option. Suggested future research areas include improving the accuracy of pairwise comparisons, adding new criteria, addressing uncertainty in calculations, empirically validating the results, integrating AHP with other methods such as machine learning, and testing the scalability of the method in large companies.

Strengths: 1) Providing a structured and step-by-step framework for the employee selection problem that is replicable. 2) Objectifying the decision-making process, which is usually subjective, by quantifying the criteria. 3) Flexibility in defining and prioritizing different criteria according to the needs of the organization. 4) Conducting sensitivity analysis (optionally) to measure the effect of changing the weights on the result.

Weaknesses: 1) Strong dependence on the subjective judgment of the decision maker in the pairwise comparisons stage, which can be a source of bias. 2) Computational complexity with an increasing number of criteria and options, which makes manual implementation error-prone. 3) The article focuses more on describing the process and does not provide strong empirical validation of the results (for example, by tracking the performance of the selected employee). 4) Failure to consider the ambiguity and uncertainty inherent in qualitative assessments (such as "good communication skills"), which are not well covered in the classic AHP method.

Part Two: General Review of the Literature and Research Areas

General Critique of the Literature:

The literature on employee selection using AHP and other MCDA methods generally emphasizes problem structuring, quantification of qualitative criteria, and ranking of alternatives. The main strength of this literature is the provision of systematic models to deal with the complexity of multi-criteria decision-making. Articles such as the present article show, in practical detail, how to implement these methods in a real-world setting.

However, the main criticism of this literature is its vulnerability to subjective and qualitative data. Many employee evaluation criteria (e.g., team spirit, creativity, fit with organizational culture) are inherently qualitative and ambiguous. Classical methods such as AHP, although they structure these criteria, do not fully model the uncertainty in their evaluation. Also, most of the articles focus on the selection process and less on post-selection evaluation (Predictive Validity) and comparison of the method results with the actual performance of the selected employee. This makes the long-term effectiveness of these methods less empirically tested.

Interesting research areas for the problem of selecting the best employee:

1.Combining fuzzy multi-criteria decision-making methods with AHP: Using fuzzy logic (Fuzzy AHP) to model ambiguity and uncertainty in decision-makers' linguistic judgments (e.g., "very good", "average") and increasing the flexibility and realism of the model.

2.Integrating MCDA methods with data mining and machine learning: Designing hybrid systems in which the weights of criteria are automatically or semi-automatically extracted from historical data on the performance of existing employees (human resource database) to reduce the subjectivity of the decision-maker.

3.Developing dynamic frameworks for employee selection: Designing models that consider not only the current status of the candidate, but also his or her future growth and learning potential, transforming the problem from a static selection into a dynamic process.

Extensive empirical validation and longitudinal studies: Conduct field research that compares

the results of selection using AHP or mixed methods with objective indicators of employee performance and success over time (e.g., 1 to 3 years after hiring) to measure the predictive power of the model.

Pay attention to new criteria in the digital age: Review and incorporate new criteria such as digital literacy, ability to collaborate in virtual environments, data management, and adaptation to rapid technological changes in candidate evaluation.

Table of main hypotheses of the research problem

Row	The main hypothesis of the research	Presence in the original article (Nugroho et al.)	Presence in other literature (example)
1	The use of the AHP method makes the selection of the best employee more objective and systematic.	Yes (The main purpose of the article is to prove this)	Yes (e.g., Saaty, 1990; Vaidya & Kumar, 2006)
2	Qualitative criteria (such as communication skills) can be weighted quantitatively and in a comparable manner.	Yes (The basis of the pairwise comparison method is)	Yes (underlying many applications of AHP in various papers)
3	The weights obtained from pairwise comparisons accurately reflect the decision maker's actual priorities.	Yes (Implicit assumption of the method. The consistency of the matrix is checked but the accuracy of the initial judgment is not)	Yes (fundamental assumption in classical AHP. Papers such as Felice & Petrillo, 2010 have attempted to improve it)
4	The employee who obtains the highest final AHP score will also perform best in practice.	No (This hypothesis is not necessarily tested and is only presented as a result. The article points out the need for future validation)	Rarely tested (this is an important research gap. Most papers focus on the selection process, not its consequences)
5	The presence of uncertainty in human evaluations does not significantly affect the results of the classical AHP.	No (The article points out the complexity and data dependence but does not model it as a fundamental limitation)	Controversial (several papers such as Nabeeb et al., 2019 have attempted to address this weakness using fuzzy or neurosophical methods)

Conclusion:

This study examined the application of the Analytic Hierarchy Process (AHP) method in the process of selecting the best employee, with an emphasis on comparing and integrating the approaches of public and private organizations within the framework of reward systems and multi-criteria decision-making. The research findings show that AHP, with its systematic structure in weighting, evaluating, and prioritizing qualitative and quantitative criteria, provides a powerful tool for objectifying and making the process of selecting the best employee fair in both sectors. In the private sector, greater flexibility, a focus on performance criteria and financial results, and a direct link between rewards and evaluation outputs have made the integration of AHP with reward systems more dynamic and responsive. In contrast, in the public sector, the emphasis on stability criteria, compliance with laws and regulations, seniority, and

social-justice criteria causes the application of AHP to be integrated with bureaucratic requirements and macro-policies, which may reduce its speed and flexibility, but increase the legitimacy and transparency of the decision.

Future Research Areas

According to the findings of this study, the following areas for future research are suggested:

Integrating AHP with modern decision-making methods: Investigating the possibility of integrating AHP with techniques such as TOPSIS, DEMATEL, or fuzzy approaches to increase accuracy and flexibility in dynamic environments.

The impact of organizational culture: A more in-depth comparative study of the impact of the specific organizational culture of each sector (public or private) on the acceptance and effectiveness of AHP implementation.

New evaluation criteria: Designing and testing new composite criteria (such as flexibility, innovation, or social effectiveness criteria) in AHP models appropriate to workplace developments.

Integrated reward systems: Researching the design of reward frameworks that are dynamically linked to AHP results at different organizational levels (individual, team, departmental).

The role of information technology: Investigating the role of AHP-based decision support systems (DSS) and artificial intelligence in automating and increasing the objectivity of the selection process.

Longitudinal Studies: Evaluating the Long-Term Effects of Applying AHP on Motivation, Job Satisfaction, and Overall Organizational Performance in Both Sectors.

Final Conclusion

Analytical Hierarchy Process (AHP) as a structured, multi-criteria tool has significant potential to overcome the subjective and complex challenges of the best employee selection process. However, its success and effectiveness are highly dependent on adapting the framework of criteria, weights, and reward mechanisms to the specific goals, values, and constraints of public and private organizations. Smart integration of this method with performance management and reward systems will not only be fairer and more transparent, but also more aligned with the organization's macro strategies. Finally, successful implementation of AHP requires management commitment, training of evaluators, and periodic review of criteria in the face of environmental changes. This research shows that despite differences in approach, both sectors can achieve more balanced and effective decision-making in identifying and rewarding competent personnel by localizing AHP principles.