



**Establishing the work environment organization system (5S) and valuing its dimensions using the AHP method (Study case: Electricity Distribution Company of Chaharmahal and Bakhtiari province)**

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**Abstract**

Human resource management in the organization and the company is one of the most important concerns of managers. high productivity and increasing the quality of services in the company and the organization makes them to use the system that is designed for human resource management. Human resource management in the organization and the company is one of the most important concerns of managers. high productivity and increasing the quality of services in the company and the organization makes them to use the system that is designed for human resource management. The 5 S elegance system is based on the management of physical and physical and environmental arrays, so beyond the discipline of discipline and discipline, it does not enter the field of behavior and inner thoughts of employees and especially managers. Workplace organization through the 5S methodology is recognized as a fundamental foundation for improving productivity and enhancing organizational performance. Identifying the priority of the five stages of 5S implementation is essential for achieving operational efficiency in service-oriented companies. This study aims to evaluate and prioritize the 5S stages in the Electricity Distribution Company of Chaharmahal and Bakhtiari Province using the Analytic Hierarchy Process (AHP). The research is applied in nature and follows a descriptive–survey approach, with data collected from 50 senior managers through a structured questionnaire. The results of the AHP model indicate that the Seiton stage holds the highest priority with a criterion weight of 0.264, followed by the Seiri, Seiso, Seiketsu, and Shitsuke stages. The consistency ratio (CR = 0.018) confirms the reliability and validity of the pairwise comparisons. The findings provide a structured framework that can assist managers in implementing 5S more effectively and enhancing organizational productivity.

**Keywords**

Work environment organization, 5S, AHP model, electricity distribution company, employee productivity

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## 1. Introduction

Order and symmetry is an inherent principle in all organizations and this order and discipline leads to efficient and purposeful planning to achieve the goals of maximum satisfaction. Electric power distribution companies face different challenges during their organizational life, some of these challenges are related to internal organizational factors such as: change in the way of doing work, increasing joint satisfaction, the need to increase productivity, etc., the need to use scientific approaches and tools to deal with these challenges is unavoidable. Organization and decoration of the work environment, which according to experts is the basic foundation of other quality and management systems, which is possible to achieve this important thing only through proper management (Hiroyuki, 1995; Takashi , 1995 ). Different methods have been designed to manage and plan and organize the work environment, the most important of which is the 5S system.

The 5S system is considered as an indicator in an organization and comprehensive implementation leads to the effectiveness of the organization's management.

The 5S method includes 5 steps as follows (Tesoehia , 2012 ; Ranteshwar et al , 2012 ):

Table 1. 5S steps

| Japanese Term | English Translation | Equivalent's' Term |
|---------------|---------------------|--------------------|
| Seiri         | Organization        | Sort               |
| Seiton        | Tidiness            | Systematize        |
| Seiso         | Cleaning            | Sweep              |
| Seiketsu      | Standardization     | Standardize        |
| Shitsuke      | Discipline          | Self – discipline  |

The implementation of 5S steps is very important based on the goals of the organization, so in the implementation of 5S, while specifying the priority of implementing 5S steps and giving value to each of the steps, it is discussed. Valuation should be in such a way that while achieving the best option and choosing a solution, it has the necessary compatibility with the judgment of decision makers. Therefore, AHP method can be used. This method selects the best option by weighting criteria and sub-criteria using pairwise comparison.

In this article, while introducing the 5S method and its application in the electric power distribution company of Chaharmahal and Bakhtiari province, using the AHP method, the selection of the priority for the implementation of the 5S steps is discussed.

## 2. 5S OVERVIEW

The grooming system consists of 5 principles, which start with the letter S in Japanese and are abbreviated as 5S.

### Seiri (S1):

In this stage, the organization, sorting, and erasing of the components are discussed. From the point of view of 5S, organizing means distinguishing the necessary from the unnecessary, making a decisive decision to apply priority management to get rid of the unnecessary. The goals of this stage can be mentioned to determine the criteria to eliminate the unnecessary and to apply the management of priorities and determine the priorities. By implementing this stage, the organization can optimize its work space, reduce waste, improve efficiency and

create a more organized and productive environment for employees (HungLing , 2011 ; Michalska et al , 2007 ; Becker , 2001).

**Seiton (S2):**

Order means putting things in the right and orderly places so that they can be used in the best way. When everything is in a proper and specific place with regard to the function and taking into account the quality and safety of the work, the place Work will always be orderly. For this purpose, we must place all the necessary tools, items and worksheets that we have already identified in step (seiri1) and specify the function of each of them in the appropriate place so that they can be accessed quickly and easily. The goals of this stage can be mentioned as: installation and arrangement in the work environment, proper placement of objects, improving productivity by eliminating the time wasted searching for objects, specifying the range and location of objects by marking (Ho , 1999 ; Cura et al , 2003).

**Seiso (S3):**

The third S seeks to define the optimal conditions of the work environment to maintain the work space in ideal conditions. Regular cleaning of the work space removes clutter from the work environment. Cleanliness from the 5S point of view is: throwing away waste and cleaning things from pollution and foreign substances. Some equipment and places must be kept very clean and free from any kind of pollution, so it is necessary to identify them exactly and insist on inspection and review. The purpose of implementing this stage is to achieve an optimal level of cleanliness, removing pollution and re-reviewing affairs and responsibilities (Becker , 2001 ; HungLing, 2012).

**Seiketsu (S4):**

Constant control and correction of organization, order, order and cleanliness is called standardization. The main emphasis of standardization is on the management to standardize and control the work environment by using appropriate check lists and standardizing regulations using innovation and creativity so that all factors are always used with the necessary speed and accuracy. Creative visual management in order to reveal inconsistencies and implementation standard for 5S continuity is one of the objectives of this stage. For standardization, each member of the organization must continuously practice the previous 3 steps (Riera et al 2012 ; Cura et al , 2012 ; Riera et al , 2012 ; Giralt , 2012).

**Shitsuke (S5):**

Discipline is the training of habits and abilities to perform a specific task. In other words, discipline is the process of repeating and practicing a task. To achieve and maintain the successful implementation of this stage, regular 5S audits are performed to reveal the status of each stage. Among the goals of this stage, we can mention: full participation in creating correct habits and following regulations, the habit of communicating correctly and controlling its results, and the habit of doing things in an organized manner (Riera et al 2012 ; Shil et al , 2014 ; Barcia , 2006).

### **3. Analysis Hierarchy Process (AHP)**

Analytical Hierarchy Process (AHP) is one of the decision making methods. This method is one of the most widely used methods for ranking and determining the factors that can be used to prioritize each of the criteria by comparing two options, which is called index weighting (Freivalds , 2012).

The steps of Analytic Hierarchy Method (AHP) are as follows:

**First step:** Creating a hierarchical diagram: In this step, the research factors must first be extracted from different sources. After extracting the factors and options, the problem was divided into criteria levels and sub-criteria and options if any. The presence of criteria in the AHP model is necessary, that is, the hierarchical model will not be created without the presence of criteria. For example, in the figure below, 3 Criteria and three alternatives form a hierarchical model.

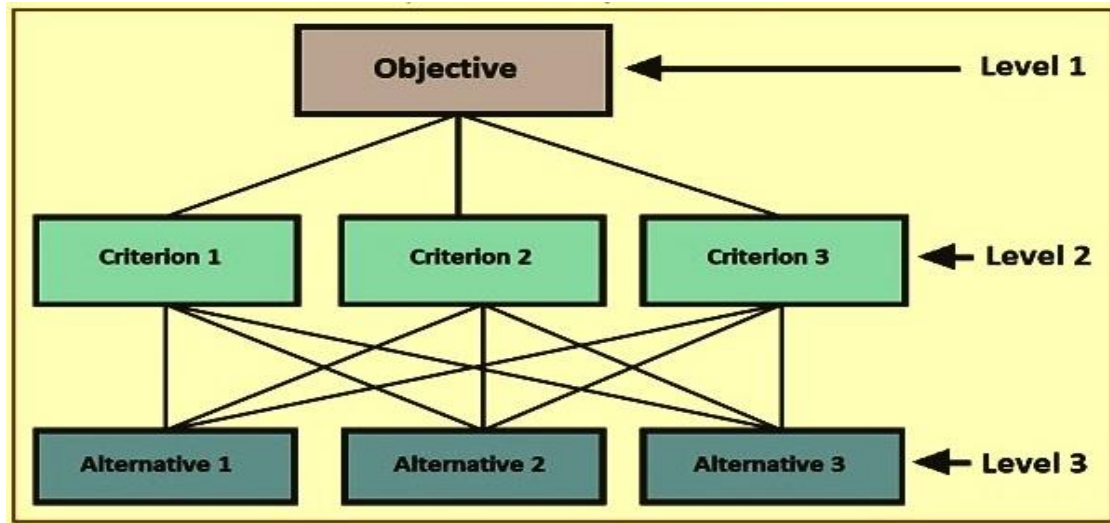


Figure 1- AHP process flowchart

**Second step:** Forming the matrix of paired comparisons: In this step, the elements of each level are compared to other related elements at a higher level in a pairwise manner and matrices of paired comparisons are formed. To determine the importance and preference in pairwise comparisons, we use the spectrum from 1 to 9, which is as follows.

Table 2- Comparison number of factors two by two

| Description                          | Severity of importance |
|--------------------------------------|------------------------|
| Maximum superiority value            | 9                      |
| Superiority value is maximum to high | 8                      |
| The value of excellence is very high | 7                      |
| High to very high superiority value  | 6                      |
| High superiority value               | 5                      |
| Moderate to high superiority value   | 4                      |
| Average excellence value             | 3                      |
| Same to medium excellence value      | 2                      |
| Equal excellence value               | 1                      |

**Third step:** In this step, according to the values of the normal matrix and the number of criteria, we calculate the weight of the criteria as follows.

$$\text{criteria weight} = \frac{\text{Elements in each row of the sum normal matrix}}{\text{Number of criteria}} \quad (1)$$

**Fourth step:** In this step, according to the weighted sum values and the weight of the criteria, we will calculate the compatibility vector as follows.

$$\text{Compatibility vector} = \frac{\text{Weighted total values}}{\text{criteria weighted}} \quad (2)$$

**Fifth step:** In this step, we calculate the largest eigenvalue of the matrix of pairwise comparisons ( $\lambda_{max}$ ) by dividing the sum of the compatibility vector by the number of criteria.

$$\lambda_{Max} = \frac{\text{Compatibility vector sum}}{\text{Number of criteria}} \quad (3)$$

**Sixth step:** In this step, we calculate the incompatibility index as follows.

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (4)$$

**Seventh step:** By dividing the value of the inconsistency index by the random index, we calculate the inconsistency ratio (Henderson, 1999 ; Esfandiari et al , 2023).

$$CR = \frac{CI}{RI} \quad (5)$$

#### 4. Study design

The mentioned study includes surveys on filled questionnaires with the aim of scoring the 5s steps in the electricity distribution company of Chaharmahal and Bakhtiari province. The successful implementation of the 5s technique in this company requires evaluating the impact of the criteria in terms of the goal, which is proposed according to the characteristics of the AHP method and creating paired comparisons for each of the criteria. In this method, by creating a table of paired comparisons, weighting is given to each of the 5 stages of 5s implementation, and by calculating the standard weight of each of the defined criteria, we rank the stages of 5s in the electricity distribution company of Chaharmahal and Bakhtiari province. By calculating the consistency rate (CR), we confirm the correctness of the implementation of the AHP method and the results obtained.

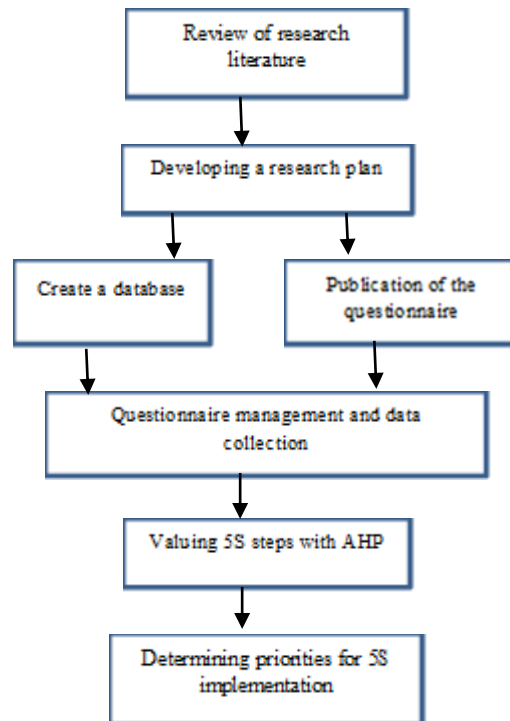


**Figure 2- Implementation method flowchart**

After collecting the data by the relevant questionnaires, we evaluate each stage of the 5S model using the AHP method. The first step of creating a hierarchical diagram is as follows:

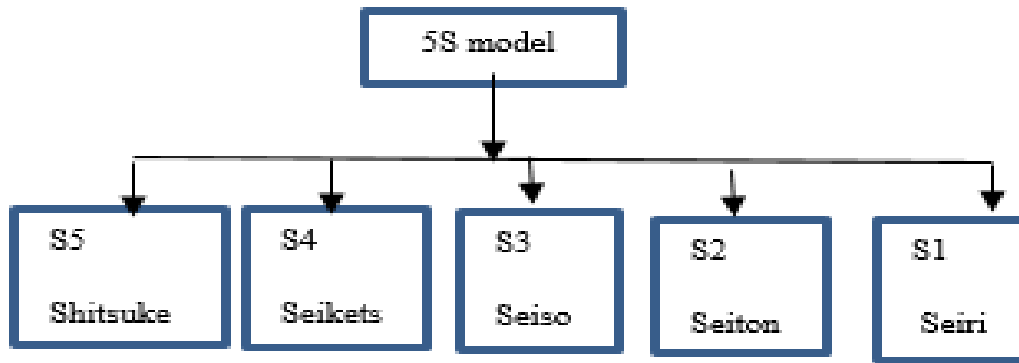


Figure 3- Hierarchical diagram

In the second step, the pairwise comparison matrix is formed as follows:

Table 3 - Pairwise comparison table

|          | Shitsuke | Seiri | Seiketsu | Seiton | Seiso | Criterion weight | weighted sum | Compatibility vector |
|----------|----------|-------|----------|--------|-------|------------------|--------------|----------------------|
| Shitsuke | 1        | 0.4   | 1        | 0.23   | 0.66  | 0.1092           | 0.009        | 0.0                  |
| Seiri    | 2.5      | 1     | 2.5      | 1      | 0.66  | 0.25             | 1.27         | 0.08                 |
| Seiketsu | 1        | 0.4   | 1        | 0.66   | 0.66  | 0.1306           | 0.6644       | 0.07                 |
| Seiton   | 3        | 1     | 1.5      | 1      | 1.25  | 0.264            | 1.33         | 0.04                 |
| Seiso    | 1.5      | 1.5   | 1.5      | 0.8    | 1     | 0.228            | 1.18         | 0.18                 |

Using the pairwise comparison matrix to calculate the normal matrix and finally, we calculate the criterion weight with the average of the elements of each row of the normal matrix:

Table 4- Normal matrix table

|          | Shitsuke | Seiri | Seiketsu | Seiton | Seiso |
|----------|----------|-------|----------|--------|-------|
| Shitsuke | 1        | 0.4   | 1        | 0.23   | 0.66  |
| Seiri    | 2.5      | 1     | 2.5      | 1      | 0.66  |
| Seiketsu | 1        | 0.4   | 1        | 0.66   | 0.66  |
| Seiton   | 3        | 1     | 1.5      | 1      | 1.25  |
| Seiso    | 1.5      | 1.5   | 1.5      | 0.8    | 1     |
| Total    | 9        | 4.3   | 7.5      | 3.69   | 4.23  |

The compatibility vector is as follows:

Table 5- Compatibility vector table

|          | Shitsuke | Seiri | Seiketsu | Seiton | Seiso | Criterion weight |
|----------|----------|-------|----------|--------|-------|------------------|
| Shitsuke | 1        | 0.4   | 1        | 0.23   | 0.66  | 0.1092           |
| Seiri    | 2.5      | 1     | 2.5      | 1      | 0.66  | 0.25             |
| Seiketsu | 1        | 0.4   | 1        | 0.66   | 0.66  | 0.1306           |
| Seiton   | 3        | 1     | 1.5      | 1      | 1.25  | 0.264            |
| Seiso    | 1.5      | 1.5   | 1.5      | 0.8    | 1     | 0.228            |

$$\Lambda_{\max} = \frac{5.05+5.08+5.07+5.04+5.18}{5} = 5.084$$

$$CI = \frac{5.084-5}{4} = 0.021$$

$$CR = \frac{0.021}{1.12} = 0.018$$

## 5. Validation of results

In order to check the accuracy and reliability of the results of the study, a questionnaire focusing on the priority of implementing 5S steps in the electricity distribution company of Chaharmahal and Bakhtiari province was distributed among the employees of the said company. Each of the personnel should first give a score to the correctness of the questionnaire and secondly select the priority of implementing the 5S steps by mentioning the reasons. Considering that the staff scored 4.25 out of 5, the validity of the questionnaire can be confirmed. By examining the selection of 5S steps by the personnel, it can be seen that the seiton step is the first priority of 90% of the personnel.

## 6. Discussion and conclusion

It is necessary to establish the 5S system, proper foundation, the belief of senior managers and to attract everyone's participation by providing appropriate feedback. Although the 5S system is being implemented in the electricity distribution company of Chaharmahal and Bakhtiari province, but the statistical analysis shows the unfavorable situation of the implementation of this plan, so it should be implemented based on the structure and prioritization of the 5S steps.

The proposed method for decision-making must be completely accurate and error-free, so we choose the AHP method because it has a hierarchy to the relationship between the goal, criteria, and options, as well as being linear and unidirectional. options, we form a pairwise comparison matrix related to each criterion and subcriteria, and while controlling the compatibility rate and ensuring the acceptability of each pairwise comparison, the relative weight of each criterion is calculated. Criterion weight has the greatest effect on the ranking of options. The decision maker must know the degree of reliability of the results to make the final decision. Therefore, by calculating the weight of each of the 5S steps, we prioritize them. According to the obtained results, the priority of the 5S steps is as follows:

Seiton stage with a criterion weight of 0.264, seiri stage with a criterion weight of 0.25, seiso stage with a criterion weight of 0.228, seiketsu stage with a criterion weight of 0.1306 and shitsuke stage with a criterion weight of 0.1092 are placed in the first to fifth priorities. It is important to mention that in determining the priority of implementing the 5s steps in the mentioned company, the criterion that should be given first priority is the seiton criterion, so it does not mean that other criteria are not important, but it shows its importance compared to others. It is the criteria.

**Table 6- Prioritization of 5s steps**

| Priority | Standard weight | Five dimensions |
|----------|-----------------|-----------------|
| First    | 0.264           | Seiton          |
| Two      | 0.25            | Seiri           |
| Third    | 0.228           | Seiso           |
| Fourth   | 0.1306          | Seiketsu        |
| Fifth    | 0.1092          | Shitsuku        |

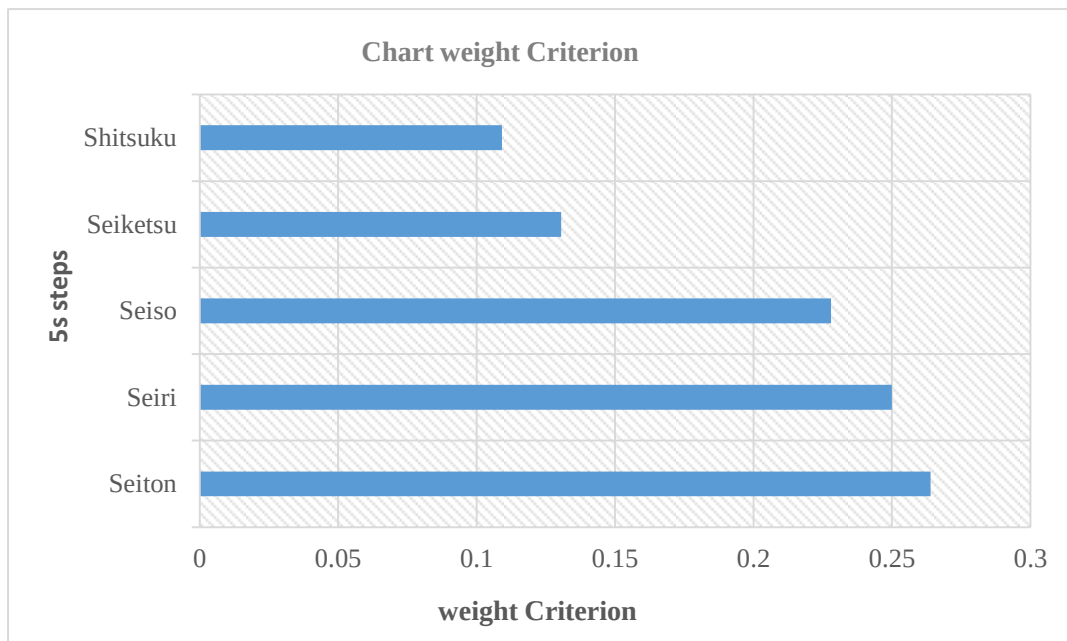


**Figure 4- 5s steps prioritization diagram**

To confirm the above results, we calculate the compatibility rate of pairwise comparisons. If the calculations are done correctly, this rate should be less than 0.1, otherwise the results are not valid. According to the calculation of the compatibility rate of paired comparisons, which is equal to  $CR=0.018$  and this value is less than 0.1, it can be concluded that the results are acceptable and correctly calculated.

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