

DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

**A DESIGN OF MULTI-CRITERIA BASED
DECISION SUPPORT SYSTEM FOR EMPLOYEE
PERFORMANCE EVALUATION: A REAL
WORLD APPLICATION**

by
Ufuk ERDOĞAN

March, 2018

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DECISION SUPPORT SYSTEM FOR EMPLOYEE
PERFORMANCE EVALUATION: A REAL
WORLD APPLICATION**

**A Thesis Submitted to the
Graduate School of Natural and Applied Sciences of Dokuz Eylül University
In Partial Fulfillment of the Requirements for the Degree Master of Science in
Industrial Engineering, Industrial Engineering Program**

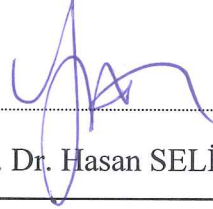
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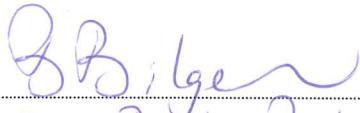
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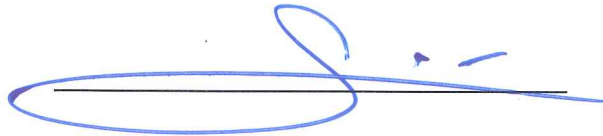
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A DESIGN OF MULTI-CRITERIA BASED DECISION SUPPORT SYSTEM FOR EMPLOYEE PERFORMANCE EVALUATION: A REAL WORLD APPLICATION

ABSTRACT

Today, successful companies focus on two things: employees and customers. In a constantly changing business environment, success of the companies depends largely on the human resources strategy they follow. In this context, an effective employee performance evaluation system has a very important role in achieving a sustainable competitive advantage. In this study, a decision support system was developed to evaluate employee performance. The proposed system includes the Analytic Hierarchy Process (AHP), a multi-criteria decision-making technique, and K-means algorithm, which is a clustering algorithm. A user-friendly interface has been developed to improve the practicability of the proposed decision support system. An application is presented to reveal the viability of the proposed system.

Keywords: Decision support system, employee performance evaluation, multi-criteria decision making, AHP, clustering, K-means algorithm

PERSONEL PERFORMANSININ DEĞERLENDİRİLMESİNE YÖNELİK ÇOK KRİTERLİ BİR KARAR DESTEK SİSTEMİ TASARIMI: GERÇEK YAŞAM UYGULAMASI

ÖZ

Günümüzde başarılı firmalar iki şeye odaklanmaktadır; çalışanlar ve müşteriler. Sürekli değişen iş ortamında firmaların başarısı çoğunlukla izledikleri insan kaynakları stratejisine bağlıdır. Bu bağlamda, etkili bir personel performans değerlendirme sistemi sürdürülebilir rekabet avantajı elde etmede kilit bir öneme sahiptir. Bu çalışmada, personel performansının değerlendirilmesine yönelik bir karar destek sistemi geliştirilmiştir. Önerilen sistem, çok kriterli bir karar verme tekniği olan Analitik Hiyerarşi Prosesini (AHP) ve bir kümeleme algoritması olan K-ortalamlar algoritmasını içermektedir. Önerilen karar destek sisteminin uygulanabilirliğini geliştirmek amacıyla kullanıcı dostu bir ara yüz geliştirilmiştir. Önerilen sistemin uygulanabilirliğini ortaya koymak amacıyla bir uygulama sunulmuştur.

Anahtar Kelimeler: Karar destek sistemi, personel performans değerlendirme, çok kriterli karar verme, AHP, kümeleme, K-ortalamlar algoritması

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CHAPTER ONE

INTRODUCTION

Employee is a fundamental asset for a company in today's highly competitive business environment. Employee performance evaluation can be defined as a system that involves setting employee standards, looking at employees' actual job performance, assessing that performance against the standards, giving feedback to the employee on the performance, how to improve it in the future and setting new goals and expectations for another period.

Employee performance management is a process for establishing a shared workforce understanding about what is to be achieved at an organization level. It is about aligning the organizational objectives with the employees' agreed measures, skills, competency requirements, development plans and the delivery of results. The emphasis is on improvement, learning and development in order to achieve the overall business strategy and to create a high performance workforce. Companies should have a performance evaluation system for increasing productivity of employee and job satisfaction.

Employee performance evaluation process, a systematic approach for the evaluation of individual performance, consists of formal structures. An effective employee evaluation system involves the ideas of employees and collaborative goals. It aims to improve companies' productivity and identify the requirements, goals and responsibilities for jobs. In addition, it aims to assess employees' performance against the common goal of a company. Employee evaluation system is employed for promotions, confirmation of personnel skills, training and development, compensation reviews, competency building, improving communication skills, evaluating human resources program, feed-back and grievance, recruitment and induction, motivation and job satisfaction.

CHAPTER TWO

EMPLOYEE PERFORMANCE EVALUATION

2.1 Basic Concepts and Definitions

2.1.1 Employee Performance Concept

Today, people step into the business life in the public or private sectors after the training they receive in various educational institutions. People's lives show a change in favor of their business life. Let's consider an employee working for a company. A large part of the employee's life is going through with the business life activities. Because of the long working hours, people live job-centric. Their behavior can be shaped by the job descriptions they have. Especially in the corporate companies, employees are in contact with many people due to their job descriptions. As a result of the communication with the people they are in contact, they are influenced by each other in both positive and negative senses as well as affecting each other. In business life, there is always an interaction between the employees and their superiors/subordinates. Interactions that take place are one of the most important basic factors on the performance of people in their business life.

Each employee inherently has certain abilities and a unique character. Every employee in the company has different personal characteristics, abilities and education levels. Basically, the impact of people's characters on their business performance cannot be changed but can be managed. Together with value judgments in changing business life, people are separating their personal characteristics from their work life as much as possible.

Businesses consist of many living and inanimate constituents. People unite and form organizations under a particular business frame. Every employee working for a company has a role. If we think of more than one cog, in order for a cog to work, the other one has to affect it. Once a cog is triggered, the others are also influenced by each other one by one. Eventually, the whole system works as a result of various

interactions. If one of the cogs has a problem, the system cannot work efficiently. It may even fail. The employees working for the businesses are like these cogs. They all have similar or different tasks. To ensure the success of businesses, employee performance is need to be managed well. Performance is a dynamic concept that changes from business to business.

It is necessary to correctly define the concept of performance for each business and job description. Employee performance is a factor of which measurement and management has a vital importance for the success of an organization. It expresses how well people who serve a specific purpose in a working system reach their goals, and it may be evaluated quantitatively, qualitatively, objectively and subjectively.

2.1.2 Employee Performance Evaluation Concept

It is the measurement of an employee's abilities, potential related to work, working habits, behaviors and all of the work related qualities in business life, in comparison with the performance of his/her colleagues and his/her own performance.

Above all, in a workplace, performance should not be regarded solely as an employee's own performance. The concept of performance & performance evaluation can be shaped depending on many variables at work. These variables are listed below;

- Capacity, personal competence: The knowledge, skills, training, experience, etc. which an employee should have in order to perform his/her assigned task.
- Feasibility, workplace environment & conditions: The environment consisting of the ergonomic physical conditions at work and all the equipment related to the employee's work, which the employee need to have in order to be able to do his/her job properly.
- Desire, motivation: It consist of the effort that an employee must make in order to carry out a job description that he/she has, taking initiative, dedication and will to succeed.

2.2 Significance and Indicators of Employee Performance

Employees working in enterprises form organizations on the basis of departments. Organizations also form various institutions on a macro scale. Institutions which are actually organizational communities that process various inputs that they provide from environment through processes & people, and transform them into goods & services to meet people's needs and eventually deliver those to the environment again. Enterprises established to meet human needs are in an interaction with their own internal & external environments due to this input output relationship. Many corporate firms also make the departments which serve each other into customers by dividing them with commercial boundaries to increase the performance and success of the company. For example, let's consider a manufacturing enterprise; in traditional organizations, production and sales departments are located under the same roof in the company. These departments are transformed into two different companies through commercial boundaries under the same roof. In this way, the departments that serve each other become a true customer of each other. The production department faces various commercial penalties if it cannot keep its monthly production amount indicated earlier to its sales department which is its own customer (i.e. if it cannot meet the demand of its internal customers). The same situation applies to the relationship between the Sales unit and the company's own real customer. Companies need to manage this input output relationship well in their internal & external environment. In this regard, it is an important factor for an enterprise to manage the input output relationship with its environment in a healthy way in ensuring the success and sustainability of that enterprise.

Companies take the resources like people, information, energy, materials, etc. and transform them into products or services to meet the needs of their customers by subjecting them to various internal processes. Enterprises must be able to manage this process effectively, rationally and cost-oriented in order to be able to reach profitability and increase their market share. The primary indicator that constitutes organizations in this input output relationship is the human factor. Many enterprises

fail because they cannot manage or identify the human resource well. In this regard, identifying and managing employee performance is crucial for enterprises.

2.3 Employee Performance Evaluation and Historical Development

Employee performance evaluation can be defined as “the period during which an evaluator evaluates the performance of the workers at work through comparison and measurement with pre-established standards” (Palmer, 1993).

While human labor power was in the forefront at first, with the invention of weaving looms and steam powered vehicles towards the end of 18th century, the mechanization of various machines has increased, capital has become more important in enterprises and accumulation situation has emerged. We can characterize this revolution as the 1st industrial revolution.

In the mid-1800s, with the discovery of internal combustion engines, 2nd industrial revolution has started. Along with the above developments in terms of qualified work force, towards the end of the 1800's, it has been tried to focus on improving the physical, mental, emotional, qualitative and intellectual abilities of the individuals in order to use the arm and muscle power of the people more effectively. Again, in the same period, with the emergence of the concept of scientific management led by Frederick Winslow Taylor, the concepts of management awareness and employee performance evaluation has shown up as well. Along with Taylor's work, productivity-focused practices were performed to increase employee productivity, and job analysis, job description and performance evaluation methods were introduced and implemented. If we elaborate on Taylorism a little more, we can see that the aim is to focus on removing workers' non-value-added activities in the workplace and trying to ensure employees to work more efficiently and productively. Thus, the employee will be able to produce more output in a shorter time. Taylorism has been a pioneer in the evaluation of workers' work performance, the emergence of the concept of job analysis, the elimination of employees' non-value-added activities at work, personnel training and performance evaluation.

Today, performance evaluation systems, which depend on certain criteria according to the output generation of people using a certain input, have started to be used as a science in various institutions in the United States. In Turkey, they have been started to be used in the public sector at first has a seventy to eighty-year history. Subsequently, in 1943, Abraham Maslow introduced the hierarchy of needs theory. In this theory, it has been attempted to hierarchically classify the physical and mental needs motivating people to continue their lives. Maslow's hierarchy of needs consist of physiological needs, security needs, the need for belonging and love, the need for respect, and the need for self-fulfillment. According to this theory, the source of motivation for a person is not the external environment but the inner self, that is, the spiritual and emotional structure. Synthesis of Taylor's and Maslow's theories is a topic of discussion in today's employee performance evaluation systems.

The ability to reach and sustain organizational success in the long run depends on how well the employees working for the organization measure their performance, effectiveness of the performance evaluation system, collection of the data obtained after the ability to measure the performance and standardization and development of the existing performance evaluation system (Fisher, Schoenfeldt and Snaw, 1990).

With a well-designed performance evaluation system, it is possible for an enterprise to achieve success on the market it operates. The success of an enterprise in a sector and the situation of increasing of its profit margins in its own activity field can be explained by employee recruitment, evaluating the performance of the employees according to proper indicators, determining the incomplete aspects of the employee in order to improve the employee performance, making career plans for developing these incomplete and weak aspects, measurement and analysis of how well employees perform, and whether the data obtained in the performance measurement process is used to improve the performance measurement criteria that the enterprise has (Özçelik, 2000).

Today, one the most important factors that provide competitive advantage among enterprises is the human. Mankind has spiritual, physical and intellectual properties.

They also tend to continuously reflect these types of phenomena in their work lives. These factors must be taken into consideration in order to be able to evaluate human's work performance holistically. In order to motivate the employees in a sustainable manner, the performance evaluation system should serve these phenomena.

2.4 Benefits of Employee Performance Evaluation

If the employee performance evaluation process implemented in an enterprise is managed correctly, the outputs of the performance evaluation process can serve many purposes within the enterprise. The aim of the performance evaluation system implemented in enterprises is primarily to reveal the potentials of the employees and to enable the managers to recognize them better. This process generally provides inputs to the human resources department in many aspects related to employees in order to enable the employee to use his or her potential (e.g. skills) efficiently and effectively.

Enterprises maintain certain values existentially (vision, mission, etc.) within themselves. These values enable institutional organizations to survive and grow. At the end of the performance evaluation process, employees may feel that they are parts of the organization by internalizing the cause of existence and operability (survival) policy of that organization. Employees may have the opportunity to become acquainted with the objectives of the organization afterwards. It can provide a healthy and systematic way of wage planning for employees. It provides a road map for career planning in the long run to the employees. It can provide an input for a healthy management of the organization structure in the enterprise. It can ensure that the in-house organizational infrastructure is built on solid foundations. Or it may be possible to ensure the enterprise progress in terms of profitability and market share by putting high targets on the basis of departments for employees. By measuring employees' performance continuously within the enterprise and setting up challenging targets, encouraging the progress they made in themselves and their surroundings (even if they cannot reach these targets) and creating a sustainable

improvement culture can be ensured. The important thing here is that employee is the stakeholder in the process. It is actually the process that needs to be rewarded.

The continuous improvement that is adopted on employee basis will spread throughout the enterprise's culture and fill the inside and outside environment of the enterprise. In this way, the culture of continuous improvement will gain an identity within the enterprise through a successful performance evaluation and management system.

The benefits that performance evaluation systems provide to the executives, the employee's subordinates, and the employee's organizations are detailed below.

- Advantages for executives: Inputs that result from the performance evaluation system primarily enable executives to better understand employees, their potentials, job-related knowledge and experience, work-related physical strengths and resilience. In addition, it provides input to executives so that that the right person is placed in the right position when a rotation is made between positions of the employees, or when a position is got empty in an organization or when a manager searches the appropriate person. It provides input about of which employee's salary to be raised with what percentage. It also offers some negative or positive data about the increase in wage & competence.
- Advantages for subordinates: First, it allows employee to realize himself/herself as an individual. As a result of the performance evaluation system outputs, it is possible for the employee to explore his/her own boundaries by making an accurate career planning. Employees can better adopt the existing job description. The employee can motivate his/her colleagues in the workplace by influencing them positively. It can help employees to better understand what is expected from them. It can facilitate the coordination of employee activities by placing a certain pattern on the employee's behavior. It enables the arrangement of the relations of the functional departments within the enterprise with each other. It ensures that

employee development can be monitored easily during performance evaluation periods. It can contribute to the development of bilateral relations between the subordinates and the superiors in general, by allowing the employee to communicate with the manager at a common denominator. It increases the work satisfaction level of the worker and self-reliance of the employee. Employees will be able to discuss, analyze and compare their goals with the institution's goals. It also helps to create an atmosphere of debate about the extent to which the objectives of the institution are linked to their working goals. It allows the employee to inquiry his/her own work.

- Advantages for the organization: It leads the formation of the institutional culture in the enterprise. It provides employee dependency (loyalty) by increasing employee's sense of belonging to the business. In this way, corporate memory in the enterprise is also protected. Institutional integrity is ensured. It ensures a strong organizational structure. It contributes to the continuity of the organization by increasing its profitability and efficiency. It helps to increase the quality of service and duty in the workplace. All work-oriented efforts of employees are measured and reported in a rational and analytical manner. It ensures the satisfaction of the internal and external stakeholders of the institution. The work-oriented processes of the employees can become simpler. It contributes to the elimination of unnecessary activities in the processes.

2.5 Aims of Employee Performance Evaluation

- To ensure that successful & unsuccessful personnel are separated from each other within the enterprise
- To provide career planning suitable for employees' potentials
- Instilling the feeling that employees are important within the enterprise
- To strengthen employees' sense of belonging to the enterprise
- To uncover the strengths and weaknesses of employees and to improve the weaknesses.

- Directing the employee to the appropriate training program in order to make up his/her weaknesses
- To use in making administrative decisions about work placement, in-house rotation, promotion, dismissal
- To create a balanced, fair, employee satisfying wage system within the enterprise
- To ensure that the employee work more effectively and efficiently
- To increase employee motivation in work-related activities
- To arrange relations between subordinate-executive and subordinate-subordinate
- To enable employees to express their feelings and ideas clearly and intelligibly about their working conditions and job descriptions, or to create a transparent communication channel within the enterprise
- To ensure that the employee focuses more on the task
- To guide the employees (coaching)
- To ensure that the employee acts in accordance with enterprise's goals, vision and mission
- To increase individual and group potential within the enterprise
- To increase the market-share and sustainability of the enterprise in the competitive market
- To ensure that the continuous improvement culture in the institution is spread and adopted
- To prevent extinction of corporate memory by ensuring employee's continuity at work.

2.6 Usage Areas of Employee Performance Evaluation

- In rotation, business enrichment, business development and delegation activities
- In determination of the training needs for the deficiencies of employees
- In career planning and creating appropriate training plans for employees

- In works which are supportive for employee performance improvement by preparing a healthy communication area with employees
- In employee recruitment
- In activities like warning and dismissal of the employees
- In wage management
- In works to remove the sharp hierarchical boundaries between employees and executives and to increase the coordination between departments

2.7 Persons Evaluating the Employee Performance

When we look at small and medium sized enterprises, since the number of employees is low, generally first and second degree managers have more information about the performance of the employee. Also, employee's managers have a good grasp of employee's work. This situation can ensure that employee performance can be observed and evaluated healthier. As the business scale grows, the responsibilities of executives and employees expand. There would be more employees working under the same executive. For this reason, the executive may not be able to monitor the performance of all employees in a healthy manner. As the business scale grows, the organizational structure within the enterprise also changes and the organizational structure and functional relationships among employees become more complex. The people who can best determine the performance of employees in corporate enterprises are the executives or team leaders whom the employee work directly for. In this respect, the healthiest performance evaluation is made by the first-degree team leader. In this regard, it is important that managers or decision makers who have sufficient knowledge of the performance evaluation process, and who are with the competence to assess an employee's performance in a workplace should be chosen. The decision makers, competence of them and the tools they can use in the evaluation process are also issues to be considered. The process can be more effectively managed, improved and supervised by the choice of the right decision makers. This is an important step in the success of the performance evaluation system within the enterprise.

2.8 Principles of an Effective Performance Evaluation System

Performance evaluation systems must be based on a variety of principles in order to be implemented in the enterprise in a healthy way. As each enterprise has a different field of activity, firstly, an employee performance evaluation system that is appropriate to company dynamics and internal structure of the company (employee structure and organizational structure) should be searched. The individual targets set for the employees within the enterprise should be in line with the company's goals. The performance evaluation system should be easily understandable by employees. The software must be user friendly. The system should create a trustworthy environment for employees. In this respect, a system that is reliable and uncomplicated to apply and having measurement accuracy through specific methods should be established which has been approved and adopted by all. The performance evaluation system should be designed in such a way that the steps can be clearly explained to employees and can be internalized by employees.

The system should be objective and fair, and should have a well-prepared infrastructure. It should enable a frequent and healthy feedback cycle between employees to occur and continue. It must be supervised by trained and conscious people who have a grip on the process. In order to be able to build and develop the basic values of the system, the system must be supported by more than one source. Especially in multinational enterprises, it should be nurtured with more cosmopolitan accumulation of knowledge. Especially at the end of the process and at every stage, every kind of knowledge in the performance evaluation process should be stored in a comprehensible manner and should be reported to the top management.

In addition, the created system must be monitored continuously or at certain time intervals. To sum up, a good employee performance evaluation system should be a process that is continuous, transparent, periodically applicable, easy to understand by all employees, based on written and verbal communication, concurrent and reportable.

2.9 Issues to Be Considered in Employee Performance Evaluation

Performance evaluation systems must be well managed. If the process is not well managed, it is possible to encounter many problems. The process is a sensitive process that needs to be focused and managed in a serious way.

- Expenditures made for the performance evaluation processes may become a burden on the enterprises' budgets. Enterprises can receive services from a number of consulting firms to adapt these systems to their business. But the price paid may cause overspending for medium or small-sized businesses. This situation causes the investments made to these systems to be stopped.
- Unfair performance management systems cause employees to lose their motivation to work. It causes the employees' self-esteem to be damaged. As a result of unfair increases in employee wages, peace of the workplace would disappear. It causes psychological terror in the workplace. Employing the employees with same duties and having the same performance within the enterprise at different wages causes chaos in the enterprise. Employees who cannot get in return for their work question their work, and they may start searching new job opportunities. Thus, the employee turnover rate increases.
- The effects of racist and discriminatory behaviors originating from the managers on the performance evaluation system negatively affect the enterprise. This leads to the loss of qualified workforce.
- Avoidance of grading employees with bad scores by persons who evaluate employee performance can also be a problem for the enterprise. This prevents qualified and unqualified work force from being separated from each other in the enterprise.

2.10 Common Problems and Failure Causes in Employee Performance Evaluation

The performance evaluation process may fail due to the following reasons.

- The situation where it is unknown or unclear who will perform the performance evaluation. This situation usually arises due to the lack of management within the enterprise.
- The situation where the performance evaluation process cannot be well described and assimilated into employees.
- The situation where actual implementation of performance evaluation system by managers is not performed. Actual support of the top management must be taken in order for success to be achieved.
- Not giving adequate information to managers and employees about operation of the system.

2.11 Common Mistakes Made During the Employee Performance Evaluation

- **Central Tendency:** *The tendency of employees to turn to certain grades and scores on the basis of the employees evaluated for their performance.* In order to prevent this mistake, employees who have the same score continuously in certain performance periods can be watched and the reports related to these employees can be prepared. In these reports, reasons for what the employees should be reassessed can be stored on the person basis, and those employees' performance can be reassessed by assigning different methodologists or different managers. This effect can then be removed. This mistake can be eliminated by clarifying the limits of the performance criteria used at the time of performance evaluation at certain rates. When the evaluation criteria are separated by clear boundaries, the decision makers will be able to evaluate the performance of the employee more clearly. This situation can also provide flexibility and convenience to managers in terms of decision making.
- **Halo Effect:** It is the situation where the good and strong attributes (which are determined by performance evaluations) of an employee is focused, and the evaluation is performed based on those attributes. In this case, the weak features of the employee are in the shadow of powerful features. This prevents the employee from being fully assessed. The appropriate training plan for the employee cannot be prepared because the weak subject, field or

the characteristic of employee cannot be determined. The performance evaluation methodology will not meet the objective. This is the tendency of the decision maker to make an inaccurate evaluation according to the first impression as well as to be influenced by an extraordinary characteristic of the employee and to evaluate other characteristics according to this characteristic. As mentioned in this study, it is possible to overcome this mistake by evaluating each criterion according to the weights of the sub-criteria that have different weights, and/or evaluating each criterion separately from the other criteria. As stated in introducing the proposed decision support system, employees are primarily assessed according to the sub-criteria dependent on certain key criteria. These main criteria are primarily concerned with the level of importance of the opinions of the decision maker (manager) about employees on the basis of certain evaluations. The main criteria also have the significance levels (criterial weights) which are calculated based on the opinions of the manager. Analytic Hierarchy Process, which is one of the multi-criteria decision making algorithms, is used in calculation of the weights of the main criteria and sub criteria.

- **Horns Effect:** It is the effect where decision makers perform performance evaluation of whole employee by focusing on the bad characteristics that employees have at an extraordinary or normal level. It's the exact opposite of the Halo effect.
- **Leniency:** It is the case where decision makers give the employee more points than they deserve during the performance evaluation. One of the reasons for this situation is that the manager does not prefer to oppose with the employee.
- **Contrast Effect:** It is the situation where employees are evaluated according to each other's characteristics instead of performance criteria of themselves. In detail, when a decision maker evaluates multiple employees in turn, the mistake arises because the decision maker evaluates successive employees in the same way and reaches the same value judgments. Or when a manager finishes evaluating a successful employee, the manager can evaluate the next

employee as successful as well although he/she is unsuccessful. To prevent this mistake, it must be realized that all of the employees are different individuals.

- ***Mistake where decision maker influenced by near-past occurrences:*** As known, performance evaluation is a process that takes place over a period of time and actually covers a long period. When making this evaluation, the decision maker shouldn't evaluate the employee only in the light of his recent performance. This leads to an incorrect evaluation of the employee's performance. Because a successful employee can fail due to unfortunate life occurrences in certain periods of his/her life or just because market conditions are bad. This may lead to an incorrect evaluation of the employee's performance. To prevent this, the performance of the employees must be assessed holistically for each period. This will prevent evaluation from falling into this error. When the reason for failure of the employee is considered, it should be taken into account that this may also be due to situations that the employee cannot control. In such cases, all the data should be analyzed carefully and all factors should be taken into account.
- ***Similar-to-me:*** It is the tendency of decision makers to give higher scores to employees who resemble themselves in the sense of employee attitudes, behaviors, and life stories. For example, an employee who graduated from the same school with an evaluator thinks that he has a high performance, assuming he/she is receiving the same training as evaluator. Managers often have the potential to mislead because it affects employee performance in many ways.
- ***Influencing by position:*** Let's consider the sales department within the enterprise. Suppose that the sales department is divided into two branches as customer sales and sales operations. Generally, during performance evaluation, managers tend to score higher on employees working in customer sales due to the department they are working in, even though the performance of the employee is poor. In this case, the employee working in the sales operations department will be pushed to the second plan in terms of performance score. Employees can also be considered successful by focusing

on the company's reputation or success instead of performance of the employee at that company. To avoid this mistake, the employee must be assessed according to his / her success.

- ***Attribution Errors:*** This error is one of the most common mistakes encountered in enterprises. When employees achieve success, this achievement is attributed to executives in the first place. However, if there is a specific failure of the employee, it is attributed to the employee but not to the executives.
- ***Errors Caused by Personal Value Judgments:*** The employee's performance assessed is biased according to the social status, religion, language, race or behaviors of the employee or as for whether the decision maker get well with the employee or not. In this case, the performance of the employee at the workplace should be taken into consideration as much as possible. The individual's social life should not be confused with his/her performance at work.
- ***Technical Errors:*** Errors arising from the fact that employees and managers are not sufficiently informed about the performance evaluation system or are unable to understand the evaluation criteria to be used in the process. In order to prevent this error, it is necessary to provide clear and understandable information about the performance evaluation process within the organization. To achieve this, a performance evaluation guide can be created and spread to employees.
- ***Severity:*** The case where the evaluators give an employee less points than he/she deserve.

2.12 Employee Performance Evaluation Process

Today, the main objective of human resources in the management process is to find and operate a qualified workforce and to ensure that this qualified workforce develops in parallel with the enterprises' goals. These activities can only be performed through an effective employee performance evaluation system.

Enterprises are organizations that have unique identities. Many enterprises have a specific and unique organizational structure required by their field of activity. We can evaluate the organizational inner-structure as organizational climate. In this sense, it is important to design an employee performance evaluation system suitable for the organizational climate. Evaluation systems designed by ignoring the organizational climate is condemned to fail.

Performance evaluation systems should serve the purpose of monitoring, analyzing, developing and providing feedback of employees' behaviors in the work environment and their work-oriented behavior. Before the process starts, the group of persons for whom the performance evaluation is planned should be selected. Care must be taken while designing the process clearly and transparently. The performance evaluation process flow chart is presented below.

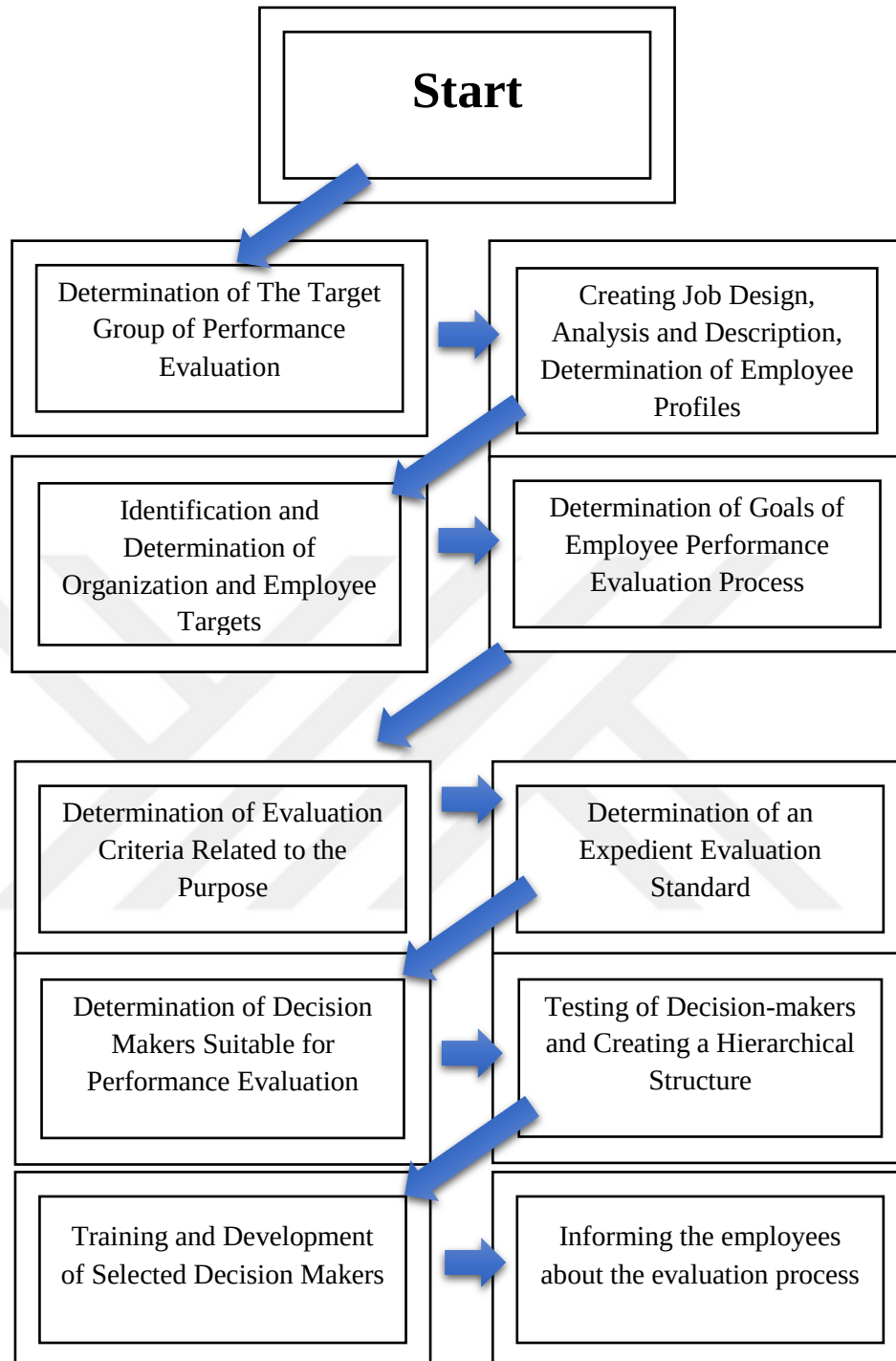


Figure 2.1 Performance Evaluation Process

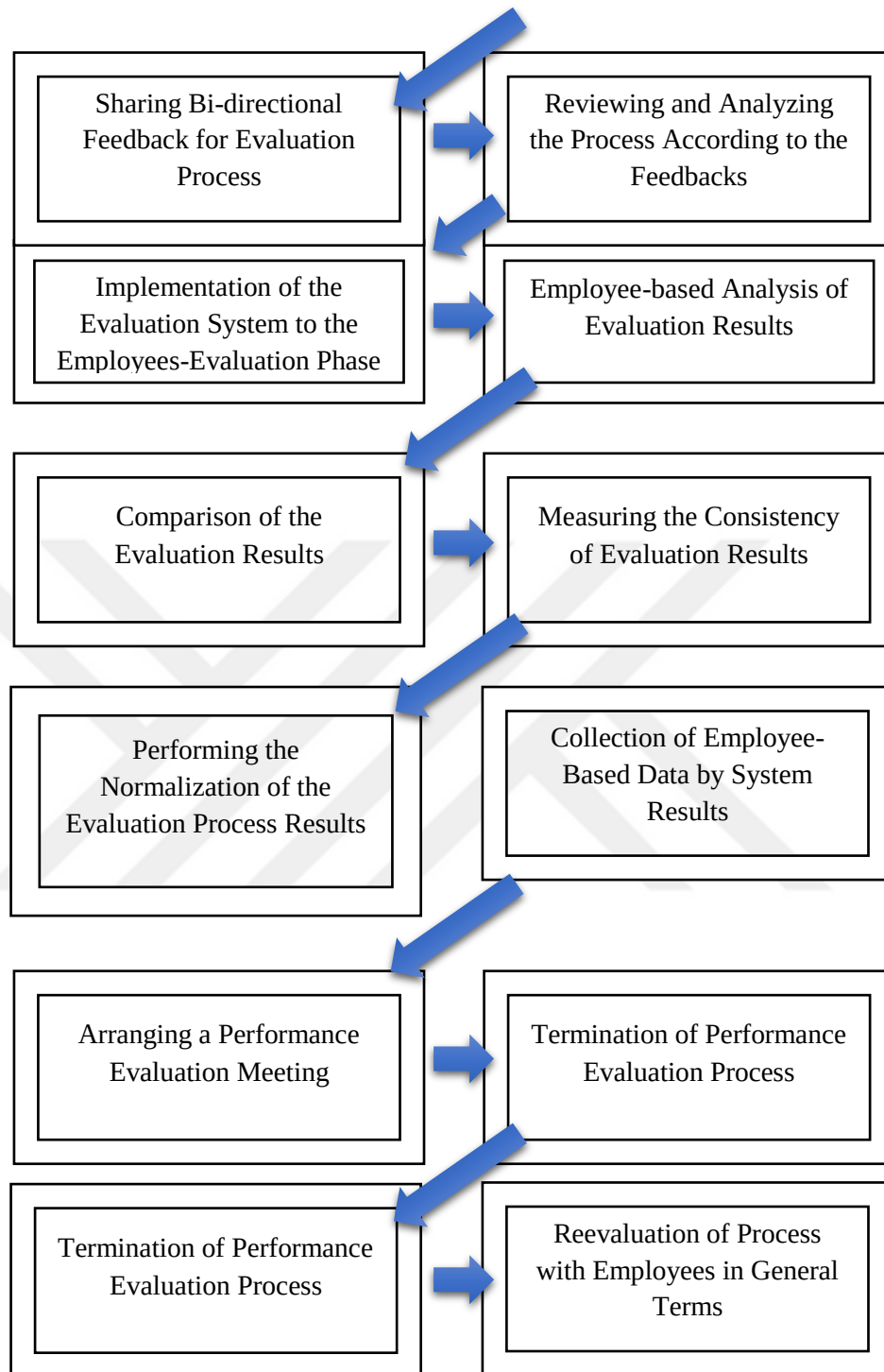


Figure 2.1 continues

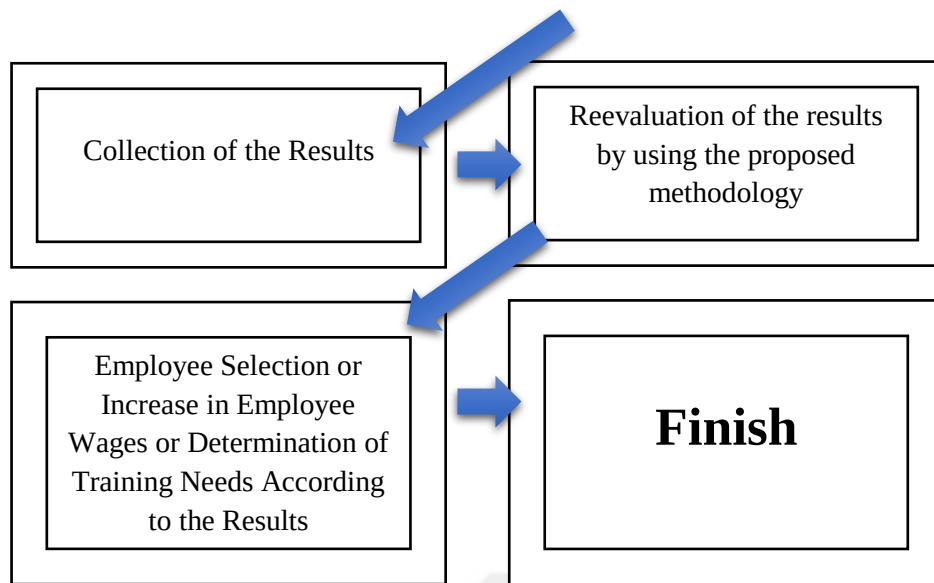


Figure 2.1 continues

This process can be considered as a preliminary study of the employee performance evaluation system which will be discussed more in this study. The above mentioned flow can vary according to the organizational structure of the business entity and it does not have the characteristic of being a general flow.

2.12.1 Determination of the Target Group of Performance Evaluation

Before starting the process, the target group should be determined. It is determined which groups of people will start the process and which department's performance will be evaluated.

2.12.2 Creating Job Design, Analysis and Description, Determination of Employee Profiles

The job description is the whole set of activities that enable employees to create value to the business to generate a certain output. The contents of job descriptions of the employees are clarified, and executives are fully informed about what employees have done. Employees should be clearly defined the limits of their job descriptions, and it should be notified to employees. The fact that job descriptions are clear in the

business can ensure that the performance evaluation process runs smoothly. Unless job descriptions are clear, employees can not accurately determine the priority level of jobs in job descriptions. This can lead to chaos in the business.

Once the job descriptions are clear, the work of the employees must be analyzed. If we are to explain the concept of job analysis here, we can express it as the employee performing the job, all the activities that need to be done related to the work, and the process of separating and determining the parts at micro level and documenting them. The group of employees to be evaluated must be subjected to a job analysis. The information obtained as a result of the job analysis are the information about the position of the employee involved, the kind of equipment they use, how they use those equipment, the relationship between the department and other departments, the level of knowledge, skills and experience the position require, the standards of success for job description, the goods and services obtained after the employees' activities, and the employees' internal and external environmental impacts as a result of their activities.

Various methods are used in job analysis to obtain the information mentioned above. The main aim of these methods is to achieve, collect and store the related information in a healthy way. These methods are described in the following section.

Information-Document Collection method can be applied before starting the work analysis.

Information-Document Collection Method: It is one of the applications made during the preparatory phase of job analysis. Here, firstly, all kinds of information and documents about the organization are collected in order to recognize the organization to be analyzed. Information about the organization, the aims and structure of the organization, and the type of inputs and outputs that are processed will be gathered. Subsequently, the parts and job descriptions to be analyzed are determined. Then, retrospective job analyzes should be made on the job description determined.

Survey: It is a widely used method for further identification of the job to be analyzed. The right questions are prepared here for the definition of the right task for defining the job to be analyzed. The questions should be in accordance with the structure of the organization and the nature of the job to be analyzed. Questionnaires prepared with the right questions need to be applied to the right people. The people who prepare the questions (business analyst) should at least be aware of the outline of the job to be analyzed.

The disadvantage of this method is that the questionnaires given to the employees are filled lightly and seen as a waste of time by the employees. The process may not be successful if the prospect of the surveys is not assimilated to the employees. During the implementation of the survey, a communication environment based on a continuous feedback should be maintained between the employees and the business analysts. In other words, when necessary, business analysts should provide counseling services to employees on questions.

Before the observation, there must be a preparation process involving data collection about the job description to be observed and information about the institution. The information obtained from the research of various written sources and the information obtained from the first person doing the work may differ. The difference between theory and real life cannot be denied in terms of work done. Therefore, when analyzing a job, it is necessary to analyze it in its own nature. In this way, you can get more factual information about the job and know about the various internal and external environments that affect the business. At the same time, the person to observe should have a good memory of observation. He must be able to communicate clearly and in writing and verbally. Afterwards, the work should examine the input and output to other jobs and should be oriented to the concept of the overall role of the job within the organization as a whole. In addition, employees should be observed without being noticed. Employees may feel uneasy when they notice that they are being observed. It is therefore important that the monitoring process is performed as feasible as possible.

Interviews and Meetings: In this method, interviews are held with the participation of the employee, business analyst and the relevant manager. Here, the business analyst asks several specific questions about the work done by the employee. The questions generally are about better understanding and analyzing the employee, job environment and job description. As the first question, it may be asked what the employee does in general. Employees may be asked to describe their work in their own eyes. They may be asked what are the requirements related to their job. Open-ended questions that are asked to the employee can lead to a better understanding of the employee's area of responsibility.

Combined Methods: The above mentioned methods can be used individually or in combination. In combined methods, firstly all kinds of information and documents about the job to be discussed, the requirements of this job and the related institution are collected. Then, through these collected documents, questionnaires are created according to the job and the requirements. These surveys are applied to the working group, which is also referred to as target group. Then, the results of the survey are collected and synthesized to gain more detailed information about the process. Later, interviews with business analysts and employees are made with the participation of managers. The accuracy and consistency of the information obtained through the documentation and questionnaires are measured in the interview step that is the last step. After the job analysis, job descriptions are formed as a result of the collected information being related to each other and merged. When we look at an institutional firm, a staff member is entitled to a fee as a natural result of realizing the job description they have. A job aside from employee's job description is rarely encountered. When we look at the process, a job-task definition emerges as a natural consequence of business analysis. Clearly defining the job descriptions in the enterprise through job analysis is important for employee performance evaluation systems.

2.12.3 Goal Setting

Identification and determination phase of the goals of the organization and its employees are important for the creation of the identity of the employee and the organization. At this stage, it is possible to set individual business targets in parallel with the corporate objectives, starting from the job descriptions. Within the enterprise, the concept of the goal exists in two ways. The first is the micro-level employee goals and the second is macro-level organizational goals that cover the entire enterprise. Goals must be accessible, concrete, clear, understandable, sustainable, dynamic, real, suitable for in-house dynamics and measurable.

Individual goals enable the employee to get answers to questions such as "what am I here for?", "What is the meaning and the purpose of my work", and "what do I serve by working in the enterprise?" Benefits of individual goals enables employee to improve himself/herself. It helps the employee to compare former position in the enterprise to his/her current position. In this sense, it allows the employee to answer questions such as "Where am I in terms of career?", "Where am I supposed to be?", "Can I really reach my aim?" It also allows the managers to inquiry the way they manage their employees. In this sense, employees and managers have the opportunity to question each other individually. In the long run, it is a route map for the future of the employees and can help to clarify career ambiguities.

Once the goal setting is achieved, it provides job satisfaction. It makes the work more robust. Also, there will be an increase in personal self-reliance. Finally, it can create an auto control mechanism that improves employees' own performance by identifying employees' individual goals. Together with this mechanism, employees are able to develop their performances faster.

Organizational goals concern the whole of the organization. In scope, the entire organization influences the internal and external environment it is related to. Such targets first determine which direction the organization should go. Thus, as an institution, the market to be focused on, customer mass, etc. will be determined. It

helps identifying the training needs of employees in the business and ensure that their deficiencies are eliminated. It ensures that the spirit of continuous development within the enterprise grows. It helps to ensure that corporate utility and productivity are spread throughout the organization. The fact that the individual goals within the organization are in line with the organizational goals enables the employee to feel as a whole with that company. This ensures the integrity within the company. Institutional climate will also be shaped together with these goals, and a more stable structure and continuity will be achieved.

2.12.4 Determination of the Objectives and Performance Evaluation Criteria

Once the organizational goals are identified, the objectives of the performance evaluation system to be implemented are determined. Then, the criteria are set up to achieve these goals. In order for the system to achieve success while the criteria are being developed, it is necessary to classify them according to the job descriptions. Different criteria should be defined for each job description that will be evaluated, if any. When viewed from this window, each task description has different responsibilities and requirements. In addition, the criteria should be clear about the definition of the task to be fully evaluated. The content of the criterion should also be relevant to the employee's work and the business environment, and it should offer the opportunity to evaluate the employee as a whole.

2.12.5 Determination of the Relevant Evaluation Standard

According to the predetermined criteria, the importance of each criterion should be determined. Calculation of the significance ratings of the criteria is made mostly according to the decision-making methodology. Afterwards, what is to be measured in the evaluation system is determined. After the criteria to be measured are determined, it is necessary to identify what is described as successful when the personnel are evaluated according to the criteria. Definitions should be made about what is classified as good or bad in the system. They must be filled in accordance with the ongoing needs of good and bad performance concepts. The evaluation

process is settled to a specific standard after being answered the above mentioned questions.

2.12.6 Determination of the Implementation Period

It is important to determine in what ranges the performance of employees should be evaluated. In some enterprises, performance evaluation process is done every 6 months and employee salaries are updated after the evaluation process. In this sense, it is important to determine the optimal time periods. Nowadays, some companies tend to shorten the performance evaluation periods to almost daily basis.

2.12.7 Determination of the Performance Evaluation Method

The performance evaluation method that is planned to be applied to the employees is determined. The method should be designed to meet the needs of the employee, manager and institution, and should be specific to the organization. Besides, it should be designed in such a way that it can serve to the whole institution.

2.12.8 Determination of the Decision Makers Appropriate for the Performance Evaluation Method

In this phase, the employees who work as the decision makers in performance evaluation process are determined.

2.12.9 Testing of the Decision Makers, Creating a Hierarchical Structure, Training of the Selected Decision Makers

The selected decision makers are evaluated among themselves. Evaluators can be classified according to a specific hierarchy based on their competence. Then, in order for the system to function properly, the decision makers' educational deficiencies are determined and missing aspects are strengthened. Decision-makers trained on the

process will be more experienced and able to guide employees well during the evaluation process.

2.12.10 Informing the Employees About the Evaluation Process

Each step of the performance evaluation process needs to be adopted well to the employees. The process will proceed in a healthy way with full participation of the employees.

2.12.11 Feedback Flow Related to the Evaluation Process

There must be a bi-directional information flow for the evaluation process. The feedbacks should be documented. In the light of the feedbacks, it is ensured that the performance evaluation process can be reviewed another time. The perception of an employee about the evaluation process may be different, he/she can notice some points that managers couldn't see in the system. Therefore, the feedback is quite important to understand the process better.

2.12.12 Analysis of the Employee Evaluation

Performance evaluation results are collected and stored on an employee basis. This information creates the input for the next step, performance interview step. It is used as an adjunct in decision-making to the decision maker in performance interview.

2.12.13 Arranging a Performance Evaluation Meeting

Based on the performance evaluation score of an employee as a result of performance evaluation, some decisions are able to be made related to the transfer of that employee to another department or duty, promotion, bonus, job removal, enrollment, career planning and training needs etc.

2.12.14 Measurement of the Success and Efficiency of the Process

After the evaluation process is completed, the feedback is received from the employees, and the issue of whether the process actually reaches its purpose is discussed. Opinions and ideas about the performance evaluation system are shared. If there is something missing in the system or something that is open to debate, the process can be evaluated from scratch and necessary steps can be taken to improve the system.

2.13 Employee Performance Evaluation Methods

Some of the employee performance evaluation methods are described in the following.

2.13.1 360-Degree Performance Evaluation Method

In traditional performance evaluation methods, the manager evaluates the employee according to his/her objective and subjective value judgments. The personnel performance evaluation process is completed in one step. The disadvantages of this type of performance evaluation process are that the process is one-way, only manager-dependent and one-stage. Employees cannot make any assessment about their performance. They cannot give feedback on their performance. Even if you make an evaluation, it may not be taken into account by the senior management. In this regard, the system should not be unidirectional.

The process must be cyclic. A person's comments about the employee may not be fully accurate. In order to be able to better evaluate employee performance, it is necessary to refer to as many views as possible. In addition, the employee should be allowed to evaluate his own performance. When the opinions and recommendations of more than one person are collected and analyzed together, the performance of the employee can be evaluated more objectively. Thus, the process consisting of completely subjective concepts can be objectified as much as possible. 360-degree

performance evaluation technique is based on the above-mentioned versatile performance evaluation methodology. For example, let's consider a procurement planning specialist working in the material management department at a company. The general job description of a procurement planning specialist is to provide the quantity and type of supply of the product group for which he/she is responsible, in order to ensure continuity of production in the factory. In this sense, the employee with this job description should be in contact with many suppliers who produce the product group they supply. When evaluating the performance of this employee, it is firstly evaluated by the managers that the employee is working under. Subsequently, people are evaluated by the departments where they are functionally related in accordance with the employee's job description. Afterwards, the employee is also subject to the evaluation by the employees of the company to which he/she supplies material. Thus, the employee is evaluated for performance both within and outside the organization. Employee performance is evaluated multi-dimensionally by 360-degree performance evaluation system.

Hereby, the above mentioned performance evaluation mistakes will be eliminated to some extent. A fair performance evaluation system can be put in place if the employees' specific task areas are evaluated. The disadvantage of this process is that the surveys done by more than one person (stakeholder) can take a long time. If the employee keeps track of the negative comments made about him and finds the sources who make these comments, this can lead to a tense environment at the workplace. If the process is not well documented, the performance evaluation results of different employees may be confused. This can lead to a false impression of the employee. However, if the process is well managed, it is a likely way of achieving success.

2.13.2 Sorting Method

In this method, regardless of the employee's seniority or job description, employees are collected in a pool of assessments and evaluated according to the manager's subjective judgment. The main factor in the focus of the evaluation

methodology is the judgment of the manager. As the qualitative judgments of the manager cannot be clearly expressed in a quantitative scale, it is impossible for the manager to clearly distinguish the performance of the employees from each other. If the manager cannot express exactly with what criteria he/she evaluates the performance of the employees, and if the employees are conscious of this situation, the motivation and morale of the employee may be lost. This method can be classified under four main headings. These are; simple sorting method, alternative sorting method, scoring method and binary comparison method.

- Simple Sorting Method: In this method, employees working in the same department in an enterprise are treated. A list of the employees with the best performance is created. The method is extremely simple and economical, and can be applied easily and in a short time. It enables the manager to save time. As it is based on managerial judgments, it is subjective. However, employees cannot have clear information on how their performance is assessed. Therefore, it is an undesirable method.
- Alternative Sorting Method: In this method, all employees working for a company are written on a piece of paper. It is ensured that the employees with the best and worst performance are identified. The disadvantage of the method is that it is not possible to determine the performances of middle level in the enterprise.
- Scoring Method: A certain base score is determined in this performance evaluation system. This score is shared among employees. Subsequently, divided points are distributed according to the performance status of each employee. Ultimately, sum of these performance scores received by all employees again equals the base point determined by the employer. Employees are ranked according to their performance scores.
- Binary Comparison Method: It is a method to compare employees according to certain performance criteria determined by the managers. In this method, positive feedbacks that employees receive on the basis of binary comparisons are collected and the performance of employees is ranked.

2.13.3 Behavior-Based Scoring Table Method

This method is to evaluate the performance of the employees by means of the scores determined by the managers according to the specific characteristics of the work towards the work done by the employee. Criteria that are performance standards for the job description of the person are determined. With these criteria, very good, good, average, bad etc. choices are assigned with certain scores by the managers. According to the criterion, the employee is evaluated according to each specific characteristic towards his/her work. This method determines the extent to which an employee performs a variety of behaviors and tasks that his/her job description requires. In a job description, there may be more than one specific criteria in parallel with the employee's authority area.

The long duration and cost of this process is one of the disadvantages of this method, in which each of these specific criteria is identified and evaluated on a personnel basis. Time and cost is one of the reasons why this method is not preferred. This method can be considered as a waste of time in terms of decision makers.

2.13.4 Method of Valuation with Respect to Objectives

In this method, the employer and employee come together to discuss and determine the goals and objectives of the organization. Once the goals and objectives of the organization are identified, the objectives and targets of the employees are determined. A specific time frame is determined afterwards. Various input and output evaluations are made on the basis of the organization and the employees. The relationship between planned goals and current situation is examined. In this way, performance of the employees is evaluated according to the concrete results. The disadvantage of this method is that it makes the employees very dependent on each other and on the organization. This may affect the creativity of the employees in the future positively or negatively.

2.13.5 Business Standards Technique

There are often job-specific job descriptions of employees. In this technique, evaluation of employee success is based on the output the employee has achieved in the sense of his/her job description. The evaluation among employees may not be objective, as the criteria by which employees are evaluated are the same, even though the factors and the environmental conditions may differ. Here, employees are evaluated on the basis of the relation of his/her output obtained by processing the particular inputs. It is a method in which efficiency and effectiveness of the work is evaluated.

2.13.6 Free Expression Method

In this method, a file containing the performance of each employee in the business is created by the manager. A free text technique is used. Strengths and weaknesses, and competences of the related employee are written. The success of this method depends on the ability of the manager in the workplace to observe and analyze the employee and to express himself/herself in writing as well as to express related employee's work activities. The process is subjective. Its reliability is often argued. It does not have a particular pattern.

2.13.7 Valuation Center Method

This method is one of the most important methods today. This method combines more than one method. It can be used, for example, when an employee is scheduled to get promoted. Firstly, employees who are shown as candidates for a position are identified. Then the candidates are subjected to individual tests. They participate in various case studies. The reactions and behaviors of the employees at different occasions and their performances are monitored and reported. The data obtained about the employees within a certain period of time are stored. Candidates subjected to a series of tests in groups are formed afterwards. Participation in specific case studies is provided in specific groups. In this way, employees are compared and

evaluated on equal terms, against each other and against the proposed actions and performance levels. According to the collected data, the employee to be promoted is determined more clearly and objectively. Decision makers in this process are generally human resources managers, psychologists, experienced managers within the business, consultants, and so on. This performance evaluation method is often used by senior manager selection.

2.13.8 Self-Evaluation Method

It is a performance evaluation system based on self-evaluation of the employees. When evaluating his/her own performance, he/she can see better what the manager has missed and can evaluate himself fairly. Employees can pretend falsely to their managers and colleagues. It is more difficult to mislead them in the sense of individual performance. This method can help the manager better define his/her personnel. It also provides clues as to how the workers' motivation can be improved. This method contributes to the recording of positive developments in the performance evaluation system if it is used together with other methods.

2.13.9 Team Based Performance Evaluation Method

In the past, employers defined the employee as someone who performed a specific task given by the manager within the enterprise. The employee was the only person who was doing the job expected from him/her in the framework of his job description. Today, the situation is completely different. In addition to the previous definition, the employee is defined as the person who brings creativity and productivity to the business. In this sense, employees are now a weapon in the organizations that are working and sustaining the competitive advantage. The concept of the individual, which has an important place in the past, has left its place to teams. Employees have various needs within the enterprise that they cannot meet individually. These needs can often be met through groups/departments of which they are members. Synergy and harmony between employees are very important for an employee to be able to show his/her creativity within the enterprise. The most

important feature of this method is that it provides an atmosphere of peaceful competition, cooperation and solidarity among employees. The employees are evaluated as a team. The synergetic environment that employees create by triggering each other also enables the performance evaluation system to succeed. The disadvantage of this method is that employees are not individually evaluated in detail.

2.13.10 Critical Incident Evaluation Method

This method is based on the observation of employees by their managers. Managers observe the work-oriented performance of employees within the working hours, as well as the proactive or reactive attitude towards events that occur within the enterprise. They identify specific critical events and observe how the employee acts in response to these events. These observations are recorded and stored on an employee basis. The managers must be good observers. Without disturbing the employee, they often follow the actions of employees in certain critical events. If the employee notices that he/she is constantly monitored, he/she may be uneasy and unable to give himself to the work. The employee may be affected negatively. In order to avoid such situations, the process should be well managed. The method has no specific time or period requirement. The process is triggered and starts when a critical event occurs.

2.13.11 Modern Performance Evaluation Systems

As stated before, there exists many performance evaluation methods. Today, companies that are market leaders have developed their own performance management systems. Classical performance evaluation systems are unable to meet the needs of companies operating in changing and developing market conditions. In order to increase the culture of continuous development and innovation within the company, new applications have been carried out.

The characteristics of modern performance evaluation systems are listed in the following.

- The employee does not feel the pressure of the senior management.
- Employees are encouraged to try again even if they make mistakes. When a worker makes a mistake, the worker's service contract is not terminated immediately. On the contrary, these errors are recorded in the enterprise memory. This allows the employee to be more careful and experienced while working on his/her work.
- There is no feedback given to the employee with criticism and negative style about bad performances.
- The important part is the process by which the employee achieves this result rather than the success or failure of the employee.
- It focuses on improving the weaknesses of employees.
- As far as possible, there is no bureaucracy or unnecessary hierarchy within the enterprise.
- Communication channels within the enterprise are open. Employees' access to each other is not restricted or limited.

Tracking unrestricted minds that are completely free can reveal an extremely difficult environment of change. Employees can get rid of many pressures that limit themselves within the enterprise and increase the dominance of the business within the market and can ensure that the company to reach the leader position in the market.

Today, professional enterprises remove the performance evaluation system and use a variety of human resources software to maintain continuous communication with the top management. There is continuous and uninterrupted communication between the manager and the employee. Employees' performances are not evaluated in certain periods such as standard performance evaluation systems, but are assessed on a daily basis. In these systems, the employees' work-oriented activities are monitored by software, when the employee does something wrong, there is a double

feedback loop in many topics for that. By means of this momentary feedback cycle, the performance evaluation systems are constructed from scratch. Thus, it is also aimed to eliminate the fear and anxiety caused by the distance between the company employees and the senior management. The form of communication in the business is informal in the positive sense.

The system that is being edited is held responsible for instant follow-up on directing of the manager's employee activities. The managers are involved in the business process as much as possible. In the event of an adverse situation, the administrator is immediately involved in the process to remedy this situation through this instant network. This system is also one of the modern performance evaluation systems.

Systems implemented within companies may be abused by employees and managers. In order to prevent such situations, it is possible to place control mechanisms in the system in such a way as to support the worker in a certain way and to have a positive effect on the employees.

When we look at the companies which are today's big market leaders, we can see that they are leaving their performance management systems to rating and scoring or binary comparisons with revolutionary decisions.

It is stated that periodical reports of various managers and related paperwork related to performance evaluation studies occupy both managers and employees' times in a way that cannot be underestimated. Human resources agree that the classical employee evaluation systems used in the past, according to the considerations of the majority of managers, do not provide sufficient information about the employee. The perception that previous performance evaluation systems are causing unnecessary cost and time to operate is spreading more and more. Large companies are planning to simplify their performance evaluation processes as much as possible with the revolutionary decisions they make. For example, they are trying to adapt themselves to their own internal (organizational structure and dynamics)

feedback system and to implement it in their own way, where the employee is asked questions less frequently and the employee performance is evaluated every day. Besides, instead of comparing employees to other employees, they are trying to design systems in which employees are compared within themselves.

According to some researches, it is seen that the creativity and productivity of the employees who have good performance in improperly managed performance systems are adversely affected. Performance evaluation made in the shadow of the manager's subjective judgments also causes employees with good performance to have low morale, motivation and job performance as a result of low performance scores and feedbacks. The employees with low level of performance but loves to make themselves prominent within the enterprise causes that executives make incorrect decisions and the performance management process to fail in the long run. In this respect, it is necessary for managers to distinguish good and bad performance among the enterprises well.

In order for performance management systems to be successful, it is very important that the selection of the right personnel at the beginning and also the recognition of the employees in the enterprise by the employers must be good. In addition, managers in the enterprises must have many features. Managers should initially choose the right person to the right job and employ him/her. They must innovate to employees who are competent to the job, and they must be given a sufficient level of authority so that they can lead in various operations within the enterprise. They should share their responsibilities with their employees at certain rates. They are required to monitor employees' behaviors in a proper manner while the employees are provided with responsibilities at specific rates assigned to them. Employees should be guided by the managers after the transfer of authority.

Managers should remind employees of their shortcomings through performance evaluation systems, rather than constantly criticizing them and elongating the distance between them. They should give more guidance to employees. At the distances of communication, the continuous feedback mechanism established within

the enterprise is removed. In doing so, they are making an extra effort to improve themselves every hour of the day. However, such systems must be well controlled and monitored by establishing control mechanisms within the enterprise. The process will fail if it is not managed well with the control mechanisms in the enterprise.



CHAPTER THREE

DECISION SUPPORT SYSTEMS

The human mind has limited judgment ability to calculate various probabilities. For example, suppose you are shopping in a mobile phone store, look at mobile phone models. As the number of phones increases, the customer is confused about the phone selection. The customer may not be able to decide which phone to buy or may have difficulty making a decision. Here, the importance of decision support systems arises.

Decision support systems have been developed to calculate and analyze more than one probability related to a situation. Basically, they are based on binary comparison, sorting methods. With the proposed decision support system, it will be possible to make employee performance evaluation that can be done by human intelligence for a very long time in just a few minutes. The proposed system can be employed by top management and the human resources department in an enterprise. It can be defined as a collection of computer based videotaped systems that are used to collect information about the subject when it decides a relevant matter related to the employees, to store information easily and quickly when needed, and to use information for various managerial decisions.

The areas of responsibility of employees working with growing organizations are expanding, and employees are trying to be judged on a number of criteria about themselves. This does not allow the employee's performance to be fully assessed, as traditional methods assess the employee according to one-sided and fewer criteria. More precisely, it causes the performance of the employee to be viewed from a single, limited window. Therefore, it is necessary to evaluate the performance of employees in more than one criterion. This is possible with decision support systems.

Decision support systems support decision makers in solving complex problems encountered in business. They are not systems that decide, instead they are developed to support decision makers. They help the decision maker to get a sense of

a particular system. They are computer software based systems. They can be designed to associate with multiple systems. They allow multiple criteria to be evaluated together, interactively or non-interactively. Decision makers benefit in terms of time, cost and having a healthy information. They ensure that the right information is collected and processed to solve a problem in the enterprise. In this respect, they provide flexibility for decision makers to make better decisions. They can be designed and integrated with an analytical method. In certain cases, the employee may or may not be able to intervene in the system. They provide support for the taking of group and individual decisions through the systematic adaptation to the changing quartile. They are systems that adapts quickly to changing environmental conditions and has the ability to respond quickly. The mission enables multiple managers in different levels of the chain of command to communicate on a common ground thanks to the decision support system. It is important that these software packages are easy to use by employees. User-friendly interfaces are designed to ensure that the user is not overwhelmed by the numerical data.

3.1 Usage Areas of Decision Support Systems

Decision support systems are employed in many areas such as human resources management, selection of suppliers in purchasing activities, selection of the most appropriate market in sales and marketing activities, risk analysis, portfolio analysis, production planning and providing early diagnosis of diseases.

3.2 Advantages of Decision Support Systems

It provides time and cost advantages for employers and employees. It provides a sustainable competitive advantage among the competitors of the enterprises. It enables employees to work more efficiently and effectively at the workplace. By accelerating the problem solving process, complex problems can be solved more easily and in a short time. It enables removing communication barriers between people and departments within the enterprise to improve communication. It supports in-house learning. It helps to collect and analyze relevant information on decision

making. It supports the development of new approaches to problem solving. Provides automation of administrative activities. In this way, managers can make decisions faster, save time and work more efficiently. Helps increasing creativity between groups through group decision support systems. Enables higher quality decisions to be taken. Many information in the enterprise can be gathered better and accessed easily when needed and used more effectively. Decision makers offer more alternatives quickly. It improves the ability to adapt quickly to changing environments and conditions.

3.3 Components of Decision Support Systems

Decision support systems contain three basic components. The first component is the data matrix infrastructure. In order to be able to develop a method for solving a problem, it is necessary to have knowledge of the problem. First, the relevant data should be collected from the inside and the outside of the enterprise. Data sets are generated after the relevant data is collected. The data sets are arranged and organized within themselves. Data stores are created in order to store the organized data. Functional data matrices for decision support systems are thus created.

The second component in decision support systems is the computer software infrastructure. It is the part of the software that the decision support system will use including the method. It has a hybrid structure and may contain more than one interdisciplinary method.

The final component is the interface between the decision support system and the decision maker or user. It is the only section where the decision maker communicates with the decision support system. Here, decision makers can provide data entry to the system to trigger and run the decision support system.

3.4 Types of Decision Support Systems

Data-Based Decision Support Systems: The human brain does not have a structure that can call multiple data, linking them and making analysis between them in a short period of time. Large enterprises have big data because they have a wide range of responsibilities and activities. It is important to separate useful information from unnecessary information among the data chunks available in the systems. In order for decision-makers to be able to make efficient decisions, they need to be able to access the necessary data efficiently. By using useful data, accurate and effective decisions are given. These systems provide the separation of information within the enterprise and support decision-makers' decisions.

Model-Based Decision Support Systems: These are the decision support systems that use various mathematical and statistical methods.

CHAPTER FOUR

APPLICATION OF THE PROPOSED DECISION SUPPORT SYSTEM

In this section, the proposed decision support system for employee performance evaluation is presented.

4.1 Structure and Components of the Performance Evaluation System

To confirm the practicability of the proposed decision support system a real world application is presented in this study. Firstly, job description and employee profile is defined in the selected manufacturing firm. Considering job description, employee profile and the supervisors' opinion, a questionnaire including subjective and objective issues is conducted.

Five main criteria and 31 sub-criteria, which are based on our literature review & expert opinions, are used for the evaluation process in the proposed decision support system. Consulting the Supervisor's opinion, weights of the main criteria and sub-criteria are obtained by using AHP through the user friendly interface, a C# Visual Studio application, developed in this study. Supervisor and the human resources manager of the firm are the decision makers in the case under concern. The proposed performance evaluation system provides a performance score for all of the employees under concern. These scores are further assessed by using K-means clustering algorithm through RAPID MINER software.

Steps of the designed personnel performance evaluation system are presented in the following.

- 1: Determination of the job description and employee group, i.e. related department, within the enterprise
- 2: Conducting job analysis according to the job description, and determining the requirements of job description

- 3: Setting the performance evaluation criteria for the employees in the light of the manager's opinions
- 4: Determining the standard of each criterion
- 5: Setting the objectives of the evaluation system in the institutional scope that will cover the individual and the company's entirety
- 6: Determining the time interval of the performance evaluation process
- 7: Determining the method of to be used
- 8: Evaluation of employee performance
- 9: Calculation of the performance scores of employees
- 10: Storage of the acquired scores
- 11: Evaluation and classification of the scores, and determining the specific performance score ranges
- 12: Increasing the salaries of employees according to their performance levels
- 13: Finalizing the performance evaluation process.

In our application, current job descriptions of the employees of the enterprise, i.e. the blue-collar workers working in the production or office, are used, and job analysis is performed according to these job descriptions. The questions of the questionnaire are generalized so that the proposed system can be applied to a broad range of enterprises.

As stated before, five main criteria and 31 sub-criteria are used for the evaluation process in the proposed decision support system. The main criteria are “communication skills”, “personnel characteristics”, “motivation”, “business knowledge” and “job discipline”. The main criteria are based on sub-criteria. In the evaluation process, each main criterion and sub-criterion will be evaluated in relation to each other. In this way, the requirements of job descriptions will be determined by main and sub-criteria. The main criteria and sub-criteria are presented in the following.

Main Criterion 1: Communications Skills

Sub-Criteria 1: effective communication with other stuffs

Sub-Criteria 2: tendency of teamwork

Sub-Criteria 3: verbal and writing communication skills

Sub-Criteria 4: informing the troubles in work place through appropriate canals to the management

Main Criterion 2: Personnel Characteristics

Sub-Criteria 1: protecting the tempo of the work

Sub-Criteria 2: ability of completing the job responsibilities

Sub-Criteria 3: co-operation skills with other stuffs

Sub-Criteria 4: requesting shiftwork

Sub-Criteria 5: making a point of job environment

Sub-Criteria 6: obeying the hygiene rules

Sub-Criteria 7: working under hard conditions

Sub-Criteria 8: personal productivity

Main Criterion 3: Business Knowledge

Sub-Criteria 1: deciding quickly in the state of emergency

Sub-Criteria 2: machine and gadget using skills

Sub-Criteria 3: machine and gadget protecting skills

Sub-Criteria 4: usage of personal protection equipment information

Sub-Criteria 5: obeying the occupational health and safety rules

Sub-Criteria 6: empowered skills

Sub-Criteria 7: being aware of and performing first aid rules

Sub-Criteria 8: obeying the rules of firm and instructions

Main Criterion 4: Personal Characteristics

Sub-Criteria 1: struggled to stress skill

Sub-Criteria 2: being open to criticism

Sub-Criteria 3: reliability and honesty

Sub-Criteria 4: being inquisitive skill

Sub-Criteria 5: self-control in emergency

Sub-Criteria 6: sense of responsibility

Sub-Criteria 7: physical strength

Main Criterion 5: Motivation

Sub-Criteria 1: concentration on the job

Sub-Criteria 2: frequency of the job

Sub-Criteria 3: target orientation

Sub-Criteria 4: success ambitious

After the criteria are set, the standards used in the evaluation of the criteria is determined. Individual targets will then be set in parallel with the institutional objectives. Depending on the enterprise's strategy and employees' expectations, it will be decided at which intervals the performance evaluation system will be carried out. According to the selected criteria, the analytical methods to be used and integrated into the evaluation system will be determined. Analytical methods will be applied to the selected department. After the process, each employee will get his own performance score. According to this performance score, they will be categorized. After categorization, the wages of the employee will be increased at certain rates. The process will then be completed.

4.2 Real Life Practice

The Blue-collar Evaluation Questionnaire consists of 5 main titles. AHP algorithm is encoded by using C # Visual Studio. According to the generated AHP algorithm, the main criterion matrix comes out with the opening of the program. In order to evaluate the manager candidate personnel, firstly each sub-criterion has relations with each other. The decision maker's criterion is entered into the system. The decision maker can store values between 1 and 9 in the binary comparison matrix. According to the data entered in the matrices, each criterion calculates the weights indicating the relation between each other. Consistency of the decision maker is analyzed according to these weights. If the evaluations are inconsistent, the inconsistency index value and a warning appear on the screen. In case of inconsistency, the next binary comparative criterion matrix will not come to the

screen until the decision maker makes consistent evaluations. Transition to the main questionnaire can be possible if the relationship evaluations of all criteria are consistent. Then, the main survey questions will be transitioned. Employees are also evaluated through the main questionnaire. After the main questionnaire is completed, the main performance scores are calculated. At the end of the questionnaire, the scores of the employees are exposed.

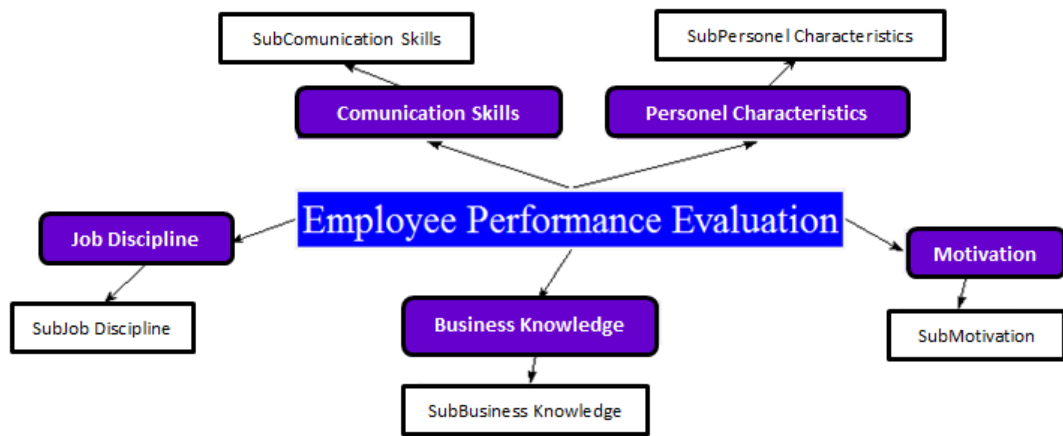


Figure 4.1 The Hierarchy of the Criteria and Sub-criteria of the Employee Performance Evaluation Process

The operation mechanism of the evaluation process is presented in the following.

- 1- Data entry into the managers' decision matrices
- 2- Consistency check of managers' evaluations
- 3- Proceeding to the next matrix if the consistency test passes
- 4- If all matrices are consistent, transition to survey questions
- 5- Employee evaluation according to the questionnaire.

Firstly, the Supervisor enroll data in the pairwise comparison matrix for the main criteria that are illustrated in the following.

AHP Scale of Importance for comparison pair (a _{ij})	Numeric Rating	Reciprocal (decimal)
Extreme Importance	9	1/9 (0.111)
Very strong to extremely	8	1/8 (0.125)
Very strong Importance	7	1/7 (0.143)
Strongly to to very strong	6	1/6(0.167)
Strong Importance	5	1/5(0.200)
Moderately to Strong	4	1/4(0.250)
Moderate Importance	3	1/3(0.333)
Equally to Moderately	2	1/2(0.500)
Equal Importance	1	1 (1.000)



	Business Knowledge	Communication Skills	Job Diciplines	Motivation	Personel Characteristics
Business Knowledge	1	3	7	9	4
Communication Skills	0,33	1	3	5	1
Job Diciplines	0,14	0,33	1	3	0,5
Motivation	0,11	0,2	0,33	1	0,25
Personel Characteristics	0,25	1	2	4	1

[Go to the Communication Skills Submatrix](#)

Figure 4.2 Main Criteria Evaluation

The weights for the main criteria are obtained by AHP as follows; communication skills (0.1923), job discipline (0.0843), business knowledge (0.5232), personnel characteristics (0.1595), and motivation (0.0407). Then, the consistency ratio corresponding to the manager's opinions is calculated. If the consistency ratio is smaller than 0.10, the manager's opinions are consistent. Then the manager takes the next step. If the consistency ratio is greater than 0.10, the proposed performance evaluation system notifies the manager as illustrated in Figure 4.3.

Main Criteria Matrix

	Business Knowledge	Communication Skills	Job Diciplines	Motivation	Personel Characteristics
Business Knowledge	1	2	4	1	1
Communication Skills	0.5	1	2	2	5
Job Diciplines					2
Motivation					4
Personel Characteristics					1

Calculated Consistency index is greater than 0,1 and your consistency index is :1,435 (inconsistent).Please check your evaluations!

Tamam

Go to the Communication Skills Submatrix

Figure 4.3 Inconsistency notification of the proposed performance evaluation system

Main Criteria Matrix

	Business Knowledge	Communication Skills	Job Diciplines	Motivation	Personel Characteristics
Business Knowledge	1	3	7	9	4
Communication Skills	0,33	1	2	5	1
Job Diciplines	0,14	0,33		3	0,5
Motivation	0,11	0,2		1	0,25
Personel Characteristics	0,25	1		4	1

Sum of the all weights is : 1

Tamam

Go to the Communication Skills Submatrix

Figure 4.4 The test and warning screen stating the sum of the weights is 1

The manager checks the summation of the weights of the criterion after entering the judgments within the framework of the AHP methodology (see Figure 4.4). The weights of the criterion are continued when the sum is 1.

	C1 :	C2 :	C3 :	C4 :
C1 :	1	2	0,25	0,5
C2 :	0,5	1	0,13	0,25
C3 :	4	8	1	2
C4 :	2	4	0,5	1

C1 : Tendency of Teamwork

C2 : To Inform the Troubles in Work Place Through Appropriate Canals to the Management

C3 : Verbal and Writing Communication Skills

C4 : Providing for Effective Communication Between Other Stuffs

Go to the Job Dicipline SubMatrix

Figure 4.5 Communication Skills Submatrix

The sub-criteria of the main criteria of communication skills are illustrated in Figure 4.5. The manager makes data entry into the communication skills submatrix. Data input is performed to calculate the relevance ratios of the sub-criteria of communication skills according to the work requirements. The user interface expose that verbal and written communication sub-criterion is partly more important than tendency to team work. This evaluation is subject to change according to each manager's own judgment.

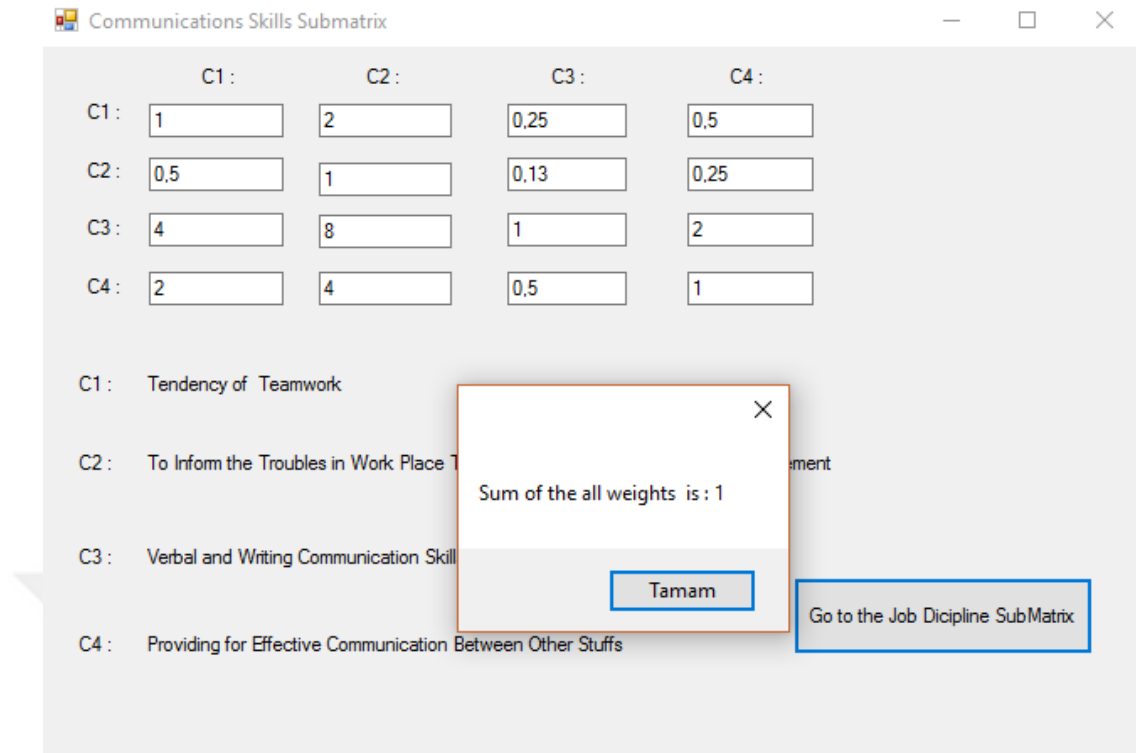


Figure 4.6 The test and warning screen stating the sum of the weights is 1

As illustrated in Figure 4.7, judgments of the manager are consistent.

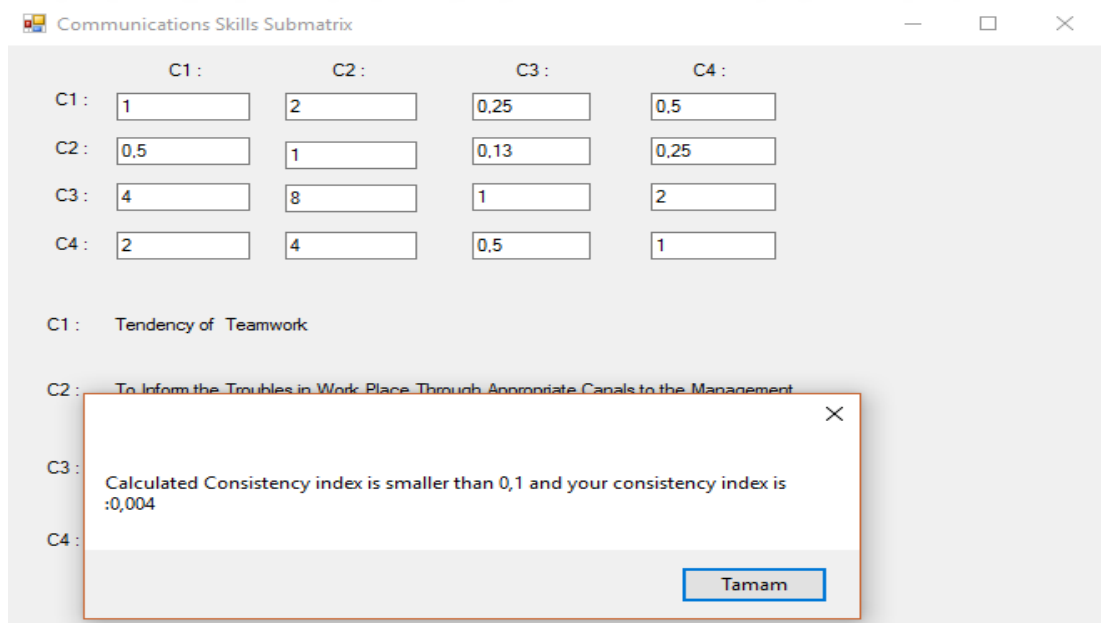


Figure 4.7 Consistency notification of the proposed performance evaluation system

Job Dicipline SubMatrix

	C1 :	C2 :	C3 :	C4 :	C5 :	C6 :	C7 :	C8 :
C1 :	1	0,33	2	8	5	5	7	3
C2 :	3	1	4	9	6	7	8	5
C3 :	0,5	0,25	1	8	4	5	6	2
C4 :	0,13	0,11	0,13	1	0,2	0,25	1	0,2
C5 :	0,2	0,17	0,25	5	1	3	4	0,33
C6 :	0,2	0,14	0,2	4	0,33	1	2	0,33
C7 :	0,14	0,13	0,17	1	0,25	0,5	1	0,2
C8 :	0,33	0,2	0,5	5	3	3	5	1

C1 : To Protect Tempo of Work

C2 : Ability of Completing Job Responsibilities

C3 : Co-operation Skills with Between Other Stuffs

C4 : Requesting Shiftwork

C5 : Make a Point of Job Environment

C6 : Obey the Hygiene Rules Skill

C7 : Working Under the Hard Conditions

C8 : Personal Productivity

Go to the Business Knowledge Submatrix

Figure 4.8 Job Dicipline Submatrix

Job Dicipline SubMatrix

	C1 :	C2 :	C3 :	C4 :	C5 :	C6 :	C7 :	C8 :
C1 :	1	0,33	2	8	5	5	7	3
C2 :	3	1	4	9	6	7	8	5
C3 :	0,5	0,25	1	8	4	5	6	2
C4 :	0,13	0,11	0,13	1	0,2	0,25	1	0,2
C5 :	0,2	0,17	0,25	5	1	3	4	0,33
C6 :	0,2	0,14	0,2	4	0,33	1	2	0,33
C7 :	0,14	0,13	0,17	1	0,25	0,5	1	0,2
C8 :	0,33	0,2	0,5	5	3	3	5	1

C1 : To Protect Tempo of Work

C2 : Ability of Completing Job Responsibilities

C3 : Co-operation Skills with Between Other Stuffs

C4 : Requesting Shiftwork

Calculated Consistency index is smaller than 0,1 and your consistency index is :0,089

Tamam

Figure 4.9 Consistency notification of the proposed performance evaluation system

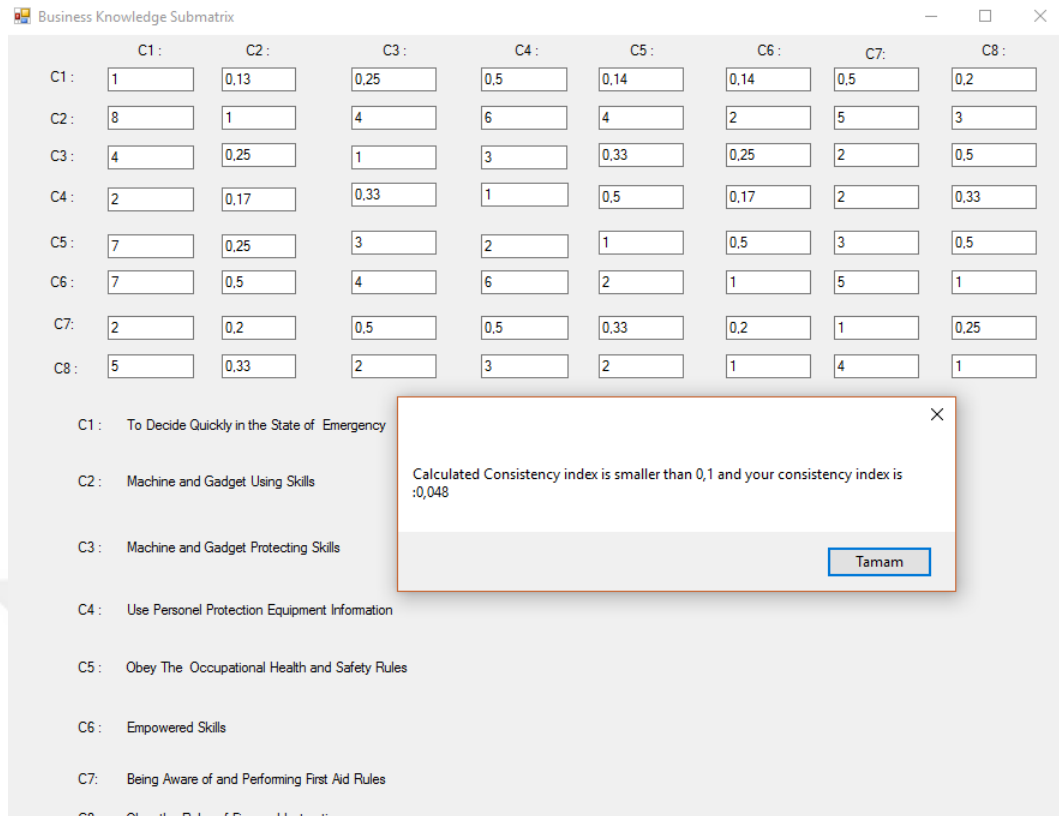


Figure 4.10 Business Knowledge Submatrix

Personal Characteristics SubMatrix

	C1 :	C2 :	C3 :	C4 :	C5 :	C6 :	C7 :
C1 :							
C2 :							
C3 :							
C4 :							
C5 :							
C6 :							
C7 :							

C1 : Struggled to Stress Skill
 C2 : Being Open to Criticism
 C3 : Reliability and Honesty
 C4 : Being Inquisitive Skill
 C5 : Control Yourself Towards Emergency Situation
 C6 : Sense of Responsibility
 C7 : Physical Strength

Go To the Motivation Submatrix

Figure 4.11 Personal Characteristics Submatrix is showed empty

Personal Characteristics SubMatrix

	C1 :	C2 :	C3 :	C4 :	C5 :	C6 :	C7 :
C1 :	1	6	2	7	3	0,33	0,33
C2 :	0,17	1	0,2	3	0,33	0,11	0,13
C3 :	0,5	5	1	5	2	0,25	0,25
C4 :	0,14	0,33	0,2	1	0,25	0,11	0,13
C5 :	0,33	3	0,5	4	1	0,17	0,25
C6 :	3	9	4	9	6	1	2
C7 :	3	8	4	8	4	0,5	1

C1 : Struggled to Stress Skill
 C2 : Being Open to Criticism
 C3 : Reliability and Honesty
 C4 : Being Inquisitive Skill
 C5 : Control Yourself Towards Emergency Situation
 C6 : Sense of Responsibility
 C7 : Physical Strength

Calculated Consistency index is smaller than 0,1 and your consistency index is :0,059

Tamam

Figure 4.12 Consistency notification of the proposed performance evaluation system

Motivation Submatrix

	C1 :	C2 :	C3 :	C4 :
C1 :	1	0,33	2	5
C2 :	3	1	4	9
C3 :	0,5	0,25	1	3
C4 :	0,2	0,11	0,33	1

C1 : Concentration of Job

Calculated Consistency index is smaller than 0,1 and your consistency index is :0,017

Tamam

Figure 4.13 Consistency notification of the proposed performance evaluation system

Blue Collar Questionnaire & Main criteria and Subcriteria Weights			1	2	3	4	5
0,1923	Communications skills	0,2665	Providing for Effective communication between other stuffs				
		0,1332	Tendency of Teamwork				
		0,533	Verbal and Writing Communication Skills				
		0,0673	To Inform the Troubles in Work Place Through Appropriate Canals to the Management				
0,0843	Job Discipline	0,2088	To Protect tempo of work				
		0,3644	Ability of Completing job responsibilities				
		0,1576	Co-operation Skills with Between Other Stuffs				
		0,0222	Requesting Shiftwork				
		0,0723	Make a point of Job Environment				
		0,0452	Obey the Hyigene Rules Skill				
		0,0256	Working Under the Hard Conditions				
		0,1039	Personel Productivity				
0,5232	Business Knowledge	0,0256	To Decide Quickly in the State of Emergency				
		0,3184	Machine and Gadget Using Skills				
		0,0805	Machine and Gadget Protecting Skills				
		0,0502	Use Personel Protection Equipment Information				
		0,1215	Obey The Occupational Health and Safety Rules				
		0,2079	Empowered Skills				
		0,0417	Being aware of and Performing First Aid Rules				
		0,1542	Obey the Rules of Firm and instructions				
0,1595	Personel Characteristics	0,1516	Struggled to Stress Skill				
		0,0351	Being open to criticism				
		0,1026	Reliability and honesty				
		0,0232	Being Inquisitive Skill				
		0,0677	Control Yourself Towards Emergency Situation				
		0,3546	Sense of Responsibility				
		0,2652	Physical Strength				
0,0407	Motivation	0,2397	Concentration of Job				
		0,5689	Frequency of Job				
		0,1394	Target Oriented				
		0,0520	Success Ambitious				

1:Poor. 2:Below average. 3:Average. 4:Good. 5:Excellent

Figure 4.14 Significance levels of criterion among each other

The manager has put his ideas into the system through the interface which is designed to evaluate all the criteria on some basis. Then, relations between opinions and thoughts were entered, and consistency was ensured among the relations. As

soon as all stages have been completed, the system has calculated the importance levels of the criteria by using AHP. These importance levels are used as input to the next phase.

The next phase of the proposed performance evaluation system is the individual personnel performance assessment (see Figure 2.1). This phase includes 31 questions. The scores for the questions are calculated as in the following.

The screenshot shows a window titled "Motivation" with a light gray background. It contains four questions, each with five radio button options: "Poor", "Below Average", "Average", "Good", and "Excellent".

- Question 1 :Concentration of Job**: The "Poor" option is selected.
- Question 2 :Frequency of Job**: The "Below Average" option is selected.
- Question 3 :Target Oriented**: The "Poor" option is selected.
- Question 4 : Success Ambitious**: The "Below Average" option is selected.

At the bottom right, there is a "Finish" button. A small white pop-up window with a red border is overlaid on the form, displaying "Total Score : 32" and a "Tamam" button.

Figure 4.15 Individual personnel performance assessment phase

The part of the decision support system based on the questionnaire-based rating is shown in Figure 4.15.

- Question score = Main criteria weight * Sub-criteria weight * Survey Question Evaluation score (1 to 5) * 20 (constant)

Performance score of an employee is calculated by summing the scores of the questions for that individual. The constant is assigned the value of 20 so that the maximum value of the question score is 100. Using the proposed performance evaluation system, 150 employees of the firm are evaluated and their performance

scores are obtained. The firm wants to use these performance scores in determining the premium rate for its personnel. Then, using these scores, the employees are clustered into three groups by K-means algorithm.

- If the performance score of the employee is in the first cluster, his/her premium rate is %15.
- If the performance score of the employee is in the second cluster, his/her premium rate is %10.
- If the performance score of the employee is in the third cluster, his/her premium rate is %5.

Results of the K-means algorithm are summarized in the following.

- Cluster one: score range is 88 to 100, it includes 30 employees.
- Cluster two: score range is 73 to 87, it includes 39 employees.
- Cluster three: score range is 59 to 72, it includes 31 employees.

The results reveal that performance scores of 50 personnels are under 60. Therefore, these 50 personnels do not get any premium.

CHAPTER FIVE

CONCLUSION

In today's business environment, an effective employee performance evaluation system is crucial in gaining sustainable competitive advantage. This study develops a decision support system for employee performance evaluation. The proposed system encompasses a multi-criteria decision making method, AHP, and a clustering algorithm, K-means. Five main criteria and 31 sub-criteria are used for the evaluation process in the proposed system. The main criteria are; "communication skills", "personnel characteristics", "motivation", "business knowledge" and "job discipline". A user friendly interface is developed to enhance the applicability of the proposed decision support system. To confirm the practicability of the proposed decision support system a real life application is presented. The results indicate that the proposed system can effectively be used in practice for linking performances to compensation, rewards, and recognition in organizations. The proposed system could be adopted to evaluate performance of white-collar personnel in any production system. In addition, other multi-criteria decision making methods or modelling approaches can be integrated to the proposed decision support system.

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APPENDICES

APPENDIX A1

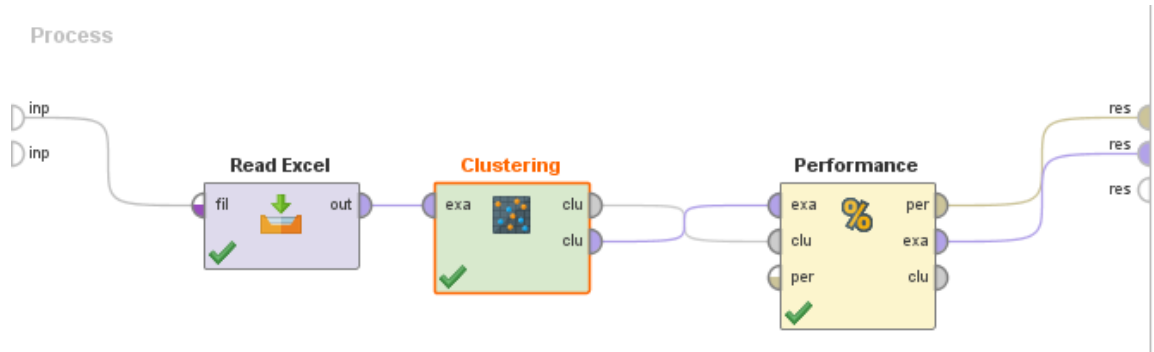


Figure A1.1 Rapid Miner Model

APPENDIX A2. Employee Scores

Table A2.1 Employee Performance Evaluation Scores

	SCORE		SCORE
EMPLOYEE1	61	EMPLOYEE49	66
EMPLOYEE2	94	EMPLOYEE50	60
EMPLOYEE3	75	EMPLOYEE53	74
EMPLOYEE4	80	EMPLOYEE54	98
EMPLOYEE5	78	EMPLOYEE55	71
EMPLOYEE6	91	EMPLOYEE56	67
EMPLOYEE7	60	EMPLOYEE57	91
EMPLOYEE8	63	EMPLOYEE58	99
EMPLOYEE9	100	EMPLOYEE59	72
EMPLOYEE10	74	EMPLOYEE60	65
EMPLOYEE11	96	EMPLOYEE61	96
EMPLOYEE12	64	EMPLOYEE62	65
EMPLOYEE13	84	EMPLOYEE63	60
EMPLOYEE14	89	EMPLOYEE64	67
EMPLOYEE15	97	EMPLOYEE65	84
EMPLOYEE16	75	EMPLOYEE66	71
EMPLOYEE17	92	EMPLOYEE67	95
EMPLOYEE18	99	EMPLOYEE68	81
EMPLOYEE19	98	EMPLOYEE69	93
EMPLOYEE20	98	EMPLOYEE70	61
EMPLOYEE21	63	EMPLOYEE71	73
EMPLOYEE22	79	EMPLOYEE72	77
EMPLOYEE23	92	EMPLOYEE73	78
EMPLOYEE24	67	EMPLOYEE74	88
EMPLOYEE25	61	EMPLOYEE75	78
EMPLOYEE26	80	EMPLOYEE76	84
EMPLOYEE27	80	EMPLOYEE77	71
EMPLOYEE28	78	EMPLOYEE78	92
EMPLOYEE29	98	EMPLOYEE79	64
EMPLOYEE30	72	EMPLOYEE80	87
EMPLOYEE31	78	EMPLOYEE81	78

Table A2.1 continues

EMPLOYEE32	86	EMPLOYEE82	80
EMPLOYEE33	63	EMPLOYEE83	80
EMPLOYEE34	97	EMPLOYEE84	79
EMPLOYEE35	85	EMPLOYEE85	63
EMPLOYEE36	86	EMPLOYEE86	60
EMPLOYEE37	82	EMPLOYEE87	99
EMPLOYEE38	79	EMPLOYEE88	64
EMPLOYEE39	96	EMPLOYEE89	99
EMPLOYEE40	66	EMPLOYEE90	68
EMPLOYEE41	94	EMPLOYEE91	91
EMPLOYEE42	76	EMPLOYEE92	87
EMPLOYEE43	77	EMPLOYEE93	76
EMPLOYEE44	84	EMPLOYEE94	60
EMPLOYEE45	99	EMPLOYEE95	99
EMPLOYEE46	90	EMPLOYEE96	74
EMPLOYEE47	80	EMPLOYEE97	91
EMPLOYEE48	78	EMPLOYEE98	82
EMPLOYEE51	69	EMPLOYEE99	72
EMPLOYEE52	73	EMPLOYEE100	60

APPENDIX A3. Salary Range Clusters

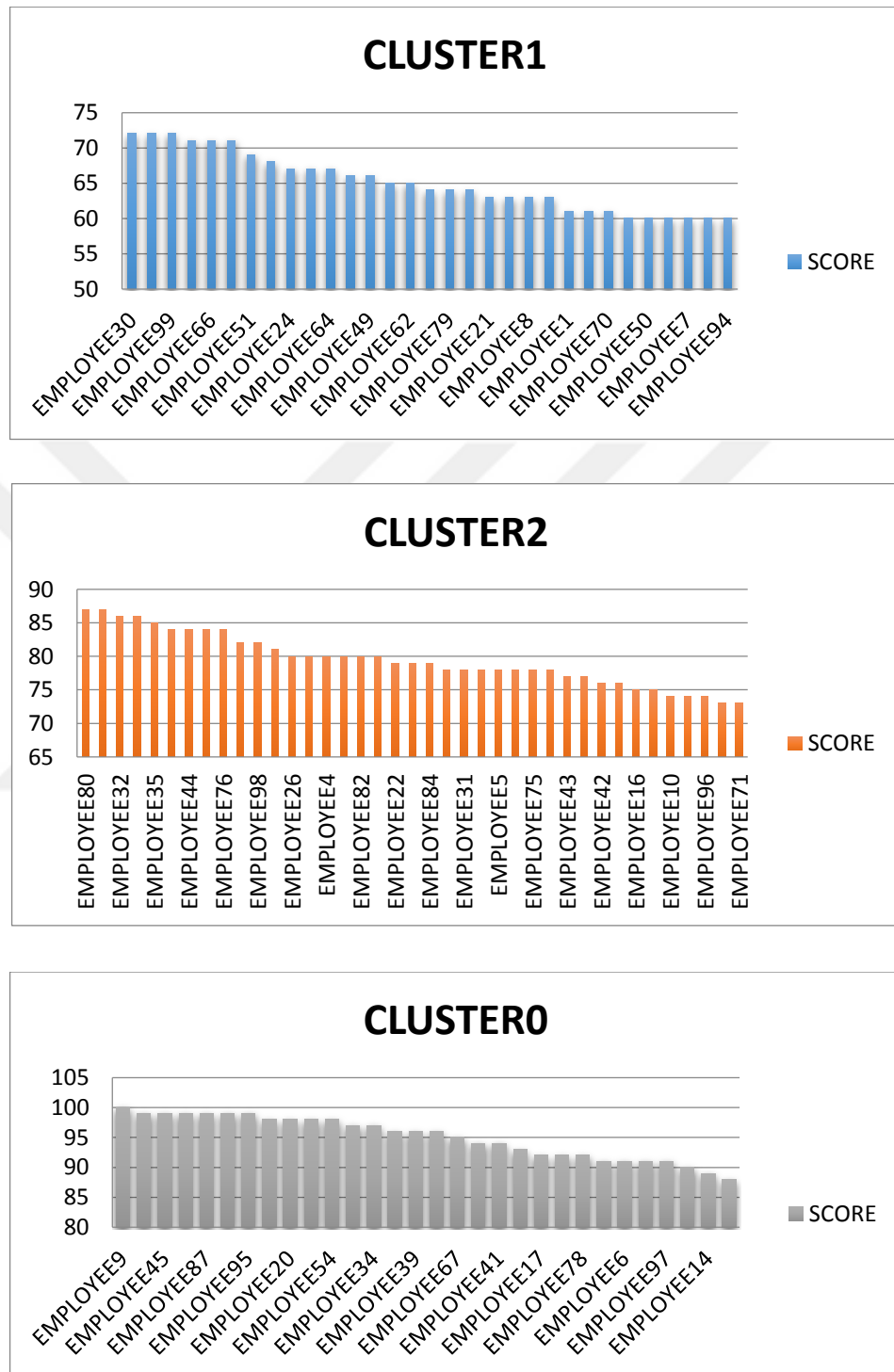


Figure A3.1 Rapid Miner Employee Salary Range Clusters

APPENDIX A4. Personnel Evaluation System Steps Flow Chart

