Application of multiple linear regression analysis in determining the employee performance

W Ayuandiani¹, M Shaleh¹, Magfirah¹, and A R Kadir²
¹Universitas Sulawesi Barat, Majene, Indonesia
²Faculty of Economics and Business, Hasanuddin University, Makassar, Indonesia

Email: wulanayuandiani@unsulbar.ac.id

Abstract. The research aimed to investigate the influence of preventive discipline and corrective discipline on the employee performance at Ministry of Religion Office, West Sulawesi in 2019. This research answered three hypotheses by using the data from questionnaire then using manual multiple linear regression analysis. This study had founds; Preventive discipline partially had a positive effect and not significance on the employee performance at the Ministry of Religion Office, West Sulawesi. This first hypotheses had found positive regression value of 0.849 and negative correlation value of -0.1202. Corrective discipline partially had a positive effect and significance on the employee performance at the Ministry of Religion Office, West Sulawesi. This second hypotheses had found positive regression value of 0.163 and positive correlation value of 0.0765. Preventive discipline and corrective discipline simultaneously had a positive effect and significance on the employee performance at the Ministry of Religion Office, West Sulawesi. This third hypotheses had found strong positive correlation value of 0.994.

1. Introduction
Employee performance are indispensable in improving the productivity of an organization, from both private companies and government agencies. Performance is the result of work that can be achieved by a person or group of people within an organization in accordance with the duties (duties and functions) each personally, in order to achieve the objectives of the organization in question legally, do not break the law and in accordance with ethical, moral, value and norms in society. Performance is something to be achieved, the achievement of which is shown, the work ability of employees [1,2]. Performance is the result of a employee achieved in carrying out the duties and responsibilities imposed upon him and is based on skills, experience skills and timeliness [3,4].

Discipline is the ability to control oneself and implement of norms applicable in life, obey the ordinances that have been determined in carrying out duties and responsibilities have been handed to each person, so that it can be run with full awareness [5]. Discipline is a form of self-control and the implementation of a regular employee shows the level of seriousness of work teams in an organization [6]. Employee discipline is one of the factors that affect the performance improvement in an organization. However, there are some things that can inhibit an organization in achieving its goals, both in private companies, and government agencies. It is characterized by an undisciplined employee behavior (disciplinary) as lazy complete the work which they are responsible, late for work, the implementation of activities not in accordance with the time schedule and so on. Some of these obstacles still existing in some organizations, including government agencies. If it is allowed to
continuously, it can lead to a decrease in the performance of employees in an organization the target was not optimal and does not match the predetermined organizational objectives.

Based of the problems who mention above, efforts will be undertaken to improve work employee discipline is any person will be given a variety of benefits such as performance benefits. However, the granting of these benefits have not been fully able to significantly influence the improvement of employee discipline. Employee behavior that led to inability of organization to goal achieve is a reference for all government agencies to continue to pursue a variety of ways, so that a low employee discipline problems, can be resolved soon.

This particular study, discipline behavior has been divided into the discipline of preventive and corrective discipline. Preventive discipline is an act of discipline undertaken to comply with the rules of conduct that apply in an organization, with the aim of preventing the abuses that resulted in organization. Preventive discipline is to encourage employees to adhere to the various provisions in force and meet the standards set, meaning that through clarity and explanation of the pattern of attitudes and behaviors desired action of each organization sought precaution lest the employees behave negatively [7].

Corrective discipline occur if there are employees who obviously were in infringement of the provisions of the normative nature [8]. Corrective discipline is a disciplinary action to fix the offense that have been committed by a person or group of people who are members of an organization. Preferably within an organization, every employee shall perform preventive discipline with the aim to keep the rules that apply within the scope of the organization to prevent offense and preferably within an organization, the implementation of corrective discipline is very little or nothing. Because, more application of corrective discipline, it can be said the number of employees who have committed an offense. To prevent further offense, its need the action of corrective discipline.

In other place, it is undeniable that there are many employees are unaware of its existence as the main perpetrator is expected to improve the quality of human resources. As a result, there are employees who often neglect the duties and its obligations, in particular on the issue of the presence of each hour of work. This was evidence that the employee has not been optimal discipline. The Ministry of Religion Office West Sulawesi is one of office that have been used as the locus in this study. Solution to resolve the employee's performance low, especially in terms of employee attendance, the Ministry of Religion Office West Sulawesi has been procuring machines attendance list like finger print or the other machine which have a same function and is not in manual again. The present list of machine procurement has benefited in improving employee discipline behavior, particularly in terms of the presence of any employee working hours. This is one of the preventive discipline behavior, which comply with the rules, especially at the time of entry and return from work.

While, for behavior of corrective discipline is a correction when there an employee who infringement the rules set by the Ministry of Religion Office West Sulawesi. To prevent infringement that occur on each employee of the Ministry of Religion West Sulawesi, then the ministry should be continue to seek the best solution to increase the performance of employees with the aim of anticipating a low in employee performances, is also expected to further improve the performance of employees in the future.

2. Methods
The method used in this research is the manual calculation of multiple regression analysis and correlation coefficient analysis, by processing the items respondents of the questionnaire were distributed.

2.1. Multiple Linear Regression Analysis
Testing the hypothesis, the analysis methods used in processing the data that has been gathered through a questionnaire study of the selected sample is a method of multiple linear regression analysis [9] with the following formula:
Which:

\[ Y = a + b_1X_1 + b_2X_2 + e \]  \hspace{1cm} (1)

Where:
- \( Y \) = Improved Employee Performance
- \( a \) = Constants
- \( X_1 \) = Preventive Discipline
- \( X_2 \) = Corrective Discipline
- \( b_1-b_2 \) = Regression Coefficient of X
- \( e \) = Error

To determine the value of a parameter in multiple linear regression, it can be used the following equation:

\[ a = \frac{[\Sigma Y - b_1\Sigma X_1] - [b_2 - \Sigma X_2]}{n} \]  \hspace{1cm} (2)

Furthermore, to determine the value of the parameters \( b_1 \) and \( b_2 \), it can be used the following equation:

\[ b_1 = \frac{\Sigma x_2^2 \cdot \Sigma x_1 y - \Sigma x_1 x_2 \cdot \Sigma x_2 y}{\Sigma x_1^2 \Sigma x_2^2 - (\Sigma x_1 x_2)^2} \]  \hspace{1cm} (3)

\[ b_2 = \frac{\Sigma x_1^2 \cdot \Sigma x_2 y - \Sigma x_1 x_2 \cdot \Sigma x_1 y}{\Sigma x_1^2 \Sigma x_2^2 - (\Sigma x_1 x_2)^2} \]  \hspace{1cm} (4)

Which:
- \( y \) = Employee performance after deducting the average of \( Y \)
- \( x_1 \) = Preventive discipline after deducting the average of \( X_1 \)
- \( x_2 \) = Corrective discipline after deducting the average of \( X_2 \)
- \( b_1-b_2 \) = Regression coefficient of X
- \( n \) = Number of respondents

2.2. Analysis Correlation Coefficient

Before calculating the simultaneous correlation and partial correlation, it first has to calculate the correlation of each variable \( X_1 \), \( X_2 \) and \( Y \), with the following formula:

2.2.1. Partial Correlation Coefficient Analysis

1) Preventive discipline (\( X_1 \)) on employee performance (\( Y \)) where in corrective discipline (\( X_2 \)) considered constant

Correlation of preventive discipline relationship (\( X_1 \)) on employee performance (\( Y \)) where corrective discipline (\( X_2 \)) held constant, the Ministry of Religion Office West Sulawesi used the correlation coefficient analysis with formula:

\[ r_{Y_{1,2}} = \frac{r_{y_1} - (r_{y_2} \cdot r_{1,2})}{\sqrt{(1 - r_{y_2}^2) \cdot (1 - r_{1,2}^2)}} \]  \hspace{1cm} (5)

Which:
- \( r_{Y_{1,2}} \) = The correlation between \( X_1 \) and \( Y \), where \( X_2 \) is constant
- \( r_{y_1} \) = Partial correlation of \( X_1 \)
- \( r_{y_2} \) = Partial correlation of \( X_2 \)
2) Corrective discipline \((X_2)\) on employee performance \((Y)\) where in preventive discipline \((X_1)\) considered constant

Correlation of corrective discipline \((X_2)\) on employee performance \((Y)\) where preventive discipline \((X_2)\) held constant, the Ministry of Religion Office West Sulawesi used the correlation coefficient analysis with formula:

\[
r_{Y_{2.1}} = \frac{r_{Y2} - (r_{Y1} \cdot r_{1.2})}{\sqrt{(1 - r_{Y1}^2) \cdot (1 - r_{1.2}^2)}}
\]  

(6)

Which:
- \(r_{Y2}\) = The correlation between \(X_2\) and \(Y\), where \(X_1\) is considered fixed
- \(r_{Y1}\) = Partial correlation of \(X_1\)
- \(r_{1.2}\) = Partial correlation of \(X_2\)

2.2.2. Simultaneous Analysis Correlation Coefficient

Simultaneous correlation between preventive discipline \((X_1)\) and corrective discipline \((X_2)\) on employee performance \((Y)\) at the Ministry of Religion Office West Sulawesi used the correlation coefficient analysis with formula:

\[
r_{\text{simultan}} = \frac{(b_1 \cdot \sum x_1 y) + (b_2 \cdot \sum x_2 y)}{\sum y^2}
\]  

(7)

Which:
- \(y\) = Employee performance after deducting the average of \(Y\)
- \(x_1\) = Preventive discipline after deducting the average of \(X_1\)
- \(x_2\) = Corrective discipline after deducting the average of \(X_2\)
- \(b_1\) - \(b_2\) = Regression coefficient of \(X\)
- \(n\) = Number of respondents

Population is all the characteristics / properties owned by the subject or object to be examined [9]. Total population in this study is the overall number of employees of the Ministry of Religion Office West Sulawesi.

Sampling technique in this study using simple random sampling that the sample selected randomly, by distributing questionnaires to the respondents as many as 25 people.

3. Result and Discussion

3.1. Multiple linear regression analysis

| No | \(X_1\) | \(X_2\) | \(Y\) | \(X_1^2\) | \(X_2^2\) | \(Y^2\) | \(X_1 Y\) | \(X_2 Y\) |
|----|-------|-------|-------|---------|---------|-------|--------|--------|
| 1  | 21    | 20    | 22    | 441     | 400     | 484   | 420    | 462    | 440    |
| 2  | 22    | 19    | 21    | 484     | 361     | 441   | 418    | 462    | 399    |
| 3  | 22    | 18    | 21    | 484     | 324     | 441   | 396    | 462    | 378    |
| 4  | 23    | 18    | 20    | 529     | 324     | 400   | 414    | 460    | 360    |
| 5  | 22    | 18    | 20    | 484     | 324     | 400   | 396    | 440    | 360    |
| 6  | 22    | 19    | 20    | 484     | 361     | 400   | 418    | 440    | 380    |
| 7  | 22    | 17    | 22    | 484     | 289     | 484   | 374    | 484    | 374    |
| 8  | 22    | 20    | 20    | 484     | 400     | 400   | 440    | 440    | 400    |
| 9  | 21    | 18    | 22    | 441     | 324     | 484   | 378    | 462    | 396    |
To determine the value of the parameter $b_1$, then it can be used the following equation:

$$b_1 = \frac{\sum x_2^2 \cdot \sum x_1y - \sum x_2y \cdot \sum x_1x_2}{\sum x_1^2 \sum x_2^2 - (\sum x_1x_2)^2}$$

$$b_1 = \frac{(9084.48 \cdot 11298.24) - (10031.04 \cdot 10077.12)}{(11379.84 \cdot 9084.48) - (10077.12)^2}$$

$$b_1 = 0.849$$

Furthermore, to determine the value of the parameter $b_2$, it can be used the following equation:

$$b_2 = \frac{\sum x_1^2 \cdot \sum x_2y - \sum x_1y \cdot \sum x_1x_2}{\sum x_1^2 \sum x_2^2 - (\sum x_1x_2)^2}$$

$$b_2 = \frac{(11379.84 \cdot 10031.04) - (11298.24 \cdot 10077.12)}{(11379.84 \cdot 9084.48) - (10077.12)^2}$$

$$b_2 = 0.163$$

To determine the value of a parameter in a multiple linear regression, it can be used the following equation:

$$a = \left[ \frac{\sum Y - b_1 \sum X_1}{} \right] - [b_2 - \sum X_2]$$

$$a = \left[ \frac{541 - 0.849 \cdot 544}{} \right] - [0.163 - 483]$$

$$a = 22.479$$

Based on the calculation above, the multiple linear regression equation can be written as follows:

$$Y = 22.479 + 0.849 X_1 + 0.163 X_2 + e$$

(8)
3.2. Partial Correlation Coefficient Analysis

3.2.1. Preventive Discipline (X1) on Employee Performance (Y) where in Corrective Discipline (X2) Considered Constant

Preventive discipline relationship (X1) on employee performance (Y) where corrective discipline (X2) held constant in the Ministry of Religion Office, West Sulawesi can be calculated as follows:

\[
\begin{align*}
    r_{Y_1,2} &= \frac{r_{Y_1} - (r_{Y_2} \cdot r_{1,2})}{\sqrt{(1 - r_{Y_2}^2) \cdot (1 - r_{1,2}^2)}} \\
    r_{Y_1,2} &= \frac{-0.120 - (-0.042 - 0.0022)}{\sqrt{(1 - 0.00176) \cdot (1 - 0.00000484)}} \\
    r_{Y_1,2} &= -0.1202
\end{align*}
\]

Based on the calculation above shows the partial correlation between preventive discipline (X1) on employee performance (Y) in the Ministry of Religion Office West Sulawesi is not significant. It can be seen from the negative correlation value of \(-0.1202\) (assuming the corrective discipline /X2 considered constant). Specifically on the internal of the Ministry of Religion Office West Sulawesi, many the other factors affect the performance of employees to preventive discipline, such as work motivation, basic training and leadership in enhancing human resources and quality assurance systems and technical administration. Thus, by a variety of factors, preventive discipline is not the most important / significant in determining of employee performance s, especially in the Ministry of Religion Office West Sulawesi.

3.2.2. Corrective Discipline (X1) on Employee Performance (Y) where in Preventive Discipline (X2) Considered Constant.

Corrective discipline (X2) on employee performance (Y), where preventive discipline (X1) held constant in the Ministry of Religion Office, West Sulawesi, can be calculated as follows:

\[
\begin{align*}
    r_{Y_2,1} &= \frac{r_{Y_2} - (r_{Y_1} \cdot r_{1,2})}{\sqrt{(1 - r_{Y_2}^2) \cdot (1 - r_{1,2}^2)}} \\
    r_{Y_2,1} &= \frac{-0.042 - (-0.120 - 0.0022)}{\sqrt{(1 - 0.0144) \cdot (1 - 0.00000484)}} \\
    r_{Y_2,1} &= 0.0765
\end{align*}
\]

Based on the calculation above shows the partial correlation between corrective discipline (X2) on employee performance (Y) in the Ministry of Religion Office West Sulawesi is significant. It can be seen from the positive correlation of 0.0765 (assuming the preventive discipline / X1 is considered constant). Specifically in the Ministry of Religion Office, West Sulawesi, corrective discipline have a significant effect on employee performance, although relatively minor significance. Empirically, it can be explained that the employees who are in the scope of the Ministry of Religion Office, West
Sulawesi, will improve its performance if their strike, either orally or in written warning from the leader who is corrective, which is associated with the time and labor discipline.

3.3. Simultaneous Correlation Coefficient Analysis

Simultaneous relationship between preventive discipline (X1) and corrective discipline (X2) on employee performance (Y) in the Ministry of Religion Office, West Sulawesi, used the correlation coefficient analysis with the following formula:

\[
\begin{align*}
    r_{simultan} &= \frac{(b_1 \cdot \sum x_1 y) + (b_2 \cdot \sum x_2 y)}{\sum y^2} \\
    r_{simultan} &= \frac{(0.849 \cdot 11298.24) + (0.163 \cdot 10031.04)}{11279.04} \\
    r_{simultan} &= 0.994
\end{align*}
\]

Based on the calculation above shows that simultaneous correlation between preventive discipline (X1) and corrective discipline (X2) together have a powerful influence on employee performance (Y) on the scope of the Ministry of Religion Office West Sulawesi. It can be seen from the positive correlation of which showed a significant correlation value is very strong. Thus, in this case can be concluded that in order to improve employee performance of 0.994. Specifically on the internal sphere of the Ministry of Religion Office West Sulawesi, the role of the discipline of preventive and corrective discipline is very strong both variables affect employee performance improvement, if both variables are combined into a variable work discipline.

4. Conclusion

Based on the discussion that describes the influence of Work Discipline (Discipline Preventive and Corrective Discipline) on Employee Performance in the Ministry of Religion Office West Sulawesi, the research results can be summarized as follows:

1. Discipline preventive have a positive and not significant effect on employee performance at the Ministry of Religion Office West Sulawesi, thus, the first hypothesis is rejected. This is due to many other factors in improving the employee performance in addition to preventive discipline, so that preventive discipline is not the most important / significant in determining employee performance improvement.

2. Corrective discipline have a positive and significant effect on the employee performance at the Ministry of Religion Office, West Sulawesi, so, the second hypothesis is accepted. This is due to employee performance who are in the scope of the Ministry of Religion Office West Sulawesi will improve its performance if their strike, either orally or in written warning from the leader who is corrective, which is associated with the time and labor discipline.

3. Preventive discipline (X1) and corrective discipline (X2) together have a powerful influence on employee performance (Y) on the scope of the Ministry of Religion Office West Sulawesi, so, the second hypothesis is accepted. Specifically on the internal sphere of that office, the role of the preventive discipline and corrective discipline is very strong both variables affect employee performance improvement, if both variables are combined into a variable work discipline.

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