Model development based on baldrige excellence framework criteria in palm oil factory

N Matondang, T Alda*, and H Nasution

Department of Industrial Engineering, Universitas Sumatera Utara, Jl. Almamater Kampus USU Medan 20155, Indonesia

*E-mail: taniaalda710@gmail.com

Abstract. This research was conducted in palm oil factory. So far, the palm oil factory's performance measurement is still conventional, focusing on the financial sector and ignoring other sectors that are also important to be known its performance. The purpose of this research is to build performance measurement model comprehensively using Baldrige excellence framework criteria. Baldrige excellence framework consists of 7 criteria that is leadership, strategy, customer, knowledge management, workforce, operation, and result. The calculation is done by path analysis using SPSS. Based on the calculation is known that leadership has the most substantial direct influence on the palm oil factory's performance of 0.341 and then followed by the workforce of 0.260, strategy of 0.235, knowledge management of 0.119, operations of 0.097 and customers of 0.082. Leadership and workforce have a substantial influence on increasing palm oil factory performance. In other words, it can be concluded that human resources in palm oil factory have a substantial influence in improving the performance.

1. Introduction

Palm oil industry experienced a moderately rapid development over time resulting in competition among companies increasingly stringent. One way that can make the company survive and excel in this competitive competition is to make performance measurements for the company to know its performance and can compete with other companies.

This research was conducted at the palm oil factory in Deli Serdang-Sumatera Utara. During this time, performance measurement conducted by the palm oil factory is still conventional that focus on the financial sector and ignore other aspects that are also important to be known its performance. This condition because the palm oil factory has not assessed its performance comprehensively and make the factory does not know what the actual factors that lead to decreased the performance.

Based on the above explanation, performance measurement based on financial sector cannot describe the condition of the company comprehensively. Wibisono [1] states that limitations of financial measurement systems include oriented to past performance reporting, short-term orientation, inflexible, not foster improvements and cost distortion. Therefore it is necessary to build a model that is in accordance with the condition of the palm oil factory by involving all aspects of the palm oil factory by using the criteria Baldrige excellence framework.

NIST [2] and Sadikin [3] state that the Baldrige excellence framework consists of 7 criteria including leadership, strategy, customer, knowledge management, workforce, operations, and results. Previous research has made a test using Baldrige excellence framework model including Wilson and Collier, 2000; Meyer and Collier, 2001; Flynn and Saladin, 2001, Jayamaha et al., 2011; Mahour
2. Method
This research uses primary data that is by spreading the questionnaire. Respondents in this study are all individuals within the palm oil factory so that this study is a population study. This research uses a hypothesis test to test whether or not there is influence between two variables or more [10]. Data processing is done with path analysis technique with SPSS program to calculate the path of each variable to get the path coefficient [11,12,13]. The path analysis technique is used to test the amount of contribution indicated by the path coefficients on each path in the research model. This calculation will examine the magnitude of the direct effect, the indirect effect and the influence of the total exogenous variables on the endogenous variables in this study.

Based on previous studies, the models developed from previous theories and research can be seen in Figure 1.

![Figure 1. Structural Model of Research](image)

The structural equation of the research model is:

\[ X_2 = \rho_{X2X1} X_1 + \rho_{X2} \varepsilon_1 \] ......................................................... (1)
\[ X_3 = \rho_{X3X1} X_1 + \rho_{X3X2} X_2 + \rho_{X3} \varepsilon_2 \] ......................................................... (2)
\[ X_4 = \rho_{X4X1} X_1 + \rho_{X4} \varepsilon_3 \] ......................................................... (3)
\[ X_5 = \rho_{X5X1} X_1 + \rho_{X5} \varepsilon_4 \] .......................................................... (4)
\[ X_6 = \rho_{X6X1} X_1 + \rho_{X6X5} X_5 + \rho_{X6} \varepsilon_5 \] ......................................................... (5)
\[ Y = \rho_{YX1} X_1 + \rho_{YX2} X_2 + \rho_{YX3} X_3 + \rho_{YX4} X_4 + \rho_{YX5} X_5 + \rho_{YX6} X_6 + \rho_Y \varepsilon_Y \] (6)

Where:
\[ X_1 = \text{Leadership} \]
X₂ = Strategy  
X₃ = Customer  
X₄ = Knowledge Management  
X₅ = Workforce  
X₆ = Operation  
X₇ = Performance  

3. Results and discussions

3.1. Validity and reliability test
An instrument is valid if r-count is higher than r-table. After the test results obtained that the instrument in this research is valid because the value of r-count is higher than r-table. Testing reliability in this research using Cronbach’s alpha which states that an instrument is reliable if the value is higher than 0.60. After the test obtained results 0.941. In other words, a reliable research instrument is higher than 0.60. Based on the results of validity and reliability testing concluded that the research instrument is valid and reliable so that worthy of being an instrument in this research.

3.2. Testing structural model of research
The result of the structural model of research can be seen in Table 1.

| Model          | Influence of Variables | F     | t    | Sig. | Path Coefficient (Beta) | The Coefficient of Determination R² | Other Variable Coefficients |
|----------------|------------------------|-------|------|------|--------------------------|-------------------------------------|-----------------------------|
| Substructure 1 | X₁ to X₂               | 185.622 | 13.624 | 0.000 | 0.791                    | 0.626                              | 0.612² or 0.374             |
| Substructure 2 | X₁ to X₃               | 5.213   | -1.498 | 0.137 | -0.223                   | 0.087                              | 0.956² or 0.913             |
| Substructure 3 | X₁ to X₄               | 30.738  | 5.544 | 0.000 | 0.466                    | 0.217                              | 0.885² or 0.783             |
| Substructure 4 | X₁ to X₅               | 342.986 | 18.520 | 0.000 | 0.869                    | 0.755                              | 0.495² or 0.245             |
| Substructure 5 | X₁ to X₆               | 36.304  | -0.376 | 0.708 | -0.056                   | 0.398                              | 0.776² or 0.602             |
| Substructure 6 | X₃ to X₇               | 121.860 | 2.087 | 0.039 | 0.082                    | 0.873                              | 0.356² or 0.127             |

Based on the above results can be concluded that:
- Leadership influence the strategy
- Leadership has no effect on customer
- Strategy influence the customer
- Leadership influence the knowledge management
- Leadership influence workforce
- Leadership has no effect on the operation
- Workforce influence the operation
Leadership influence performance
Strategy influence performance
Customer influence performance
Knowledge management influence performance
Workforce influence performance
Operation influence performance

After the improvement by removing the coefficient of the path that is not significant with the trimming method, the research model can be seen in Figure 2.

![Figure 2. Structural Model of Research After Improvement](image)

The structural equation of the research model after the improvement is:

- **Strategy**
  \[ X_2 = \beta_{X2X1} X_1 + \beta_{X2\varepsilon1} \varepsilon_1 \] ..........................................................(7)
  \[ X_2 = 0.791 X_1 + 0.612 \varepsilon_1 \] .........................................................................(8)

- **Customer**
  \[ X_3 = \beta_{X3X2} X_2 + \beta_{X3\varepsilon2} \varepsilon_2 \] .................................................................(9)
  \[ X_3 = 0.261 X_2 + 0.965 \varepsilon_2 \] .............................................................................(10)

- **Knowledge Management**
  \[ X_4 = \beta_{X4X1} X_1 + \beta_{X4\varepsilon3} \varepsilon_3 \] .................................................................(11)
  \[ X_4 = 0.466 X_1 + 0.885 \varepsilon_3 \] .............................................................................(12)

- **Workforce**
  \[ X_5 = \beta_{X5X1} X_1 + \beta_{X5\varepsilon4} \varepsilon_4 \] .............................................................................(13)
X₅ = 0.869 X₁ + 0.495 ϵ₁..................................................(14)

- Operation
X₆ = ρₓ₆ₓ₃ X₃ + ρₓ₆ₓ₅ ϵ₅..................................................(15)
X₆ = 0.630 X₅ + 0.777 ϵ₅..................................................(16)

- Performance
Y = ρₓ₁ₓ₁ X₁ + ρₓ₂ₓ₁ X₂ + ρₓ₃ₓ₁ X₃ + ρₓ₄ₓ₁ X₄ + ρₓ₅ₓ₁ X₅ + ρₓ₆ₓ₁ X₆ + ρₓ₆ₓ₆ ϵ₆.................................(17)
Y = 0.341 X₁ + 0.235 X₂ + 0.082 X₃ + 0.119 X₄ + 0.260 X₅ + 0.097 X₆ + 0.356 ϵ₆...........(18)

The direct influence, indirect influence and total influence of each path can be seen in Table 2.

| Influence of Variables | Influence | Direct | Indirect | Total |
|------------------------|-----------|--------|----------|-------|
| X₁ → X₂                | 0.791     | -      | -        | 0.791 |
| X₂ → X₃                | 0.261     | -      | -        | 0.261 |
| X₁ → X₄                | 0.466     | -      | -        | 0.466 |
| X₁ → X₅                | 0.869     | -      | -        | 0.869 |
| X₅ → X₆                | 0.630     | -      | -        | 0.630 |
| X₁ → Y                 | 0.341     | 0.186  | 0.017    | 0.053 | 0.878 |
| X₂ → Y                 | 0.235     | -      | 0.021    | -     | 0.256 |
| X₃ → Y                 | 0.082     | -      | -        | -     | 0.082 |
| X₄ → Y                 | 0.119     | -      | -        | -     | 0.119 |
| X₅ → Y                 | 0.260     | -      | -        | 0.061 | 0.321 |
| X₆ → Y                 | 0.097     | -      | -        | -     | 0.097 |

Based on the direct influence, the most influential variables on palm oil factory performance are leadership variables of 0.341 followed by workforce variables of 0.260, strategy variables of 0.235, knowledge management variables of 0.119, operation variables of 0.097 and customer variables of 0.082.

Based on the total influence that is the sum of direct influence with indirect influence hence the most influential variable to palm oil factory performance is leadership variable equal to 0.878 followed by workforce variable equal to 0.321, strategy variable equal to 0.256, knowledge management variable equal 0.119, operating variable equal to 0.097 and customer variable equal 0.082.

These results show that leadership is a driver for strategy, customers, knowledge management, workforce and operations in an effort to improve palm oil factory performance. In addition, it can be seen that the variables of leadership and workforce have a significant influence on improving the palm oil factory performance. Therefore, based on research conducted in palm oil factory can be concluded that human resources are an important asset to a palm oil factory that has an important role in the improvement the performance, organizations will get value added by humans. human resources play a significant role in the organization [14]. Human resources as a driver, thinker, and maker of good plans and strategies in an effort to achieve the vision, mission, and goals of the palm oil factory.
4. Conclusions
The conclusion of this research is Leadership variable is a driver for other variables due to having the substantial influence on palm oil factory performance followed by the variable of the workforce, strategy, knowledge management, operation, and customer. Leadership and workforce variables have a substantial influence on the improvement of palm oil factory performance so it can be concluded that human resources in the palm oil factory have a substantial influence in improving the performance. This palm oil factory can strengthen human resources by providing the best training and knowledge due to leadership and workforce is the most important factor in efforts to improve the performance of palm oil factory engaged in the palm oil industry.

References
[1] Wibisono D 2006 Manajemen Kinerja: Konsep, Desain, dan Teknik Meningkatkan Daya Saing Perusahaan (Jakarta : Penerbit Erlangga)
[2] National Institute of Standards and Technology 2015 Baldrige Excellence Framework: A System Approach to Improving Your Organization’s Performance (United States : Department of Commerce)
[3] Sadikin I 2010 Malcolm Baldrige National Quality Award (MBNQA) (Bandung : Lembayung Center Indonesia)
[4] Parast M M 2015 Int. J. Production Economics 164: 24
[5] Jayamaha N P, Grigg N P and Mann R S 2011 Measuring Business Excellence 15: 20-33
[6] Meyer S M and Collier D A 2001 Journal of Operations Management 19: 403
[7] Wilson D D and Collier D A 2000 Decision Sciences 31: 361
[8] Jones M R 2014 The Quality Management Journal 21: 49
[9] Flynn B B and Saladin B 2001 Journal of Operations Management 19: 617-652
[10] Sinulingga S 2011 Metodologi Penelitian (Medan : USU Press)
[11] Sunyoto D 2011 Riset Bisnis dengan Analisis Jalur SPSS (Yogyakarta : Gava Media)
[12] Riduwan and Kuncoro E A 2007 Cara Menggunakan dan Memaknai Analisis Jalur (Path Analysis) (Bandung : Alfabeta)
[13] Sarwono J 2007 Analisis Jalur Untuk Riset Bisnis Dengan SPSS (Yogyakarta: Penerbit Andi)
[14] Nasution H 2015 Pengelolaan Modal Manusia (Medan : USU Press)