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Work Unit Efficiency Analysis Using Integration Of Data Envelopment Analysis And Logic Model Methods

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ABSTRACT
This research aims to assess the efficiency of work units by integrating data envelopment analysis and logic model methods. By collecting data for 2 years, fluctuations in the efficiency of work units can be seen in terms of resources, processes, outputs and outcomes. For work units that are not yet efficient, efficient work units can be used as a benchmark.

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INTRODUCTION

According to Nordiawan (in Agus and Riyanto, 2012), public sector organizations frequently face limitations due to restricted resources while striving to deliver optimal services to the community. Resource allocation must be prioritized as a strategic concern for public sector organizations to enhance goal attainment. This can be achieved by identifying adequate and suitable resources or by optimizing the allocation of current resources efficiently and effectively.

According to Freeman and Shoulders (1999), a budget is the process of distributing an organization's resources to meet infinite demands. Agus and Riyanto (2012) highlighted Nordiawan's assertion that the predominant focus on regulating inputs rather than attaining outputs and outcomes has been the principal issue in budgeting to date. Numerous fundamental issues within Indonesia's budgeting system predate the enactment of three legislative packages concerning state finance. The identified problems align with The World Bank (1998) assessment, which highlighted deficiencies in resource allocation, including ineffective planning; a lack of connection between policy formulation, planning, and budgeting; insufficient expenditure control; and inadequate financial performance reporting.

The Directorate General of Budget's examination of national budgeting in 2014 yielded the following findings: a) Ambiguous input, output, and outcome; b) Outcome lacks clarity and is excessively normative; c) Challenging to discern the correlation between input, output, and outcome; d) The pertinence of the outcome to organizational requirements is obscured due to the absence of information in the Work Plan and Budget of the Ministry/Institution (RKA-K/L) (Indonesia Directorate General of Budget, 2014).

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The four findings led to the conclusion that budgeting issues arise from inadequate performance information. Despite the evaluation occurring in 2012, analogous conditions persisted until 2014, as articulated by the DJA during the 2015 budget debate. The issuance of ADIK (Architecture and Performance Information) arrangement guidelines is founded on Attachment II of the Minister of Finance Regulation Number 143/PMK.02/2015, which involves the compilation of K/L performance information based on the K/L Renstra or K/L Renja documents (Indonesia Ministry of Finance, 2015).

Performance-based budgeting involves the compilation of performance architecture and information through a logic model, which includes elements such as input, activity, output, and outcome, along with indicators and targets for each outcome and output (Ministry of Finance, 2014). Outcomes in the logic model can be attained if the necessary output is there. Output production necessitates a sequence of operations that demand various inputs or resources.

To assess efficiency with various inputs and outputs, one can employ the Data Envelopment Analysis (DEA) approach, introduced by Farrell (1957). This method not only accommodates many inputs and outputs but also enables the comparison of efficiency among similar businesses (Ramanathan, 2003). Nonetheless, these measurements have failed to elucidate the efficiency of each component from resources to outcomes in depth. Consequently, a synthesis of methodologies is required to assess the efficacy of each component, enabling the design of more precise improvement strategies.

An organization may exhibit greater efficiency in one aspect while demonstrating reduced efficiency in others. To attain optimal performance, efficiency must be equilibrated among all components. The identification conducted must correspond to the elements within the logic model. This study evaluates the efficiency of the BPPK training center in each activity component by merging the DEA approach with the logic model.

The logic model is a frequently utilized framework in performance measurement literature for evaluating programs or activities (McLaughlin and Jordan, 1999). This model delineates the logical relationship among the components of an activity: resources (input), process, output, and outcome. During the evaluation process, activities are categorized into four components. This methodology facilitates the identification of crucial measurement locations.

METHODS

Input and Output Variables

No definitive benchmark exists for the selection of input and output variables in DEA analysis (Alm and Duncan, 2014). The selection of these variables must be conducted meticulously. The chosen input and output variables must accurately reflect the DMU's inputs and outputs. The selection of various input and output variables can significantly influence the outcomes of the DEA model. This occurs because DEA assesses relative efficiency, facilitating specialization in distinct input/output variables.

Emrouznejad and De Witte (2010) asserted that the selection of inputs and outputs may be informed by literature reviews, managerial assessments (identifying optimal inputs and outputs for the organization), multivariate analysis (such as detecting multicollinearity among various inputs and outputs), or through ratio analysis. Cook and Zhu (2008) propose employing a ratio when the classification of a variable as either an input or output is ambiguous. This ratio is defined by a straightforward efficiency equation: output divided by input. If an augmentation in the value of a variable leads to an enhancement in the efficiency score, it is incorporated in the numerator, which represents the output variable. If the rise in value results in a reduction of the efficiency ratio, it is incorporated into the denominator, which serves as an input variable. Table 1 displays the input and output variables for each component of the training center activity.

Table 1. Input and output variables of training activities

Logic Model Elements	Input	Output
Resources	1. Number of employees 2. Number of Teachers 3. Budget Amount	1. Number of activities 2. Number of days
Process	1. Number of activities 2. Realization of training budget	1. Number of participants
Output	1. Realization of training budget 2. Number of Participant	1. Jamlator 2. Graduates of the training must be at least good
Outcome	1. Ratio of hours to working hours 2. Graduates of the training must be at least good	1. The value of increasing HR competency

The selection of variables is carried out for each element of the training center activity based on the training logic model. This is based on the flow of changes in the resource element to the outcome element. The selection of input and output variables for each element is also carried out through field observations by looking at the similarities in the inputs needed and the outputs produced by all DMUs.

Data

1. Resource elements

The assessment of the resource component evaluates efficiency prior to the execution of the activity. The input variables are the resources possessed by the training center for organizing its activities. The variables for the number of employees and instructors are derived from the average statistics at the beginning and end of the year, while the training budget is sourced from the most recent DIPA revision. An adjustment to the training budget data in one unit is made by deducting the controlled scholarship budget.

The output variables utilized are the quantity of activities and the duration in days derived from the execution of training sessions, workshops, seminars, and similar events. Data is extracted from the training calendar of each training center. Data is computed exclusively for individuals supported by the DIPA of the training center. Nonetheless, there is a modification for computing data on activities financed by cost sharing (a portion of the funds contributed by the user). The frequency of activities and days for the data is acknowledged as just half of the total conducted due to the absence of financing data.

2. Process elements

Efficiency in the process component is determined by the quantity of participants produced from the activity. The input variable data incorporates the quantity of activities utilized, alongside the output variable in the resource element, in conjunction with the actual charges disbursed via DIPA. The execution of the training budget is based on the actual data of the Number of Training Participants (1731.004) for 2015 and the Output of Training Services (1731.502) for 2016 as recorded in the DIPA of the training center. Data modifications are implemented for a single unit by decreasing the budget allocation for scholarships factored into the assessment of training realization.

The data regarding the number of participants utilized as the output variable in this element is derived from the summary data of the jamlator realization calculations. The data for the variable Number of Participants is modified similarly to the variables Number of Activities and Number of Days, specifically by acknowledging half of the actual number of participants for activities financed through cost sharing.

3. Output elements

The substantial quantity of participants generated in the process element does not inherently facilitate the creation of a comparable jamlator. Consequently, efficiency is assessed in the output component by employing the jamlator as an output variable. The Jamlator data is derived from the recapitulation data concerning the realization calculations of the Jamlator for activities funded by the DIPA of the training facility. In addition to calculating the number of participants and activities, modifications are also implemented for activities that utilize cost-sharing financing. Another output variable is the number of graduates meeting a minimal criterion of "good," derived from the Performance Report of each unit. The input variables utilized are the participant count and the execution of the training budget.

4. Outcome elements

The assessment of the result element evaluates the efficacy of the education and training program in enhancing the competencies of participants. The input variables utilized include training graduates with a minimum criterion of satisfactory performance, which are also present in the output component, and the ratio of training hours to working hours, serving as the Primary Performance Indicator of the training center. The ratio of hours is derived from the training programs administered by the training center, including those conducted in the center and in regional locations.

The enhancement of HR competency, which represents the outcome of training organization, is utilized as an output variable for assessing efficiency in this aspect. HR competency encompasses the attributes and professional capabilities that comprise knowledge, skills, and attitudes relevant to the responsibilities and activities of a position. The values utilized are the outcomes of sampling conducted by the training center across multiple designated training facilities. Data for all variables in this element are sourced from the Performance Report of each training center.

Operational definition

The definition of each variable is as follows.

a. The number of employees is the number of structural personnel plus functional computer administrators at the training center. Employees with Study Assignment status are excluded from the calculation.
b. The number of instructors is the number of functional instructors. Instructors with Study Assignment status are excluded from the calculation.
c. The amount of training budget is the nominal amount of the budget in the Budget Implementation List (DIPA) allocated for the implementation of training managed by the unit during a period of one year.
d. The number of activities is the total number of education and training (diklat) activities, including seminars, workshops, workshops, and the like held by the training center in a period of one year.
e. The number of days is the total number of days of all training activities, seminars, workshops, workshops, or other similar activities held by the unit in a period of one year.
f. The realization of the training budget is the amount of costs used directly in the implementation of training using DIPA.
g. The number of participants is the total realization of participants who have participated in training activities held by the unit in one year.
h. Jamlator or training hours per person is the result of multiplying the number of training hours by the realization of the number of participants.
i. Minimum good training graduates is a comparison of the number of training participants who received a minimum good predicate with all participants who passed the trainings tested.
j. The ratio of training hours to working hours is a comparison of the total training hours (jamlat) as a whole which is the Main Performance Indicator of the training center with the total working hours of employees.
k. The value of increasing HR competency is the difference between the final competency level and the initial competency level of employees. Increasing HR competency is measured using the 360° survey method with an assessment scale of 1-10 which is converted to a score of 1-100, both at the initial competency level and the final competency level. This measurement is carried out by sampling at several trainings organized by the training center.

DEA Model

The activities of the training center exhibit varied returns to scale. This indicates that each supplementary input in the training center activities will result in a disproportionately greater increase in output. Consequently, the DEA model selected for this investigation is the BCC model, which operates under the assumption of varying returns to scale.

The orientation of the DEA model is determined by evaluating the DMU's control on the input and output variables of the training center's activities. The DMU exerts superior control over output relative to input. This study employs an output orientation (maximizing output), where efficiency is defined as an increase in output while using the same quantity of input. The fundamental equation of the DEA BCC model for maximizing output is represented by the following equation.

$$\text{Max Z} = \sum_{j=1}^{J} v_{jn} y_{jn} + v_n \tag{1}$$

Subject to:

$$\sum_{i=1}^{I} u_{in} x_{in} = 1 \tag{2}$$

$$\sum_{j=1}^{J} v_{jn} y_{jn} - \sum_{i=1}^{I} u_{in} x_{in} + v_n \leq 0$$
$$v_{jm}, u_{im} \geq \varepsilon, v_m \ (free)\ unlmited \tag{3}$$

n : DMU, n = 1, 2, ..., N
I : Input, i = 1, 2, ..., I
J : Output, j = 1, 2, ..., J
yjn : Output value to-j from DMU to-n
xin : Input value to-I drom DMU to-n
vjn : Value for output j from DMU to-n
uin : Value for input I from DMU to-n
ε : small positive numbers

Data Period and Number of DMUs

Data on input and output variables were gathered for the two most recent years, specifically 2015 and 2016. Alongside acquiring the most accurate representation of the current situations, the chosen era was utilized to facilitate a comparison of circumstances prior to and subsequent to the introduction of ADIK. The quantity of DMUs was equivalent to the population, specifically six DMUs, as illustrated in Table 2.

Table 2. DMU name list

No.	Training Center	Year	DMU Name
1.	Unit 1	2015	DMU A1
		2016	DMU A2
2.	Unit 2	2015	DMU B1
		2016	DMU B2
3.	Unit 3	2015	DMU C1
		2016	DMU C2
4.	Unit 4	2015	DMU D1
		2016	DMU D2
5.	Unit 5	2015	DMU E1

No.	Training Center	Year	DMU Name
		2016	DMU E2
6.	Unit 6	2015	DMU F1
		2016	DMU F2

Analogous to parametric regression, maximizing the number of observations is essential for obtaining significant findings. The inherent relativity of DEA renders it vulnerable to issues related to degrees of freedom. The degrees of freedom will rise with an increase in the number of Decision-Making Units (DMUs) and diminish with an increase in the number of input and output variables. Podinovski and Thanassoulis (2007) propose two strategies to enhance efficiency discrimination in DEA: augmenting the number of DMUs or diminishing the number of inputs/outputs. If the incorporation of DMUs is unfeasible due to sample or population constraints, data may be consolidated into a cross-sectional dataset. Alongside the computation of the annual efficiency score, testing is conducted using data pooling, rendering the annual data a distinct Decision-Making Unit (DMU). This is performed to enhance the degrees of freedom while evaluating the efficiency outcomes of the two years inside a single computation set. The 2016 financial data is adjusted to 2015 by incorporating a Consumer Price Index increase of 3.0%.

RESULTS AND DISCUSSION

DEA Model Quality Test

Pedraja-Chaparro et al. (1999) demonstrated that the efficiency generated by a DEA model is affected by four primary factors: the distribution of efficient DMUs within the sample, the quantity of DMUs included, the number of variables (input + output), and the correlation among the utilized variables. To evaluate the model's practicality, multiple experiments must be conducted.

Table 3 presents a comparison between the quantity of inefficient DMUs and the entire DMU data utilized in the DEA analysis. The rising quantity of inefficient DMUs signifies that the model is more adept at distinguishing levels of DMU efficiency, ensuring that the frontier is exclusively filled by genuinely efficient DMUs. A model is deemed ineffective in delivering valuable information if all its Decision-Making Units (DMUs) are classified as efficient, precluding any opportunity for improvement projections.

Table 3. Proportion of number of inefficient DMUs

Dataset evalution	Proportion of number of inefficient DMUs			
	Resource	Process	Output	Outcome
2015	0.6667	0.3333	0.5	0.6667
2016	0.3333	0.3333	0.3333	0.5
Data Pooling	0.5833	0.5	0.5	0.6667

The quantity of DMUs and the number of variables employed influence the degrees of freedom in the DEA model. This also impacts the model's capacity to differentiate efficiency levels. Sarkis (2002) asserts “Typically, the choice and the number of inputs and outputs, and

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the DMUs determine how good of a discrimination exists between efficient and inefficient units. There are two conflicting considerations when evaluating the size of the data set. One consideration is to include as many DMUs as possible because with a larger population there is a greater probability of capturing high performance units that would determine the efficient frontier and improve discriminatory power."

Boussofiane et al. (1991) asserted that the minimal quantity of DMUs employed must be a multiple of the number of both variables to provide effective discrimination. Moreover, there exist several perspectives concerning the guideline pertaining to the quantity of DMUs employed. Golany and Roll (1989) asserted that the quantity of DMUs should be double the number of inputs and outputs utilized, but Dyson et al. (2001) advised a total of double the number of input and output variables. Table 4 presents the computation of the minimum quantity of DMUs according to several scholars.

Table 4. Minimum DMU Calculation Based on Rule of Thumb

Element	Number of Input	Number of Output	Minimum DM Calculation		
			Boussofiane, Dyson, and Thanassoulis	Golany and Roll	Dyson et al.
	(1)	(2)	(1) x (2)	2 x [(1) + (2)]	2 x [(1) x (2)]
Resource	3	2	6	10	12
Process	2	1	2	6	4
Output	2	2	4	8	8
Outcome	2	1	2	6	4

The application of this rule of thumb should be recognized as a relative guideline rather than an absolute measure, serving as an approximate approximation for comparing the number of variables to the number of DMUs. Models with fewer DMUs than these thresholds can still be utilized; however, the information obtained will vary with an increasing number of DMUs. This is due to the fact that DEA assesses the relative efficiency of a DMU in comparison to other DMUs. To adhere to certain guidelines, testing may be conducted by augmenting the quantity of DMUs. The restricted number of DMU populations necessitates the augmentation of DMUs by the amalgamation of data from two distinct years.

In certain publications, the relationship between variables is frequently overlooked. Simultaneously, this is crucial for streamlining a DEA model, particularly for models characterized by numerous variables and a restricted quantity of DMUs. The employment of two positively correlated inputs in a DEA model will exert a minimal influence on the efficiency score relative to two uncorrelated inputs. In the extreme case where two inputs exhibit a correlation coefficient of one (perfect correlation), the DEA outcomes will remain unchanged if one of the inputs is removed. This is also pertinent to the correlation among output variables.

The correlation results to be examined pertain to the relationship between variables that are either both inputs or both outputs in the evaluation of each element. In the three elements aside from the resource element, there is no input (output) that exhibits a positive correlation with other inputs (outputs). The training budget variable and the number of employees, both inputs, exhibit a positive correlation of 0.722, but the number of activities and the number of days, both outputs, have a positive correlation of 0.763. Despite being positively associated, both variables are only marginally above the crucial threshold of 0.708, indicating that their impact on the efficiency score remains quite high. The findings of the subsequent sensitivity analysis substantiate this, demonstrating that the removal of any one of these variables yields distinct efficiency data. Consequently, the deletion of one variable is unnecessary.

Efficiency Score Analysis

Data processing with OSDEA version 0.2 yields relative efficiency values for each DMU. A modification in one DMU may also alter the efficiency scores of other DMUs. Variations in the value of a single variable can influence the total efficiency score. Modifications may also arise from the increase or decrease in the quantity of DMUs. This may influence the alteration of the border or DMU, which represents the boundary on the efficiency graph. Efficiency assessments are conducted for each component of the logic model. Efficiency of the six DMUs is assessed individually for each year through testing.

Resource Element

DEA testing on resource elements use three input variables and two output variables. The input factors are the number of employees, the number of instructors, and the number of DIPA, whereas the output variables are the number of activities and the number of days. This computation assesses the efficiency of Pusdiklat operations relative to the available resources. The test findings for 2015 in Table 5 indicate two efficient DMUs: DMU B1 and DMU F1, corresponding to Units 2 and 6, respectively.

Table 5. Resource element DEA test results in 2015

DMU Name	Objective Value	Efficient	Peer Group
DMU A1	0.654822335		DMU F1.
DMU B1	1	Yes	DMU B1.
DMU C1	0.454840811		DMU B1, DMU F1.
DMU D1	0.386857143		DMU F1.
DMU E1	0.740944274		DMU B1, DMU F1.
DMU F1	1	Yes	DMU F1.

Calculations from 2016 indicate the existence of four efficient DMUs, as presented in Table 7. Units 2 and 6, previously efficient DMUs, remain efficient DMUs this year. Furthermore, there are two additional efficient DMUs, specifically Unit 1 and DMU E2, as well as Unit 5. Independent testing often regards efficiency scores as comparative outcomes among different DMUs within the same year. This test presupposes that the conditions in both years may differ, rendering the amalgamation of data useless. Conversely, a limited quantity of DMU data results in a low degree of freedom, causing certain DMUs to appear more efficient than when assessed with a larger dataset.

Process Element

DEA testing on process elements use two input variables and one outcome variable. The input variables are the quantity of activities and the allocation of the training budget, whereas the output variable is the number of participants. This computation assesses the efficiency of the activity implementation process, with the direct outcome being the number of participants. The 2015 test results presented in the table indicate four efficient DMUs: DMU B1, DMU C1, DMU D1, and DMU F1, as shown in Table 6.

Table 6. Process element DEA test results in 2015

DMU Name	Objective Value	Efficient	Peer Group
DMU A1	0.789243876		DMU D1.
DMU B1	1	Yes	DMU B1.
DMU C1	1	Yes	DMU C1.
DMU D1	1	Yes	DMU D1.
DMU E1	0.781750466		DMU B1, DMU D1, DMU F1.
DMU F1	1	Yes	DMU F1.

In 2016, four efficient DMUs exhibited efficiency levels as presented in Table 8. Units 2 to 5 are efficient, whereas Units 1 and 6 are inefficient within the process elements.

Table 7. Process element DEA test results in 2016

DMU Name	Objective Value	Efficient	Peer Group
DMU A2	0.917501921		DMU D2, DMU E2.
DMU B2	1	Yes	DMU B2.
DMU C2	1	Yes	DMU C2.
DMU D2	1	Yes	DMU D2.
DMU E2	1	Yes	DMU E2.
DMU F2	0.858962693		DMU E2.

Output Element

DEA evaluation of output elements employs two input variables and two output variables. The input factors are the number of participants and the allocation of the training money, while the output variables are the jamlator and a minimum of proficient training graduates. This computation assesses performance efficiency by evaluating the output level derived from activity implementation. The 2015 test results, as presented in Table 8, indicate three efficient DMUs: DMU B1, DMU C1, and DMU D1.

Table 8. DEA test results of output elements in 2016

DMU Name	Objective Value	Efficient	Peer Group
DMU A1	0.975112338		DMU B1, DMU C1, DMU D1.
DMU B1	1	Yes	DMU B1.
DMU C1	1	Yes	DMU C1.
DMU D1	1	Yes	DMU D1.
DMU E1	0.958123599		DMU B1, DMU C1, DMU D1.
DMU F1	0.965353064		DMU B1, DMU C1, DMU D1.

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In 2016, four efficient Decision-Making Units (DMUs) were identified: DMU A2, DMU B2, DMU C2, and DMU D2, as illustrated in Table 9.

Table 9. DEA test results of output elements in 2016

DMU Name	Objective Value	Efficient	Peer Group
DMU A2	1	Yes	DMU A2.
DMU B2	1	Yes	DMU B2.
DMU C2	1	Yes	DMU C2.
DMU D2	1	Yes	DMU D2.
DMU E2	0.9485575		DMU A2, DMU B2, DMU D2.
DMU F2	0.983608068		DMU A2, DMU B2, DMU D2.

Outcome Element

DEA analysis of the outcome variable employs two input variables and one output variable. The input variables comprise at least proficient training graduates and the ratio of hours to working hours within the Ministry of Finance, whilst the output variable is the enhancement of HR competency value. The assessment of this factor evaluates the efficacy of the impact/outcome that can be enhanced by the performance level attained by a unit. Table 10 presents the 2015 test results, indicating two efficient DMUs: DMU B1 and DMU E1.

Table 10. DEA test results outcome elements in 2015

DMU Name	Objective Value	Efficient	Peer Group
DMU A1	0.492434988		DMU B1.
DMU B1	1	Yes	DMU B1.
DMU C1	0.933154585		DMU B1, DMU E1.
DMU D1	0.521513002		DMU B1.
DMU E1	1	Yes	DMU E1.
DMU F1	0.854905337		DMU B1, DMU E1.

In 2016, three efficient DMUs were identified, specifically DMU B2, DMU C2, and DMU E2, as illustrated in Table 11.

Table 11. DEA test results outcome elements in 2016

DMU Name	Objective Value	Efficient	Peer Group
DMU A2	0.913580247		DMU B2.
DMU B2	1	Yes	DMU B2.
DMU C2	1	Yes	DMU C2.
DMU D2	0.592592593		DMU B2.
DMU E2	1	Yes	DMU E2.
DMU F2	0.803136556		DMU B2, DMU C2.

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Comparison of Efficiency in 2015 and 2016

Efficiency assessments in both years yield disparate efficiency values. Units that exhibit no change possess an efficiency score of one in both 2015 and 2016, indicating consistent efficiency across both years. Table 12 illustrates the disparity in efficiency determined using two distinct tests in the efficiency analysis.

Table 12. Comparison of efficiency in 2015 and 2016

Training Center	Efficiency Trend			
	Resource	Process	Output	Outcome
Unit 1	Up	Up	Up	Up
Unit 2	Constant (efficient)	Constant (efficient)	Constant (efficient)	Constant (efficient)
Unit 3	Up	Constant (efficient)	Constant (efficient)	Up
Unit 4	Up	Constant (efficient)	Up	Up
Unit 5	Up	Up	Up	Constant (efficient)
Unit 6	Constant (efisien)	Down	Up	Down

Resource Element

In the resource element, three training centers exhibited enhanced efficiency, while one training center, Unit 2, maintained its efficiency across both years. Nonetheless, a decline in efficiency was observed in Unit 4 and Unit 6. Unit 4 is an inefficient Decision-Making Unit (DMU) in the resource component for both years, exhibiting the lowest efficiency score relative to other DMUs. From the output perspective, the value is rather high compared to various other DMUs with superior efficiency ratings; the quantity of activities and the duration of Unit 4 activities exhibit little variance in value. When analyzed from the input perspective, Unit 4 has a comparatively elevated input value relative to the overall data average. DIPA Unit 4 possesses the biggest enrollment compared to other training units and has a greater number of instructors as well. The surplus in input value results in a diminished efficiency score, which is projected to decline further in the subsequent year.

Unit 6 got a score reduction due to its already high efficiency in 2015. This is evident when contrasted with other training facilities from the same year (distinct measurement); it is an effective DMU. In 2016, the production value of activities and days remained significantly higher than that of other training facilities, despite a decline from the prior year.

Process Element

The efficiency trend in the process element declined from 2015 to 2016. Four DMUs shown a decline in efficiency, one DMU demonstrated an improvement in efficiency, and one DMU maintained consistent efficiency over both years. Unit 3 emerged as the training center consistently proficient in the process component. The input/output values remained reasonably stable, evidenced by the consistent number of activities in both years, as well as the stable number of participants and budget realization, which did not exhibit major fluctuations.

Unit 5 achieved enhanced efficiency owing to a substantial rise in output value compared to the prior year. This was then accompanied by a rise in input value; however, the efficiency test findings indicate that the increase in output had a more significant impact on the efficiency score. The input from 2016 can be adjusted to yield a higher output, so classifying the DMU as efficient. Conversely, the four training facilities that witnessed a decline in efficiency scores also experienced a reduction in production value.

Output Element

The efficiency trend in output components differs for each DMU. Three DMUs, specifically Unit 1, Unit 4, and Unit 6, saw an enhancement in efficiency scores. Unit 2 maintained efficiency in both years, however Unit 3 and Unit 5 encountered a decline in efficiency scores. Unit 3, previously an efficient DMU in 2015, became inefficient in 2016, but Unit 5, which similarly saw a decline in efficiency scores, remained an inefficient DMU in both years. The decline in efficiency scores in Unit 3 resulted from a reduction in its output value in 2016, despite an increase in its input value. Conversely, Unit 5 had an augmentation in one of its outputs, although its efficiency score persisted in declining. This results from an escalation in the input side, which also significantly impacts the reduction in efficiency scores.

Outcome Element

No decision-making unit exhibited a decline in efficiency scores regarding the outcome component. Five DMUs saw an improvement in scores, however one DMU, Unit 2, maintained efficiency in both years. The five DMUs that exhibited enhanced efficiency scores did so as a result of increased production values in 2016. Unit 2, although no alteration in efficiency scores, encountered a reduction in its output values. It remained efficient due to a decline in its input values compared to the prior year.

The efficiency trend for this element is highly favorable, as the growth was observed in nearly all training centers. One training center, whose efficiency score stayed unchanged, was already on the border in both years, indicating that its efficiency score was at the maximum level. The declining output value of this aspect signifies a deficiency in meeting the training center's objectives, necessitating changes.

Logic Model Analysis

This study's logic model categorizes activities and programs into components: resources, processes, outputs, and outcomes. The logic model is employed to assess the logical connections among the components of activities in a training center. The logical relationship can be shown by the alignment of a training center's efficiency score, from the resource element to the outcome element.

A unit may exhibit efficiency in one or multiple specific aspects while lacking efficiency in others. This indicates that the unit currently lacks alignment among pieces that signify a logical link. A unit that excels solely in resource management may facilitate numerous activities, yet fails to generate a corresponding number of participants or enhance

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competence. Conversely, units that excel solely in output or outcome may yield graduates with high competence, but do so at the expense of resource use.

The efficiency test results obtained using DEA indicated that only one DMU achieved a flawless efficiency score across all elements. Unit 2 demonstrates efficiency across all components for the 2015 and 2016 assessments. This demonstrates a reasonable correlation among the components of activities and programs conducted by Unit 2. The remaining five training institutes have differing efficiency rankings in one or two aspects. Only Unit 3 in 2016 demonstrates a logical correlation between the process element and the output, despite it fails to attain a high efficiency score in the resource element. The DMU exhibiting the poorest logical relationship is Unit 1 in 2015, which shown inefficiency across all assessments, followed by Unit 6 (2016) and Unit 5 (2015), each of which attained an efficient score in only one evaluation..

CONCLUSION

The efficiency assessments conducted for each logic model component yielded disparate efficiency scores for the measured units. In 2016, Unit 1 demonstrated efficiency just in the resource and output components. Unit 2 demonstrated efficiency in nearly all aspects, with just a minor decline in the process element's value in 2016, which remained very high. Unit 3 demonstrated efficiency in both process and output aspects in 2015, as well as in process and outcome elements in 2016. Unit 4 demonstrated efficiency in both process and output elements during the two years. Unit 5 demonstrated efficiency solely in 2016 concerning three components: resources, processes, and outcomes. Unit 6 demonstrated efficiency in resource and process components for both years. Each training center possesses efficiency advantages in specific aspects. Only Unit 2 exhibits a uniform efficiency score across all aspects for the years 2015 and 2016. This illustrates a reasonable correlation among the components of activities/programs conducted by Unit 2. The remaining five units, while effective in some aspects, currently lack alignment among elements that demonstrate a logical relationship. The decline in efficiency scores primarily transpired in the process element between 2015 and 2016. Nonetheless, performance in the remaining three factors generally improved. All training facilities observed an enhancement in the efficiency of the result aspect. The deployment of Performance Architecture and Information initiated in 2016 aligns with the enhancement of efficiency. Nonetheless, the capacity for enhancement is substantial. This can be accomplished by directing the output of each element from inefficient units towards efficient units that function as benchmarks. This study has multiple shortcomings, necessitating recommendations for enhancement in future research as outlined below.

a. An adjustment is made for computing statistics on activities sponsored by cost sharing (a portion of the funds from the user). The lack of financing results in the recognition of certain variables' frequency as merely half of the complete data. Data measurement would be more suitable if the acknowledgment of data frequency was contingent upon the allocation of money.
b. Numerous activities at the training center possess distinct features categorized by terms such as training, workshops, seminars, or other designations. Furthermore, there

exists a categorization of activities that are both boarded and unboarded. Weighting may be applied according to the nature of the activity to demonstrate the quality of each endeavor.

c. Activities conducted by the training center occasionally include supplementary funding mechanisms, such as reimbursement for participant travel, fieldwork activities, or specific simulations, for which comprehensive data may not be fully accessible. If the relevant data is accessible for all measured units, modifications can be implemented through weighting or exclusion of certain data points.
d. The allocation of resources for activities beyond the primary duties and responsibilities of the training center, such as training collaboration, should be restricted to ensure optimal resource use.
e. The potential failure to attain the desired number of participants may compromise the efficacy of the activity implementation process. This must be effectively handled, one method of which is determining training requirements.
f. The implementation model for activities where the ratio of participants to training hours is imbalanced, such as one-day seminars or workshops, should be diminished, as this not only renders material delivery ineffective but also adversely impacts performance outcomes.

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