Analysis of Factors Affecting Operator Performance with Partial Least Square Approach

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Abstract—UP PT is unable to meet the targets set in the SdOF, SOF, and PS categories. There are several things that cause it, such as High Pressure Heater leakage, and boiler pipes leakage. Coal switching which also have an impact on the frequent occurrence of derating and human error. This condition is defined by operator incompetence, there is an increase in the number of late for work in 2018. Study conducted to improve operator performance. The questionnaire was used as a medium for data collection of the entire population at UP PT since analyzed with the Partial Least Square method. The results shows compensation variables, organizational culture, training effectiveness had a significant influence on employee performance with and without mediated by work motivation. Therefore, the company carries out performance improvement related to compensation through dispensation arrangements, leave, improvement of supporting facilities. It organize operational safety standards for workforce formation, conducting work instructions review for the organizational culture. The allocation of bussiness trip and basic maintenance for training effectiveness. Then work motivation by setting talent criteria that consider to the preparation of outstanding candidates.

Keywords—Quality of Structure Work, Six Sigma DMAIC, Structure Work Disability.

I. INTRODUCTION

TP PT working in the field of electricity generation. Its accommodate high-quality, reliable and eco-friendly electrical energy. Competition between power plants to gain high merit order ranks is increasing. Merit order applies in the Java-Bali area plants in terms of the cost of provision (BPP). UP PT considered less competitive to compete. This will influence the Performance Contract (Konkin) which has been mutually agreed with PT. PLN (Persero). In addition, UP PT must compete with Independent Power Producer (IPP), which is certain that PT. PLN (Persero) is required to purchase full electricity from the power plants. The solution implemented by UP PT in order to continue their existence and compete to power plants is by changing the fuel consumption. Through Coal Switching UP PT must reduce coal calorie content. UP PT began implemented the use of low calorie coal between 4,000 - 4,700 kcal.

UP PT has successfully achieved their performance contract upon 2017. In terms of customer satisfaction UP PT provides good service and communication to PT. PLN, equivalent availability factor (EAF) or performance indicator of the availability of generators to operate, equivalent forced outage rate (EFOR) as the ratio of non-operating generators or derating to the operating hours of the plant, sudden outage frequency (SdOF) or condition that occur when power plant is not ready for a sudden operation due to interference, schedule outage factor (SOF) or planned non-operating unit hours ratio for improvement exceeds the number of hours specified in the performance contract, nett plant heat rate (NPHR) is the amount of energy needed to produce electricity of 1 kWh, and own use (PS) is defined as the electricity consumption used for equipment in the generating unit.

However, Table 1 shows the achievement of UP PT has decreased in the 2018 period. UP PT is unable to meet the targets set in the SdOF, SOF, and PS categories. There are several things that cause it, such as high pressure heater leakage, boiler pipes leakage, coal switching which also have an impact on the frequent occurrence of derating and human error. Human error is a mistake that is described from the results or consequences of human actions, intentional violations, and actual actions committed by humans [1]. This is caused by human behavior such as inappropriate behavior discipline, fostering unsafety condition and violations of rules [2]. This condition is defined by operator indisciplinary, there is an increase in the number of late for work in 2018. Table 2 shows the frequency and number of hours late to production operators.

It indicates there are problems with motivation and operator performance due to an increase in frequency and the number of late hours that are large in 2018 compared to 2017, the authors try to conduct research on the performance of operators in an effort to improve the performance of employees of an organization. which in this case operators must understand the factors that can affect performance. Compensation will fulfill physical needs that motivate and affect employee performance. Providing suitable compensation in the sense of being fair and adequate to meet the requirements is one of the functions of human resources (HR) [3]. The organization culture plays an important role in the company's performance afterwards. According to Robbins the attractiveness of norms, values, and organizational trust has a strong influence on performance and sustainability [4]. Leadership style in an organization also has a significant impact on employee performance. The relationship between leadership and employee performance is used to achieve organizational goals, assess and direct individual skills [5]. Furthermore, employee performance is significantly affected by the ease and usefulness of the use of information technology [6]. Information technology makes workers work productively [7]. Other variable such as

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Achievement of UP PT Performance Contracts for 2017 and 2018 periods							
Indicator		Years					
		2017		2018			
Customers Satisfaction		Achieved		Achieved			
Equivalent Availability Factor (EAF)		Achieved		Achieved			
Equivalent Forced Outage Rate (EFOR)		Achieved		Achieved			
Suddent outage Frequency (SdOF)		Achieved		Unachieved			
Schedule Outage Factor (SOF)		Achieved		Unachieved			
Nett Plant Heat Rate (NPHR)		Achieved		Achieved			
Pemaikaian Sendiri (PS)		Achieved		Unachieved			
	Table 2.						
	Operator Late Frequency						
Semester	Late Hours	Frel	kuency				
2017 semester 2	10		23				
2018 semester 1	207		38				
2018 semester 2	116	66					
	Table 3.						
	Population and Criteria Data						
Data Criterion	Description						
Company	UP PT	•					
Total Population	88 People (1 Manager, 8 Supervisor (SPV), 79 Operator)						
Ages	19-50						
Position	Operator, SPV, Operation Manager						
Education	S2, S1, D3, Highschool						

Table 1

training, and other developments that depend on the HR function that considers important functions. Training and development are often used to close the gap between current performance and expected future performance [8]. Employee skills training and work attitudes will affect their performance at work [9]. Organizations motivate their employees in the form of bonuses, prizes, and several other incentives for reasons of achieving organizational goals. Moreover the motivational factor as a mediation in achieving employee performance has a significant effect when emphasized by top management [10]. This research will collaborate the determinants of performance that have been carried out in previous studies, by determining performance factors based on compensation, organizational culture, transformational leadership, information technology, training effectiveness, and work motivation criterion.

II. METHOD

This research will use the Six Sigma approach to simplify Quantitative research allows the quantification or exploration of statistics and explanation of data. Research measuring instrument in the form of a questionnaire distributed to operators. This research uses Partial Least Square. Testing is done by testing the truth of the hypothesized variables and knowing the direct and indirect relationship between two or more variables [11]. Performance modeling refers to research that has been done before by Singhvi, Dhage, & Sharma (2018), Wambugu (2014), Shahzadi, Javed, Pirzada, Nasreen, & Khanam (2014), Yıldız, Baştürk, & Boz (2014), Nuskiya (2018), Chiaburu & Tekleab (2005), Waris (2015), Riyadi, Setiawan, & Ratnawati (2018), and Elyanto RY (2017). After a literature study has been conducted, the hypothesis are formulated as follows:

- 1. H1: Compensation has a significant effect on work motivation [12-13].
- 2. H2: Organization culture has a significant effect on work motivation [14-15]. H3:

Transformational leadership has a significant effect on work motivation [16].

- 3. H4: Information technology has a significant effect on work motivation [17].
- 4. H5: Training effectiveness has a significant effect on work motivation [18]. H6: Motivation has a significant effect on employee performance [10].
- 5. H7: Compensation has a significant effect on employee performance [3].
- 6. H8: Organization culture has a significant effect on employee performance [19].
- H9: Transformational leadership has a significant effect on employee performance [5]. H10: Information technology has a significant effect on employee performance [7].
- 8. H11: Training effectiveness has a significant effect on employee performance [8].
- 9. H12: Compensation has an effect on employee performance through work motivation as mediator [13].
- H13: Organization culture has an effect on employee performance through work motivation as mediator [14, 20].
- 11. H14: Transformational leadership has an effect on employee performance through work motivation as mediator [16, 20]. H15: Information technology has an effect on employee performance through work motivation as mediator [7, 17, 21].
- H16: Training effectiveness has an effect on employee performance through work motivation as mediator [21, 22].

This sampling use population as samples [23]. The rating scale used is a Likert scalal of 1-5. Population and research data criteria shown in Table 3.

According to Garson, outer model is the path coefficient cycle, the total coefficient of influence, and the coefficient of indirect effect [24]. This model focuses on the reflective model, representing the path from factors to representative indicator variables, representing the absolute contribution of

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Variable	Dimension	Indicator	Outer Loading	AVE
Compensation	Wages	X1.1.1	0.917	
1		X1.1.2	0.914	
		X1.1.3	0.880	
	Incentive	X1.2.1	0.877	
		X1.2.2	0.901	0.636
		X1.2.3	0.876	
	Indirect Compensation	X1.3.1	0.910	
		X1.3.2	0.864	
		X1.3.3	0.858	
Organization Culture	Integrity	X2.1.1	0.901	
		X2.1.2	0.913	
		X2.1.3	0.867	
	Professional	X2.2.1	0.906	
		X2.2.2	0.898	
		X2.2.3	0.893	0.623
	Joint Colaboration	X2.3.1	0.892	
		X2.3.2	0.879	
		X2.3.3	0.856	
	Business	X2.4.1	0.816	
		X2.4.2	0.912	
		X2.4.3	0.859	
Transformational Leadership	Ideal Influence	X3.1.1	0.737	
	Inspirational Motivation	X3.2.1	0.762	
		X3.2.2	0.882	
	Intellectual Stimulation	X3.3.1	0.838	0.669
		X3.3.2	0.855	
	Individual Considerations	X3.4.1	0.791	
		X3.4.2	0.850	
Information Technology	Ease of Use	X4.1.1	0.776	
		X4.1.2	0.894	
		X4.1.3	0.890	0.649
	Usefulness	X4.2.1	0.795	
		X4.2.2	0.897	
		X4.2.3	0.907	
Training Effectivness	Training	X5.1.1	0.903	
		X5.1.2	0.901	0.812
Work Motivation		X5.1.3	0.900	
	Instrinsic	Y1.1.1	0.949	
		Y1.1.2	0.920	
		Y1.1.3	0.887	
Performance		Y1.1.4	0.895	
	Extrinsic	Y1.2.1	0.847	0.649
		Y1.2.2	0.813	
		Y1.2.3	0.863	
		Y 1.2.4	0.864	
	Synchrone	Y 1.2.5	0.819	
	System	¥2.1.1	0.844	
		Y 2.1.2 Y2.1.2	0.919	0.700
	Percent	12.1.3 V2.2.1	0.838	0.700
	reisonai	¥ 2.2.1 ¥2.2.2	0.809	
		¥ 2.2.2 ¥2.2.2	0.930	
		12.2.3	0.900	

indicators to the definition of latent variable indicators. The Convergent validity criteria values above 0.85 are strongly recommended, values below 0.50 are not recommended [25]. The construct of validity is reached when Fitness Indexes reach the acceptable level. Discriminant validity of the measurement model above is assessed based on the extent to which cross-loading and constructs differ from one another The Validity used Fornell-Larcker criterion. [26]. Comparison of the square root of the mean value of the extracted variance (AVE) of each construct with other constructs. In case the AVE square value of each construct is greater than the correlation between constructs and other constructs then the value of discriminant validity is good. Reliability test is the extent of how reliable is the measurement model in measuring the itended construct [27]. Internal reliability is achieved when the Cronbach Alpha value is 0.6 or higher. Construct reliability is a measure of the reliability and internal consistency of the measured variable representing a latent construct, a value of $CR \ge 0.6$ is required. Average Variance Extracted (AVE) is the average percentage of variation explained by the items in a construct. AVE ≥ 0.5 is required. Inner model is the path coefficient cycle and path loading. Its describe linear equations of relationships between latent variables, where endogenous dependent variables are predicted by endogenous and exogenous constructs that are causally connected [28]. According to Cavusgil *R*2 value for endogenous latent variables (0.67) good, (0.33) moderate, (0.19) weak [29]. Whilst effect sizes of PLS constructs for multiple regression, small (f2 = 0.02), moderate (f2 = 0.15), or large (f2 = 0.35) [28].

III. RESULT AND DISCUSSION

Table 4 shown the outer loading value of all indicators of the research variable which already has a value greater than 0.5. Therefore it meets the convergent validity. The results of the construct validity evaluation by the AVE value for each

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variable greater than 0.5 has been obtained. Thus the indicators used in the research variables are valid.

The square root of AVE for each variable already has a greater value than the value of the Average Varianced Extracted variable itself as in Table 5, hence the evaluation of discriminant validity has been fulfilled.

Table 6 shows that the composite reliability of each variable already has a value greater than 0.7, while for Cronbach alpha the value is also greater than 0.6. Thus research model compiled by the researcher has met the construct reliability.

Testing of the inner model, this study will explained the results of the R-Square and test the hypothesis of the PLS software. The result of R-Square values are as follows.

Table 7 shows the R-Square value for the work motivation variable value is 0.832. These results indicate the diversity of respondents or existing data on work motivation variables explained by compensation variables, organizational culture, transformational leadership, information technology, and training effectiveness. On the performance variable obtained results of 0.826, which indicates the diversity of respondents in the performance variable can be explained by the compensation variable, transformational organizational culture, leadership, information technology, training effectiveness, and work motivation. While f-Square results are listed in Table 8 as follows.

Based on Table 8, it is known that the effect size provided by the compensation variable, organizational culture, and training effectiveness on work motivation and performance is in moderate category. Meanwhile, the effect size on information technology variables, and transformational leadership on work motivation and performance are included in the small category. Hypothesis testing is done by preceive at the coefficient values and the T-Value generated in the model. The research hypothesis will be accepted as an assessment of the value of T-Values > 1.96 and p-Value < 0.05. Hypothesis testing is based on the results of bootstrap estimates on the following software.

Table 9 shows the test of the hypothetical test which shows the value of the coefficient of direct influence, T-Values and p-Value generated on the inner model.

Since the data is gathered and analyzed. Furthermore, the correlation between variables that affect operator performance will be known. The variables consist of compensation, organizational culture, training effectiveness, and work motivation.

A. Compensation

The compensation variable has an influence on work motivation. This is in accordance with previous studies conducted by Khan and Shingvi [12, 30], employees who receive appropriate compensation will be more motivated to work. Compensation is part of the employee's main motivation at work. Employees use their abilities, knowledge, time, and commitment not only to the company or organization but also expect benefits from the productivity they produce [31]. UP PT has provided compensation that the operator considers suitable. According to Suff, organization operate a cash bonus

scheme or incentive plan, there is a firm indicates the organization uses individual performance as a factor on which to base recognition [32]. Efforts will be made by someone and hope to be appreciated, but there needs to be clarity between the effort and rewards received. In addition, the company also provides indirect compensation for adequate health and welfare facilities to support the lives of operators and their families. According to JICA and Omar employees are permitted to have side jobs, health care benefits, and well-developed pension plans [33-34]. Almeida also believes the improvement of recreational facilities, health allowances, subsidized loans, canteens, safety, housing, work equipment, etc. will have a significant effect on employee job satisfaction [35]. For indirect compensation given in the form of dispensation not to work for a business trip if using holiday time instead. If the dispensation is not taken then the operator is entitled to get overtime incentives according to grade/position. There is also an agreement that leave on holidays (Eid al-Fitr and Christmas) is a collective leave that does not cut the actual working hours that are set by an agreement. There will be additional lockers, flashlights, and toilet repairs for supporting facility.

B. Organization Culture

Culture is a pattern of assumptions that are learned in dealing with problems of external adaptation and internal integration that must be taught to members [36]. UP PT has implemented corporate values as an organizational culture in the operator in terms of work procedure standards, acting fairly, transparently and loyally, responsibly, competently, supporting management, synergy, proactively, and quick adaptation. Based on the analysis of the questionnaire, there is a significant influence between organizational culture on work motivation and organizational culture on employee performance. In accordance with research conducted by Sakina and Weerasinghe companies must understand the right culture to be applied to the company so it has implications for increasing employee motivation [14-15]. A good organizational culture will create an atmosphere, commitment, conducive work climate, and discipline in work so that employee performance will improve [20]. When employees have a high level of organizational commitment and harmony, they gain knowledge and contribute to the organization [37]. Operators work by upholding ethics, honesty and trustworthiness in upholding the principles of good corporate governance through ethical behavior (acting in accordance with standards, rules and ethics). Honest (harmony between words and actions in conveying the truth). Trustworthy (maintaining trust by always being transparent, fair, accountable, and loyal). A high level of trust among individuals serves to improve the performance of all institutions including companies [38]. Operators behave professionally with responsibility for the job and authority of prioritizing environmental safety and harmony. Always be confident by continuing to develop competence through the behavior of carrying out obligations for the position or role in the organization. Proactive in company safety training programs, oriented towards environmental safety and harmony in carrying out their

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duties and roles, believe in self ability, think holistically, and always develop competence in the field of work and responsibility. According to Liu, employees who have strong relationships that can be trusted by superiors and coworkers, they are motivated to innovate at work and take responsibility for organizational safety through safe behavior, sharing information, reporting and learning from accidents or incidents [39]. Kuzu also revealed building relationships with fellow and superiors are able to improve employee performance [40]. Establishing minimum safe operating standards relating to the dimensions of integrity and professionalism, where companies apply the number of operators coming to work carried out according to the SOP in a mandate and competent manner. The consequence of occupational safety and health, operators are still prioritized. Operators implement cooperation through integration by building networks, and synergies with various parties to jointly increase the

business scale of the company. Aligning systems, simplifying processes and activities. Extend internal and external relations to build partnerships for the achievement of sustainable goals. Creating added value for the company by managing internal and external interactions so as to create synergies. Finally, operators implement best business practices in managing and achieving company goals on an ongoing basis by always being customer-oriented, thinking business & taking measured risk, innovative, agile, simple and adaptive. Understand the company's business with a focus on efforts to achieve satisfaction, long-term relationships, and the loyalty of internal, and external stakeholders. Proactively providing input for the development of the company. Keen on capturing opportunities and taking measured risks in carrying out business processes. Quick adaptation and think positively. Move swiftly through simplification of business processes and be able to adapt to face the changing business environment and technology [41]. By supporting, rewarding and empowering employees, the climate of innovation stimulates them to develop, adapt, and build their ability to accomplish the mission and goals of the organization [42]. The work instruction review will be carried out monthly in each shift. The operations analyst function will coordinate the discussion every 3 months The above conditions represent the dimensions of joint collaboration and business excellence. These conditions create a climate of partnership in achieving goals and focus on realizing the satisfaction of long-term internal relationships and improving documentation systems in order to increase the maturity level of business management in operations. According to Awadh, organizational is adequate to improve internal relationships that make employee performance escalate [19].

C. Training Effectiveness

Research conducted by [18] shows the effects of training that have a significant impact on work motivation. Since the company has provided training and development programs that are effective and well scheduled. UP PT prepares operators with scheduled training every year. This is considered sufficient to increase operator motivation. [43] said that the supervisor will give the employee time to practice the skills gained from the training. There is a significant indirect effect between the effectiveness of training variables on performance through work motivation. The mediation of work motivation variables that occur in the relationship of training effectiveness on performance is partial mediation because the direct effect that occurred previously also results in significant results. Previous researcher [21] claimed that the application of training can influence motivation. Besides work motivation has a positive effect on employee performance. UP PT implements training that has been scheduled properly and after conducting training, operators are required to implement and provide knowledge sharing about the training that has been done. To accommodate the effectiveness of training, business trip arrangements to add insight such as energy allocation meetings, concession reports, coal coordination, which involve one production operator. Customer gathering involves operators in turn. A benchmarks attempt is made to P2B, and supercritical power plants. Basic maintenance training to strengthen knowledge. Within this solution, it is expected that there will be an increase in soft skills and hard skills in the operator that can improve operator motivation and performance.

D. Work Motivation

According to research conducted by Ali, motivation has a positive influence on employee performance and job satisfaction and is able to increase capabilities in the organization [10]. Employees who are intrinsically motivated are more independent and more oriented. These conditions make them take more responsibility to ensure the required level of skills and competencies. This applied by supporting factors such as salary, job security, personal development, incentives, and bonuses. If basic needs are met it will motivate employees to work. Similar to what happened at UP PT, Operators achieve good performance when motivated through the right variables [44]. To increase the operator's work motivation, management sets talent criteria that emphasis to the preparation of candidate and outstanding employees. The proposed competition for one talent criteria one level above the standard for young highachieving employees (e.g. innovation work) in each shift representing extrinsic dimensions. The competition will motivate millennials to work harder in achieving operating targets As for the intrinsic dimension, it is returned to the individual operators of how to address a problem and how the operator wants to develop themselves.

E. Operator Performance

The compensation variable has a significant effect on performance. Uwizeye said the analysis carried out on all variables was positively correlated and high on employee performance when associated with compensation such a policy made by a company is able to effectively protect and promote employees [3]. Nassazi mentions in industries such as telecommunications it is found that training has an influence on employee performance, this is evidence that training is useful for decision making in government and academic institutions as well as in the industry of development [8]. In addition Waris also added to improve performance management, companies must provide training as a way to improve employee performance capabilities [45]. Training develops the relationship of ability and responsibility at work, as well as employee behavior. Training develops the relationship between ability and responsibility at work, as well as employee behavior. There is a significant effect of compensation variables on performance through work motivation. Mediation of work motivation that occurs in the relationship of compensation to performance is partial mediation since the direct relationship (direct effect) that occurred previously also obtained significant results. this also supported by research conducted by Rizal which states that compensation plays an important role in improving employee performance with the assist of work motivation towards

The objectives undertaken [13]. There is a significant t effect of organizational culture variables on performance through work motivation. Mediation of work motivation variables that occur in the relationship of organizational culture to performance is partial mediation since the direct effect (direct effect) that occurred previously also obtained significant results. Research by Juliningrum and Riyadi proved the application of the rules given by employees influences motivation and performance [20, 46]. Innovation and risk-taking, attention to detail, result orientation, person orientation, team orientation, aggressiveness, and stability, in its application have been able to motivate employees so that employees become motivated to excel, motivation to work and motivation to socialize. There is a significant effect of training effectiveness variables on performance through work motivation mediation. Mediation variable work motivation that occurs in the relationship of training assistance to the performance of partial mediation since the direct relationship (direct effect) that occurred earlier also obtained significant results. Raharjo who previously researched support this study with the conclusion that the application of training was able to influence motivation. Work motivation is also positive on employee performance [21].

IV. CONCLUSION AND RECOMMENDATION

The results show that variables which are able to influence operator performance in this study are compensation, organizational culture, training effectiveness. These variables have a significant effect on operator performance by mediating work motivation. While the transformational leadership variables and information technology do not affect the motivation and performance of operators since they have a small effect size through the mediaton or not. These variables do not meet the criteria of T Value and p Value. Based on the results of the study it can be concluded that the company improve operator performance related to indirect compensation by setting dispensations for business trips, joint leave, work facilities and supporting facilities. Through the organization's culture the company sets safe standards for operational shift workforce formation, activities outside working hours are minimized and adjusted to the working hours of each shift, reviewing work instructions per month in each shift and discussed every 3 months coordinated by the operations planning function to improve climate of internal partnerships and increasing maturity level of business operations management. Then allocate business trip arrangements to add operational insight and basic maintenance training to strengthen performance which is carried out once a year as an effort to increase training effectiveness. Performance improvement through work motivation with talent assessment that takes into account the preparation of candidates and employee achievements, it is agreed that the best talent scores are competed for outstanding young employees (e.g. works innovation) in each shift of operations, operators are motivated to get operating targets.

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