Analysis The Effect of Leadership to Safety Climate, Safety Culture and Safety Performance

by

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Abstract:

In this era of globalization, occupational safety is the main spotlight in every industry. By implementing a safety management system in the workplace, it is hoped that it can shape the safety climate and positive safety culture, which can be assessed from zero accidents, workforce behavior and support for the safety of oneself and coworkers.

The main objective of this research is to analyze the effect of leadership on safety climate, safety culture and safety performance. This research was conducted at a plastic packaging manufactures, PT. Berlina Tbk Tangerang with 133 participants and uses the SEM (Structural Equation Modeling) analysis method.

The results of the research analysis show that leadership, safety climate and safety culture have a simultaneous significant effect on 83% safety performance.

Keywords: Leadership, safety climate, safety culture, safety performance

Introduction

In this globalization era, occupational safety is a top priority in the business. While the accident occurs, the loss is not only borne by the victim, the company holds loss of productivity and reputation in the industry. In 2017 there were 123 thousand workplace accident cases in Indonesia with a claim value of Rp. 971 billion and manufacturing contributed 31 percent (BPJS TK). Besides number of the accident, safety climate and safety culture are the outputs implementation of occupational safety that can be felt directly by the workforce. Management's commitment to occupational safety can be seen from the leaders in providing examples and influences members of their working groups to achieve organizational safety goals.

As a company that produces plastic packaging with various risks of workplace accidents, PT. Berlina Tbk Tangerang has implemented safety in the workplace. The top management's committed to achieving zero accident and still not been achieved due to several incidents, related concern various obstacles, and the responsibility to safety. This company also has a special team for handle occupational health and safety, Safety Health Environmental (SHE) Department. Based on summary work accident in 2017 there were one case of LTI (lost time injury) and four medical treatment cases (SHE Dept. of PT Berlina Tbk Tangerang, Banten Province, Indonesia). The purpose of this study is to analyze some factors : leadership, climate safety, and safety culture to improve safety performance by reducing the number of occupational accidents.

Literature Review

1. Leadership

Leadership may be considered as the process (act) of influencing the activities of an organized group in its efforts toward goal setting and goal achievement (Stogdill, 1950). Empowerment behaviors refer to leader actions that emphasize the development of follower self-management or self-leadership skills (Pearce et al., 2003). Behaviors indicative of this leadership style are primarily developmental or person-orientated. Definitions of the leadership constructs that were generated at Table 1.

Table 1 Operationalization of Leadership

Dimesion	Indicator
Leading by example	1. Sets high standards for performance by his/her own behavior
	2. Works as hard as he/she can
Participating decision making	3. Encourages work group members to express ideas/suggestions
	4. Listens to my work group's ideas and suggestions
	5. Makes decisions that are based only on his/her own ideas
Coaching	6. Teaches work group members how to solve problems on their own
	7. Helps my work group focus on our goals
	8. Suggests ways to improve my work group's performance
Informing	9. Explains company goals
	10. Explains rules and expectations to my work group
	11. Explains how my work group into the company
Showing concern/	12. Shows concern for work group members' well-being

interacting with employees	13. Takes the time to discuss work group members' concerns patiently
	14. Shows concern for work group members' success

Source: Arnold, 2000

2. Safety Climate

Dov Zohar performed the earliest empirical study examining "safety climate" in 1980. After the Chernobyl disaster of 1986, Zohar's findings were introduced into the literature wherein the concepts of safety climate and safety culture were being used interchangeably (Clarke, 2006).

Safety Climate defined as 'the perceptions of employees about safety in their work area' (Dov Zohar, 1980). Dedobbler and Blend (1991) have also defined safety climate as 'perceptions of people about management actions regarding safety'.

The use of the term "climate" seems to indicate a temporary or seasonal characteristic. Definition of safety climate from Australian States of Queensland is the perceived value placed on safety in an organisation at a particular point in time. Therefore, we can think of safety climate as the "mood" of an organisation, based on what workers experience at a specific time. Since safety climate is a snapshot of safety at one point in time, it can change quickly, on a daily or weekly basis.

Table 2 Operationalization of Safety Climate

Dimesion	Indicator
Management safety commitment and ability	1. Management places safety before production
	2. Management ensures that everyone receives the necessary information on safety
	3. Management encourages employees here to work in accordance with safety rules - even when the work schedule is tight
Management safety empowerment	4. Management strives to design safety routines that are meaningful and actually work
	5. Management encourages employees here to participate in decisions which affect their safety
	6. Management involves employees in decisions regarding safety
Management safety justice	7. Management listens carefully to all who have been involved in an accident event
	8. Management looks for causes, not guilty persons, when an accident occurs
	9. Management treats employees involved in an accident fairly
Employees' commitment to safety	10. We who work here take joint responsibility to ensure that the workplace is always kept tidy
	11. We who work here help each other to work safely
Employees' safety priority and absence of risk acceptance	12. We who work here regard risks as unavoidable
	13. We who work here consider minor accidents as a normal part of our daily work
	14. We who work here never accept risk-taking even if the work schedule is tight
Learning, communication and	15. We who work here learn from our experiences to prevent accidents

trust	16. We who work here can talk freely and openly about safety
Trust in efficacy of safety systems	17. We who work here consider that safety rounds/evaluations help find serious hazards
	18. We who work here consider that it is important that there are clear-cut goals for safety

Source: Nordic Occupational safety climate questionnaire

3. Safety Culture

Zhang et al (2002) establish the definitions of safety culture: is the enduring value and priority placed on worker and public safety by everyone in every group at every level of an organization. It refers to the extent to which individuals and group will commit to personal responsibility for safety.

On the opposite safety climate, the use of "culture" assumes the existence of an acquired and developed knowledge and in this way, implying some stability. (Arezes, P.M and A. Sergio M, 2003). Safety culture is often described as the "personality" of an organisation, as it is a shared value of safety. Factsheet from the Australian state of Queensland, stated the safety culture can take time to develop, sometimes even years, and can remain unchanged for a long time.

Table 3 Operationalization of Safety Culture

Dimesion	Indicator
Managers' prioritization of safety	1. My supervisor sets a good example when it comes to safety at my workplace
	2. Management will follow up on actions from HSE-inspections and –meetings
	3. Our managers will take action if safety measures are not implemented within given deadlines 4.5
safety communication	4. In our organization it is common to intervene if someone works in a hazardous way
	5. We show care for each other in our daily work
	6. At my workplace, work operations are always stopped if there are any doubts as towhether safety is ensured
Individual risk assessment	7. The principle that 'we always have the time to work safely' is lived up to at my workplace
	8. I always consider the risks involved before I carry out my work
	9. At my workplace, operations that involve risk are carried out in compliance to rules and regulations
Supportive environment and safety rules and procedures	10. Injuries and near misses are always reported in accordance with regulations
	11. At my workplace, deliberate breaches of rules and regulations will always be sanctioned
	12. When undesirable events happen at my workplace, measures will be taken to prevent similar incidents from happening in the future
	13. If I make a mistake, I can report it to management without fear of negative reactions

Source: Antosen Stian, 2009

4. Safety Performance

Safety performance has often traditionally been measured using self-reported and/or officially recorded accident statistics. However, safety performance has been conceptualized as two types of safety behaviors: safety compliance and safety participation (Neal and Griffin, 2000). Safety compliance refers to the work activities that individuals need to carry out in order to establish workplace safety. These behaviors include adhering to standard work procedures and wearing personal protective equipment. Safety participation describes behaviors that do not directly contribute to an individual`s personal safety, but that help to develop a work environment that supports process safety. It includes activities such as participating in voluntary safety activities, helping coworkers with safety-related issues or attending safety meetings (Neal and Griffin, 2006).

Table 3 Operationalization of Safety Performance

Dimesion	Indicator
Compliance	1. I use all the necessary safety equipment to do my job.
	2. I use the correct safety procedures for carrying out my job.
Participation	3. I put in extra effort to improve the safety of the workplace.
	4. I point out to management any safety related matters that I notice.
	5. I assist others to make sure they perform their work safely.
Accident and injuries	6. How many times have you exposed to a near miss incidentof any kind at work?
	7. How many times have you suffered from an accident/ injuries, which require absence from work exceeding 3 consecutive days?

Source: Pusilo, Christine L., 2013 and Hung, K.H., 2011

5. Leadership and safety climate

Previous studies have outlined a theoretical scheme leadership were effect the safety climate. One study tested safety climate will mediate the relationship between leadership dimensions (or variables) and behavior-dependent injury. The results indicated that safety climate mediates the leadership-injury and suggest complete mediation because transformational leadership has no significant effect when climate 'preventive action' included in the regression model, Dov Zohar (2002). The result from other study 'Research on the relationship between safety leadership and safety climate in coalmines' suggest that the active management of safety leadership positively affects safety training of safety climate, the safety motivation of safety leadership positively affects the safety commitment and the safety involvement of safety climate, and the safety monitor of safety leadership positively affects the safety awareness of safety climate, DU Xuesheng and SUN Wenbiao (2012).

$H_1 1$ Leadership effect the safety climate

6. Leadership and safety culture

Leadership behavior is an important factor in achieving safety performance, as well as research conducted by B. Künzle, Kolbe & Grote (2010) that stated leadership behavior is one reason to achieve organizational safety goals. The other research conducted by Yang et al., (2010) states that leadership can improve safety performance through messages and precise communication in achieving safety goals, so it can be stated that leadership behavior is important to improve safety performance that can be done through awareness or safety programs. Another research conducted by Mavis Andoh (2013) on leadership style and safety performance with the research population of a gold mine in Ghana,

obtained from the results of transformational leadership style has a higher correlation value to safety climate, compared with transactional leadership styles.

$H_1 2$ Leadership effect the safety culture

7. Leadership and safety performance

"Improving safety culture" the book title by Dominic Cooper (2001) was explained to achieve a positive safety culture, needed several components including: leadership, safety management systems, safety behavior and safety climate. Effective leadership contributions in safety management are important as company operations, productivity and quality of goods / services. Two factors of extreme importance to effective leadership is caring and controlling. The caring behavior refers to being concerned with: people well-being; assisting people when necessary; establishing a good rapport with subordinates, establishing good two-way communications by explaining things; being generally available. The controlling refers to: the setting of targets; maintaining performance standards; clarifying people's job-roles, expectation and responsibilities; motivating people to follow rules and procedure. Previous study conducted by Cravello, H.E., (2011) stated the idealized aspects of leadership driving safety motivation and ultimately good results, which included the four aspects of transformational leadership. Specifically, idealized leaders were participative or led by example, were caring and showed concern for their employees well-being, celebrated successes (positive feedback), and for supervisors, communicated about the importance of safety as a priority.

$H_1 3$ Leadership effect the safety performance

8. Safety climate and safety performance

Theoretically safety climate expected to have a positive relationship with safety performance. Previous research on the relationship of climate safety and safety performance by Griffin and Neal (2000) stated that safety climate has a significant influence on safety participation, but the climate of safety does not significantly affect safety compliance. Another research by Hon Ka Hung (2011) with the title "Relationships between climate safety and safety performance of repair, maintenance, minor alteration and addition (RMAA) Works" obtained the results safety climate has a positive effect on safety performance.

$H_1 4$ Safety climate effect the safety performance

9. Safety culture and safety performance

Queensland Workplace Health and Safety paper entitled "Understanding safety culture" (2013) it is stated that strong leadership and management commitment positively impacts safety performance. Results from previous research conducted by Latief Yusuf, et al. (2017) stated safety cost (dimensions od safety climate) is the most significant dimension affecting the safety performance.

$H_1 5$ Safety culture effect the safety performance

Research Methodology

This research was conducted at plastic packaging manufacturing with Production Department as the subject. The aim of this study was to analyze the effect of leadership to safety climate, safety culture and safety performance using a questionnaire as the instrument.
The instrument was divided into five parts: general information, leadership scale, safety climate scale, safety culture scale, and safety performance scale.

The safety climate and safety culture scale encompassed primarily items in 5-point Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree); leadership and safety performance scale encompassed primarily items in 5-point Likert-type scales ranging from 1 (never) to 5 (always).

Referring to previous leadership measurement tools (Arnold, 2000) the empowerment leadership questionnaire considering factors: lead by giving examples, participating in making decisions, conducting guidance, providing information, and showing attention.
The safety climate measurement tools from NORDIC consists 18-items questionnaire.
Instrument safety culture (Antosen Stian, 2009) was divided: managers' prioritization of safety, safety communication, individual risk assessment, supportive environment and safety rules & procedure.
Safety performance measurement constructed from previous research: compliance, participation, accident and injuries (Pusilo, Christine L., 2013 and Hung, K.H., 2011).

This research shall be a quantitative research, data analysis using Structural Equation Modeling (SEM). According to Hair, et al. (2010) state that SEM analysis is a multivariate technique that combines multiple regression aspects and factor analysis to estimate interdependent relationships simultaneously.

The steps of processing and analyzing data in SEM analysis according to Ferdinand (2002) are as follows:

1. Development of theoretical models

   In the step of developing a theoretical model, what must be done is to carry out a series of scientific explorations through literature review to obtain justification for the theoretical models to be developed.

2. Development of flowcharts (Path Diagram)

   In this second step, the theoretical model that has been built in the first stage will be depicted in a flow chart, which will make it easier to see the causal relationship that you want to test. In the flow diagram, the relationship between constructs will be expressed through arrows. A straight arrow shows a causal relationship directly between one other construct. While the curved lines between constructs and arrows at each end show a correlation between constructs which is built in a path diagram that can be divided into two groups, namely Exogenous constructs and Endogenous constructs

3. Convert flowcharts into equations.

   The equation obtained from the converted flow diagram consists of:

   a. Structural equations are formulated to express causality between various constructs.

      Variable endogen = variable eksogen + variable endogen + error

   b. The measurement model, must be determined variable that measure the construct and determine a series of matrices that show correlation between constructs or variables.

4. Selecting the input and estimation matrices of the SEM model uses input data that only uses the variance / covariance matrix or correlation matrix for the overall estimation made.

5. Possibility of identification problems

The problem of identification in principle is about the inability of the model developed to produce unique estimates. If each time an estimate is made an identification problem arises, then the model should be reconsidered by developing more constructs.

6. Testing of the suitability of the model is carried out by examining various criteria *goodness of fit*.
7. The final step is to interpret the model and modify the model for models that do not meet the testing requirements.

Results and Discussion

The subjects of this study were employees of PT. Berlina Tbk Tangerang with 133 respondents working at all levels in the Production Department. Table x is the demographic of study sample, shows that sample was predominantly male (84%).

Table 4 Demographic characteristic of sample (N=133)

Characteristic	Classification	Numbers	Percentage (%)
Gender	Man	112	84%
	Women	21	16%
Age (years)	21-30	36	27%
	>30	97	73%
Education Level	High school	125	94%
	Junior college	8	6%
	Bachelor's degree	0	0%
Years employed	Fewer than three years	23	17%
	Three years or more	110	83%

1. Measurement model analysis.

According to recommendations from Hair, et al. (2010) that the appropriate observation variable is used as an operational construct or latent variable must have loading factor that is greater than 0.4, so that the model used has a good match, in addition to the t-value. The loading factor must be greater than the critical value (> 1.96). Leadership, safety climate, safety culture and safety performance can be accepted or valid because the factor loading value all has a good match (> 0.50).

Good reliability requirements that have reliability constructs (>0.60) and variance extracted (>0.50) (Hair, et al., 2010). Using the calculation all variables have met the reliability requirements, the value of construct reliability in leadership is 0.91; Safety Climate 0.9;, Safety Culture 0,92; and Safety Performance 0.93. In the value of variance extracted, leadership is 0.50, Safety Climate 0.50, Safety Culture 0,50 and Safety Performance 0.93. The results of validity factor and reliability construct show the all variables are valid and reliable.

2. Suitability analysis of all models

To see the goodness of fit model there are several criteria that can be used. The results of the analysis of goodness of fit in this research model are as follows:

Table 5 ***Goodness of Fit***

Group	***Indicator***	***Value***	**Remarks**
1	*Degree of Freedom*	984	*Good fit*
	Chi Square	2150.06	
	NCP	1118.35	
	Confidence Interval	990.16 ; 1254.26	
2	RMSEA	0.093	*Marginal fit*
	Confidence Interval	7.50 ; 9.50	
	P Value	0.00	
3	ECVI *Model*	17.40	*Good fit*
	ECVI *Saturated*	16.38	
	ECVI *Independence*	182.24	
	Confidence Interval	16.43 ; 18.43	
4	AIC *Model*	2296.35	*Good fit*
	AIC *Saturated*	2162.00	
	AIC *Independence*	24055.03	
	CAIC *Model*	2673.72	
	CAIC *Saturated*	6367.47	
	CAIC *Independence*	24233.98	
	GFI	0.59	
	AGFI	0.55	
	PGFI	0.54	
5	NFI	0.91	*Good fit*
	CFI	0.95	
	NNFI	0.95	
	IFI	0.95	
	RFI	0.91	
	PNFI	0.87	
6	*Critical* N	67.93	*Poor fit*
7	*Standardized* RMR	0.099	*Marginal fit*
	GFI	0.59	
	AGFI	0.55	
	PGFI	0.54	

The results of goodness of fit indicate that the model tested in the research is good fit. Chi Square value: 2150,06. The smaller value of the model, the more appropriate between the theoretical model and sample data (Chi Square value divided by Degree of Freedom). The ideal value of good fit is <3, the results of the divider obtained a value of 2.18.

The result of Root Mean Square Error of Approximation test is 0,093, the match is good fit. (Where RMSEA <0.05 is close fit, RMSEA <0.08 is good fit, RMSEA <0.10 marginal fit, and RMSEA> 0.10 poor-fit).

ECVI model (17,40) compared with ECVI saturated model (16,38) and ECVI independence model (182,24). The ECVI model is slightly larger than the ECVI saturated model and the difference is far greater than the ECVI independence model, 90% confidence interval is 16,43;18,43 indicates a good match (around the ECVI model).

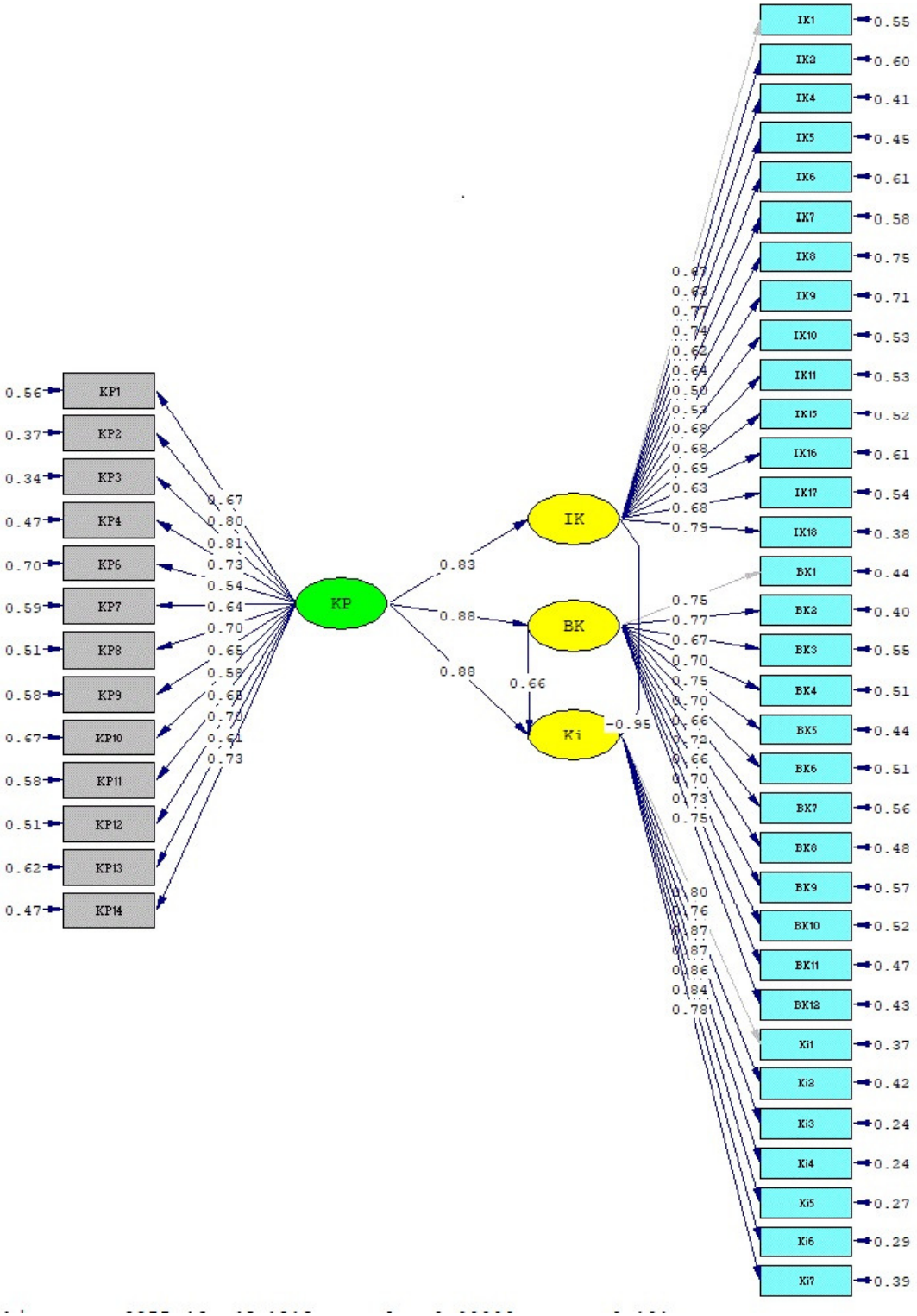
Test of Akaike Information Criterion (AIC) dan Consistent Akaike Information Creterion (CAIC): The AIC model (2296,35) is slightly larger than the AIC saturated model (2162,00) and the difference is far greater than the AIC independence model(24055,03), the smaller

value indicates a good match. CAIC model (2673,72) is far from CAIC saturated model (6367,47) and further from CAIC independence (24233,98), the smaller value indicates a good match.

Test of fit index: normed fit index is 0,91 and CFI is 0,95 (>0,90) indicates good fit. Fit index testing with the Tucker-Lewis Index or Non Normed Fit Index (NNFI) = 0.95 (> 0.90) (above 0.90) indicates good fit. Critical N (CN) = 67,93 <200, the model does not represent the sample size of the data or marginal fit (> 200, the model represents the data size or good fit). Goodness of Fit Index (GFI) = 0.590 shows marginal fit, above 0.90 indicates good fit and Adjusted Goodness of Fit Index (AGFI) = 0.55 shows marginal fit, above 0.90 indicates goodness fit.

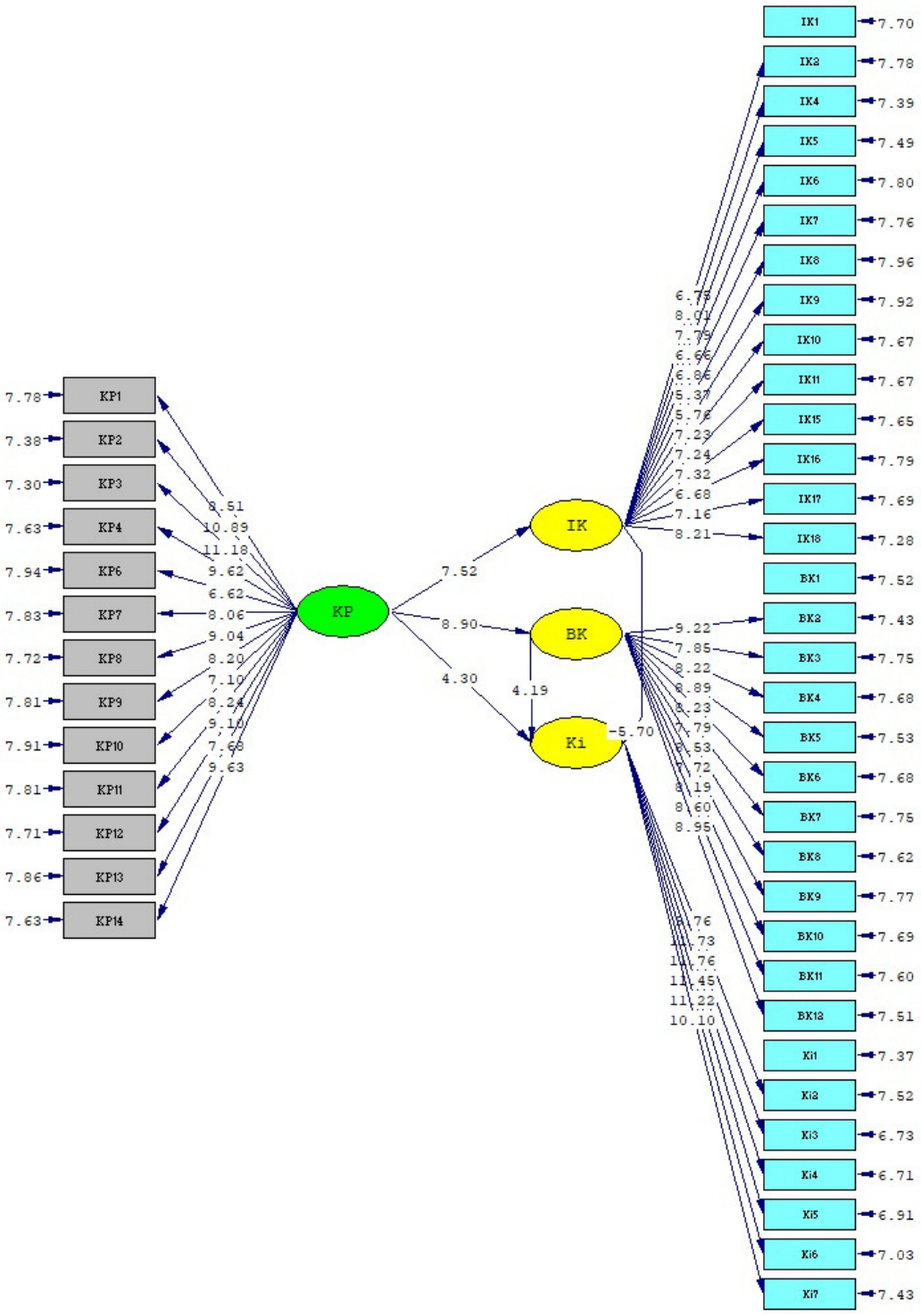
Based on seven group test, all results showed 'good fit' including Chi Square, ECVI, AIC and CAIC, Fit Index. There are results in the form of 'marginal fit' on the RMSEA and GFI; and results in the form of 'poor fit' on Critical N, That can be concluded that compatibility across the models meets the goodness of fit.

Furthermore, this study produces the path diagram as follows:



Picture 1

Path Diagram Standard Solution



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282 **Picture 2**

283 ***Path Diagram T-Value***

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3. Testing of Hypotheses

In this study, there are 5 hypotheses that are tested and based on the test results:

Table 6 Hypothesis Testing

Hypothesis		*T-Value*	Remarks
$H_1$1	Leadership has a significant effect to Safety Climate	7,52	Data supported
$H_1$2	Leadership has a significant effect to Safety Culture	8,90	Data supported
$H_1$3	Leadership has a significant effect to Safety Performance	4,30	Data supported
$H_1$4	Safety Climate has a significant effect to Safety Performance	-5,70	Data supported
$H_1$5	Safety Culture has a significant effect to Safety Performance	4.19	Data supported

In the first hypothesis, it was found that the results of the analysis support the hypothesis $H_1$1, leadership had a significant effect on safety climate, because of the T-value of 7,52>19,6. with a significance level of $\alpha = 5\%$. This result means when leadership changes, causes significant to safety climate.

In testing the second hypothesis, was found the results of the analysis supported the hypothesis $H_1$2, leadership had a significant effect on safety culture with T-values of 8.90, it can be concluded that leadership has a significant effect on safety culture. This result means when leadership changes, causes significant to safety culture.

The testing of the third hypothesis found the results of the analysis support the hypothesis $H_1$3, leadership had a significant effect on safety performance with a statistical value of t test of 4.30, that result means when leadership changes, causes significant to safety performance. In testing the fourth hypothesis was found that the results of the analysis support the hypothesis $H_1$4, safety climate had an effect on safety performance with a T-value of -5.70. It means when safety climate changes, causes significant to safety performance.

Testing the hypothesis $H_1$5, safety culture had an effect on safety performance with T-value of 4.19. This shows that the effect that occurs between the safety culture and safety performance is statistically significant at the 5% significance level. That means when safety culture changes to be more positive, causes significant to safety performance.

Conclusion and Suggestion

Based on the results, research to 133 respondents regarding analysis influence of leadership to safety climate, safety culture and safety performance at PT. Berlina Tbk Tangerang conclusions can be drawn as follows:

1. Leadership has a partially significant effect to safety climate.
2. Leadership has a partially significant effect to safety culture.
3. Leadership has a partially significant effect to company safety performance.
4. Safety climate has a significant effect to safety performance.
4. Leadership, safety climate and safety culture simultaneously have a significant influence on safety performance by 83%.

Further research is needed to expand the scope of research, for example by using various divisions of the company, and needed to explore the effect of leadership, the role of the

occupational safety and health practitioner or adviser to safety climate or culture and corporate safety performance.

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