

Determinants of Manual Rolling Productivity: Testing the Mediating Mechanism of Psychological Capital

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ABSTRACT

This study aims to examine the influence of work discipline, work environment, and work skills on the productivity of cigarette rolling workers at PT Karya Bina Sentausa Malang, with Psychological Capital as a mediating variable. The research employed a quantitative approach using a survey, involving 100 contract-based rolling workers purposively selected. Data were analyzed using SEM-PLS. The results indicate that only work discipline has a significant direct effect, while work environment and work skills do not. Psychological capital significantly mediates the relationship between work discipline and employee productivity, but does not significantly mediate the relationships of work environment and work skills with employee productivity. In labor-intensive industries that use a manual rate system, internal psychological resources (self-efficacy, optimism, hope, and resilience) act as a vital catalyst, transforming discipline, workplace comfort, and skills into optimal productivity.

Keywords: *Productivity; Psychological Capital; Work Discipline; Work Environment; Work Skills.*

ABSTRAK

Penelitian ini bertujuan untuk menguji pengaruh disiplin kerja, lingkungan kerja, dan keterampilan kerja terhadap produktivitas pekerja di PT Karya Bina Sentausa Malang, dengan modal psikologis sebagai variabel mediasi. Penelitian ini menggunakan pendekatan kuantitatif dengan metode survei yang melibatkan 100 pekerja bagian linting berbasis kontrak yang dipilih melalui *purposive sampling*. Data dianalisis menggunakan SEM-PLS. Hasil penelitian menunjukkan bahwa hanya disiplin kerja yang memiliki pengaruh langsung signifikan terhadap produktivitas karyawan, sedangkan lingkungan kerja dan keterampilan kerja tidak berpengaruh. Modal Psikologis secara signifikan memediasi hubungan antara disiplin kerja dan produktivitas karyawan, tetapi tidak secara signifikan memediasi hubungan antara lingkungan kerja dan keterampilan kerja dengan produktivitas karyawan. Dalam industri padat karya yang menerapkan sistem upah manual, sumber daya psikologis internal (efikasi diri, optimisme, harapan, dan ketahanan) bertindak sebagai katalis vital yang mengubah disiplin, kenyamanan tempat kerja, dan keterampilan menjadi produktivitas yang optimal.

Kata Kunci: *Produktivitas; Modal Psikologis, Disiplin Kerja; Lingkungan Kerja; Keterampilan Kerja.*

INTRODUCTION

Employee productivity is a crucial determinant of organizational effectiveness and efficiency, particularly in labor-intensive manufacturing sectors that still rely heavily on manual production processes. High productivity reflects workers' ability to generate optimal output by effectively utilizing time, skills, and available resources. In the manufacturing sector, productivity improvement is a strategic factor because it is closely linked to production efficiency, output growth, and the company's competitiveness in an increasingly dynamic market environment (Subagyo et al., 2023). Consequently, organizations must manage their human resources effectively to achieve optimal operational performance. In the Cigarette (SKT) industry, worker productivity in the rolling division is significant because most production activities are still performed manually under a piece-rate system. This system inherently requires workers to perform tasks quickly, accurately, and consistently to meet daily production targets. However, variations in worker productivity are still frequently observed due to several influencing behavioral and environmental factors.

Empirical observations at PT Karya Bina Sentausa Malang revealed dynamic changes in production output from the first quarter to the second quarter of 2025. As a labor-intensive industry relying on manual rolling, these variations indicate that employee productivity is shaped by work discipline, the work environment, and work skills (Rahim et al. 2024). Work discipline is considered one of the primary factors influencing productivity, reflecting employees' compliance with organizational rules and operational standards. Workers with strong discipline tend to perform tasks in a more organized, efficient, and responsible manner (Ferawati, 2017). In addition to discipline, the work environment also plays a crucial role. A safe and comfortable working environment helps employees maintain concentration and reduce fatigue during production activities, whereas an unfavorable work environment may lead to decreased focus and reduced performance. These factors are further complemented by work skills, which represent an individual's ability to complete tasks accurately and efficiently (Sari et al., 2020) and, according to company standards, enable them to produce higher-quality, higher-quantity work (Setiawan et al., 2021).

While these operational factors are vital, employee productivity is also profoundly influenced by positive psychological resources. Recent developments in human resource management research emphasize the importance of Psychological Capital (*PsyCap*) as a positive psychological resource possessed by employees. According to the Resource-Based View (RBV) theory, an organization's competitive advantage is derived from valuable internal resources, including human capital with unique knowledge, skills, and capabilities. In this study, work discipline, work skills, and Psychological Capital are considered internal organizational resources that contribute to performance optimization. Psychological capital consists of self-efficacy, optimism, hope, and resilience, all of which help employees cope with work pressure and maintain motivation (Luthans, 2011). Under a high-pressure piece rate system, workers with strong *PsyCap* are expected to view daily targets as positive challenges rather than stressors. Therefore, this study aims to analyze the influence of work discipline, work environment, and work skills on employee productivity, with psychological capital as a mediating variable at PT Karya Bina Sentausa Malang.

LITERATURE REVIEW

Resource-Based View (RBV)

The Resource-Based View theory explains that an organization's competitive advantage stems from its resources, including human resources with unique skills, knowledge, and abilities. Work discipline, work skills, and psychological capital are internal resources that can increase organizational productivity.

Positive Organizational Behavior Theory

This theory, developed by Luthans (2011), such as hope, optimism, resilience, and self-efficacy, can improve work performance and productivity. Psychological capital can be developed to enhance individual performance within an organization.

Work Productivity

Work productivity is a worker's ability to produce optimal output from available inputs, such as time, energy, and resources. This productivity can be influenced by various aspects, including individual conditions and the general work environment (Subagyo et al., 2023). Productivity can be understood as a mental attitude that emphasizes that the quality of life today must be better than yesterday, and tomorrow must be better than

today. The mental attitude that reflects productivity includes various positive characteristics such as motivation, discipline, creativity, innovation, dynamism, professionalism, and fighting spirit (Hamali, 2013).

Work Discipline

Work discipline reflects an employee's attitudes, behaviors, and actions that align with company regulations, fostering a sense of responsibility, awareness, and a willingness to work optimally (Ferawati, 2017). Work discipline plays a crucial role in driving increased productivity for both employees and the organization. Individuals with a high level of discipline typically work with greater focus, are punctual, and demonstrate consistency and effectiveness in completing their responsibilities (Samsudin et al., 2024).

Work Environment

The work environment is the setting in which employees perform their daily activities. A supportive environment can provide a sense of security and encourage employees to work optimally. When the work environment feels comfortable, employees feel more at home and can complete tasks more efficiently. Conversely, unfavorable working conditions can hinder performance and reduce productivity. Therefore, organizations need to ensure that the work environment is always conducive (Rahmawati & Damayanti, 2023). An optimal work environment is crucial for strengthening human resource management practices. This environment encompasses not only physical conditions but also psychological and social factors that shape employees' work experiences. In a supportive environment, employees tend to feel more comfortable and motivated to carry out their duties (Wahyuningsih, 2018).

Work Skills

Work skills refer to the abilities or expertise a person possesses as a result of experience and familiarity in performing specific tasks. These abilities make employees better prepared, more confident, and more effective at completing their work (Mardiah & Fahmawati, 2023). Job skills have a strong and positive influence on employee performance. The higher the skills, the more effectively employees can complete tasks. This also helps improve the quality of work output and supports the achievement of organizational goals (Latief et al., 2019).

Psychological Capital

Psychological capital is the psychological capabilities individuals possess that support personal growth and development, particularly in facing workplace challenges (Fadhila, et al., 2025). This concept was first introduced by Goldsmith, who viewed psychological capital as a personality trait that can influence a person's level of success and engagement in their work (Lehoczky, 2013). Psychological capital is a positive psychological state characterized by four main components: self-efficacy, optimism, hope, and resilience. Self-efficacy indicates an individual's belief in their ability to complete challenging tasks. Optimism relates to a positive outlook on success in the present and future. Hope reflects an individual's motivation and ability to devise ways to achieve goals. Resilience, on the other hand, is an individual's ability to persist and bounce back in the face of difficulties or failure. These four components constitute psychological resources that can support improved individual performance and productivity within an organization (Çavuş & Gökçen, 2015).

Hypothesis Development

The Relationship Between Discipline and Work Productivity

Previous research has shown that good work discipline can increase productivity. Work discipline is a person's willingness to comply with applicable regulations (Indrika et al., 2025). Work discipline not only creates an orderly environment but also increases individual responsibility, which ultimately impacts employee productivity. Research by Sinaga (2016) also suggests that work discipline has a significant impact on employee performance, supporting the assertion that strong discipline increases productivity.

The Relationship Between the Work Environment and Work Productivity

A conducive work environment is a crucial factor in increasing work productivity. According to Faadhilah et al. (2025), the work environment significantly influences productivity because when employees feel comfortable at work, they tend to be more motivated to achieve high performance. Research by Apriliani & Romus (2023) also supports this, stating that the physical environment, such as cleanliness, lighting, and work condition management, significantly influences employee morale and work efficiency.

The Relationship between Work Skills and Work Productivity

Work skills are considered a key determinant in achieving optimal work productivity. According to Rosdiana & Romdhoniati (2023), skills result from training and experience and enable employees to complete tasks efficiently. Research by Yosiana & Baraba (2025) shows that good skills are positively related to employee productivity, so the more skilled an employee is, the better their work results will be. This aligns with the findings of Faadhilah et al. (2025), who found that skills contribute significantly to productivity in an organization.

Psychological Capital as a Mediator in the Relationship between Discipline and Work Productivity

Psychological capital plays an important mediating role in the relationship between work discipline and work productivity. Research by Nissa & Pujianto (2024) shows that work behavioral factors such as work ethic aligned with work discipline can increase employee productivity by enhancing psychological capital. Positive psychological states such as self-efficacy, hope, optimism, and resilience can encourage individuals to work more effectively, maintain high motivation, and cope with work pressure. Furthermore, psychological capital also influences employee work behavior, including discipline. Individuals with positive psychological states tend to have better work attitudes, thus improving work performance and productivity (Aprina et al., 2021).

Psychological Capital as a Mediator of the Relationship Between the Work Environment and Work Productivity

The work environment is a crucial factor influencing employee productivity, both directly and through the individual's psychological state. Research shows that a positive work environment can improve internal factors such as motivation and psychological well-being, ultimately leading to increased productivity (Barri et al., 2024). Furthermore, a positive work environment also contributes to increased employee psychological capital, reflecting positive psychological states such as self-efficacy, hope, optimism, and resilience (Kurniadewi, 2016). Psychological capital itself has been shown to influence employee performance, which is part of work productivity (Kusnadi et al., 2025).

Psychological Capital as a Mediator of the Relationship Between Work Skills and Work Productivity

Work skills are a crucial factor influencing employee productivity. Research shows a positive relationship between work skills and productivity, such that the higher an employee's skills, the higher their productivity (Syahdan, 2017). Furthermore, psychological capital also plays a role in improving individual work behavior and performance, as positive psychological states such as self-efficacy, hope, optimism, and resilience can encourage individuals to work more effectively and innovatively (Khairunnisa et al., 2024). Furthermore, research shows that psychological capital can act as a mediating variable linking work factors with productivity: increasing work factors increases psychological capital, which ultimately impacts employee productivity (Nissa & Pujianto, 2024).

Based on the theoretical foundation and conceptual framework explained above, the hypotheses proposed in this study are as follows:

- H1: Work Discipline has a significant effect on Work Productivity.
- H2: Work Environment has a significant effect on Work Productivity.
- H3: Work Skills have a significant effect on Work Productivity.
- H4: Psychological capital mediates the effect of Work Discipline on Work Productivity.
- H5: Psychological capital mediates the effect of Work Environment on Work Productivity.
- H6: Psychological capital mediates the effect of Work Skills on Work Productivity.

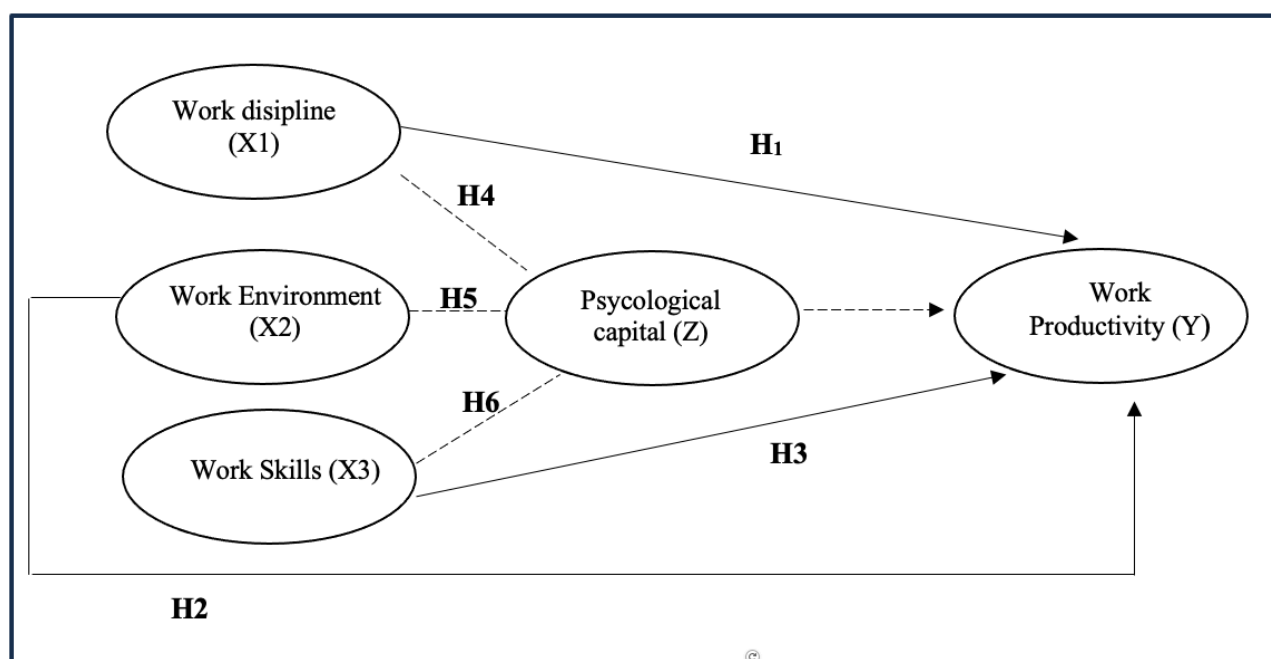


Figure 1. Hypothesis Model

Source: Researcher Data, 2026

RESEARCH METHODS

This study employed a quantitative research approach using an explanatory survey method. The research object consisted of cigarette rolling workers at PT Karya Bina Sentausa Malang. The study population included all contract-based workers in the rolling production division. Purposive sampling was applied, with the criterion that respondents were contract-based rolling workers who had worked at the company for at least 1 year. Based on these criteria, a sample of 100 respondents was obtained, providing an adequate sample size for PLS-SEM path analysis. Data primer were collected through structured questionnaires using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The research variables consisted of Work Discipline (X₁), Work Environment (X₂), Work Skills (X₃), Psychological Capital (Z) as the mediator, and Employee Productivity (Y) as the dependent variable. Work productivity is measured using five indicators adapted from Hulu & Telaumbanua (2022); Hamali (2013); work discipline is measured using five indicators adapted from Luthans (2011); Prasetyo et al. (2021); work environment is measured using three indicators adapted from Rahman & Ekowati (2025) and Wahyuningsih (2018); work skills are measured using four indicators developed from Robbins & Judge (2019); Luthans (2011). Meanwhile, psychological capital is measured using four indicators based on the views of Rahmi et al. (2024) and Mardiah & Fahmawati (2023). Data analysis was conducted using Structural Equation Modeling Partial Least Squares (SEM-PLS) with the assistance of SmartPLS 4.0 software.

RESULTS AND DISCUSSION

Construct Reliability, convergent Validity, Discriminant Validity

Based on Table 1, all research variables meet the criteria for reliability and convergent validity. The factor loadings range from 0.69 to 0.93, indicating that each indicator effectively reflects its latent construct. The (CR) values (0.79–0.95) and Cronbach's alpha values (0.90–0.97) exceed the minimum threshold of 0.60, confirming strong internal consistency. In addition, the AVE values (0.63–0.74) are above the 0.50 cut-off, suggesting that more than half of the variance in the indicators is explained by their constructs. Therefore, the measurement instruments used in this study are both reliable and valid for further analysis.

Table 1. *Validity and Reliability of Scales*

Variable	Indicators	Factor loading	CR	Cronbach's alpha	AVE
Work Discipline (X ₁)	5	0.70-0.93	0,966	0.959	0.744
Work Environment (X ₂)	3	0.71-0.87	0,927	0.908	0.645
Work Skills (X ₃)	4	0.76-0.89	0,969	0.965	0.742
psychological capital (Z)	4	0.83-0.89	0,950	0.970	0.749
Work productivity (Y)	5	0.69-0.89	0.796	0.941	0.634

Source: Processed data, 2026

Evaluation of Model Structure (Inner Model)

The structural model (*Inner Model*) is used to test the hypothesized relationship between latent variables. According to Hair et al. (2022), this model is used to assess the strength and significance of the influence between constructs through the *R-squared* (R²) value. According to Hair et al. (2022), a model is categorized as strong if R² > 0.75, moderate if 0.50–0.75, and weak if ≤ 0.25.

Table 2. R Square

Variables	R-squared	Variance Explained (%)	Criteria
Work Productivity	0.824	82.4%	Strong
Psychological Capital	0.534	34.6%	Moderate

Source: Processed data, 2026

Based on Table 2, the R-squared value for the Y variable is 0.824 (82.4%), which falls within the strong category. Meanwhile, the Psychological Capital (Z) variable has an R-squared value of 0.534 (53.4%), which falls into the moderate category.

Hypothesis Testing

According to Adzikra et al. (2025), the F-test is used to determine whether all independent variables collectively have a significant effect on the dependent variable. This test also assesses the statistical significance of the regression model. Hypothesis testing is performed at a 5% significance level ($\alpha = 0.05$), with a *t-statistic* > 1.96 or a *p-value* < 0.05 indicating a significant relationship between the variables. Hypothesis results are determined based on the values obtained from *the output path coefficients* and indirect effects.

Table 3. Path Coefficients

Variables	T statistics (O/STDEV)	P value
Work Discipline - Work Productivity	2.895	0.004
Work Environment - Work Productivity	0.178	0.859
Work Skills - Work Productivity	0.771	0.441

Source: Researcher Data, 2026

The relationship between Work Discipline (X₁) and Work Productivity (Y) can be seen from the T-statistic value (2.895), which is greater than 1.96, and the P-value (0.004), which is less than 0.05. From these two results, it can be concluded that the effect of variable X₁ on variable Y is significant, thereby accepting H₁. This indicates that good work discipline can increase employee productivity by promoting compliance with rules, taking on work responsibilities, and completing work on time.

The Effect of Work Environment (X₂) on Work Productivity (Y). The relationship between Work Environment (X₂) and Work Productivity (Y) can be seen from the T-statistic value (0.178), which is less than 1.96, and the P-value (0.859), which is greater than 0.05. From these two results, it can be concluded that the effect of variable X₂ on variable Y is insignificant, thereby rejecting H₂. This indicates that the work environment in this study has not directly influenced increased employee productivity.

The Effect of Work Skills (X₃) on Work Productivity (Y). The relationship between Work Skills (X₃) and Work Productivity (Y) can be seen from the T-Statistics value (0.771), which is less than 1.96, and the P-

Value (0.441), which is greater than 0.05. From these two results, it can be concluded that the effect of variable X_3 on variable Y is insignificant, thereby rejecting H_3 . This indicates that employees' work skills have not directly influenced increased productivity in this study.

Table 4. Mediation Effects (*Specific Indirect Effects*)

Variables	t statistics (O/STDEV)	P value
$X_1 \rightarrow Z \rightarrow Y$	2.083	0.038
$X_2 \rightarrow Z \rightarrow Y$	0.963	0.336
$X_3 \rightarrow Z \rightarrow Y$	1.887	0.060

Source: Researcher Data, 2026

The role of psychological capital as a mediator in the effect of work discipline on work productivity is indicated by the T-statistic of 2.083, which is greater than 1.96, and the P-value of 0.038, which is less than 0.05. From these results, it can be concluded that Psychological Capital (Z) significantly mediates the effect of Work Discipline (X_1) on Work Productivity (Y), thereby supporting H_4 . This indicates that good work discipline can improve employee psychological capital, such as optimism, self-confidence, hope, and resilience, which ultimately impacts work productivity.

The role of psychological capital as a mediator in the effect of work environment on work productivity is indicated by a T-statistic of 0.963, which is less than 1.96, and a P-value of 0.336, which is greater than 0.05. From these results, it can be concluded that the Psychological Capital (Z) variable does not mediate the influence of the Work Environment (X_2) on Work Productivity (Y), thereby rejecting H_5 . This indicates that the work environment in this study did not significantly increase employees' psychological capital and therefore did not mediate work productivity.

The role of psychological capital as a mediator in the effect of work skills on work productivity can be seen from the T-statistic of 1.887, which is less than 1.96, and the P-value of 0.060, which is greater than 0.05. From these results, it can be concluded that the Psychological Capital (Z) variable does not mediate the effect of Work Skills (X_3) on Work Productivity (Y), and H_6 is rejected. This indicates that employees' work skills have not optimally increased psychological capital, and thus have not had a significant mediating effect on work productivity.

The Influence of Work Discipline on Work Productivity

The results of the data analysis test indicate that work discipline has a significant effect on the productivity of the rolling mill workers at PT Karya Bina Sentausa Malang. This means that the higher the level of work discipline, the higher the resulting work productivity. Good work discipline is reflected in punctual attendance, compliance with work regulations, adherence to work standards, high alertness, and a strong work ethic. With this discipline, workers can work more focused, effectively, and efficiently in achieving daily production targets. The results of this study align with research conducted by Apriliani & Romus (2023), Indrika et al. (2025), and Yosiana & Baraba (2025), which showed that work discipline has a positive and significant effect on employee productivity. These findings indicate that discipline is a crucial factor in improving work output, particularly in labor-intensive industrial sectors that rely on a piecework system, such as PT Karya Bina Sentausa Malang.

The Influence of the Work Environment on Work Productivity

The results of the data analysis test indicate that the work environment does not have a significant effect on the productivity of the rolling workers at PT Karya Bina Sentausa Malang. The relationship between Work Environment (X_2) and Work Productivity (Y) is not statistically significant, as indicated by the T-statistic value of 0.178, which is less than 1.96, and the P-value of 0.859, which is greater than 0.05. Although a comfortable working atmosphere, harmonious relationships with coworkers, and supportive facilities may contribute to employee comfort and focus, the results of this study show that the work environment did not directly increase work productivity.

The results of this study differ from those of Faadhilah et al. (2025), Apriliani & Romus (2023), and Indrika et al. (2025), who reported that the work environment has a positive and significant effect on work productivity. The difference in findings indicates that, in this study, the work environment was not a significant direct determinant of productivity among rolling workers at PT Karya Bina Sentausa Malang.

The Influence of Work Skills on Work Productivity

The results of the data analysis test indicate that work skills do not have a significant effect on the productivity of the rolling workers at PT Karya Bina Sentausa Malang. The relationship between Work Skills (X3) and Work Productivity (Y) is not statistically significant, as indicated by the T-statistic value of 0.771, which is less than 1.96, and the P-value of 0.441, which is greater than 0.05. This indicates that differences in workers' skills did not directly produce a statistically significant increase in productivity in this study, even though skills remain important in a manual rolling production process.

The results of this study differ from those of Rosdiana & Romdhoniati (2023) and Yosiana & Baraba (2025), who found that work skills have a positive and significant effect on work productivity. The difference in findings indicates that, in this study, work skills were not a significant direct determinant of productivity among rolling workers at PT Karya Bina Sentausa Malang.

Psychological Capital Mediates the Effect of Work Discipline on Work Productivity

The results of the data analysis test indicate that Psychological Capital mediates the effect of work discipline on the productivity of the rolling mill workers at PT Karya Bina Sentausa Malang. This means that good work discipline not only directly increases productivity but also enhances the workforce's positive psychological state, which, in turn, impacts productivity gains. Good work discipline can establish regular work habits, increase a sense of responsibility, and strengthen the workforce's confidence in their ability to achieve work targets. These conditions contribute to the formation of Psychological Capital, which consists of self-efficacy, optimism, hope, and resilience.

The results of this study align with those of Nissa & Pujianto (2024) and Aprina et al. (2021), which show that positive work behaviors, including work discipline, can improve employee psychological well-being and ultimately impact work productivity. When linked to Luthans' Positive Organizational Behavior Theory, Psychological Capital is a positive psychological capital that can be developed through work experience and positive behavior. Work discipline helps individuals build self-confidence, optimism, and resilience in the face of work pressure, thereby increasing work productivity.

Psychological Capital Mediates the Effect of the Work Environment on Work Productivity

The results of the data analysis indicate that Psychological Capital does not mediate the effect of the work environment on work productivity. This means that a good work environment cannot enhance employees' positive psychological states, thereby increasing productivity. A comfortable, safe, and harmonious work environment helps employees feel calmer, more focused, and more motivated. These conditions encourage increased optimism, resilience, hope, and self-efficacy. These results align with research by Barri et al. (2024), Kurniadewi (2016), and Kusnadi et al. (2025), which states that the work environment influences employee psychological state and work productivity.

Psychological Capital Mediates the Effect of Work Skills on Work Productivity

The results of the data analysis test indicate that Psychological Capital does not mediate the effect of work skills on work productivity. This means that strong work skills cannot, by themselves, increase employees' self-confidence, optimism, and resilience in the workplace, thereby boosting productivity. Highly skilled workers tend to be more confident in completing tasks, better able to cope with work pressure, and more likely to expect to achieve production targets. These conditions foster positive Psychological Capital. The results of this study align with those of Syahdan (2017), Khairunnisa et al. (2024), Nissa & Pujianto (2024), which show that work skills can increase productivity both directly and through positive psychological states.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

This study concludes that work discipline significantly influences work productivity, whereas work environment and work skills do not. Additionally, work discipline can improve employee psychological capital, such as optimism, self-confidence, hope, and resilience, which ultimately impacts work productivity. The work environment in this study did not significantly increase employee psychological capital and therefore did not mediate work productivity. Work skills have not been able to increase psychological capital optimally, thus not having a significant mediating effect on work productivity.

Implications

This study extends the human resource management literature rooted in the Resource-Based View (RBV) by confirming the strategic integration of physical-technical assets (skills and environment) and positive psychological resources (*PsyCap*) in driving performance in manual, labor-intensive manufacturing sectors.

Recommendations

This study has limitations because it was conducted only at the PT Karya Bina Sentausa Malang. while PT Karya Bina Sentausa Malang also exists in several other regions. Therefore, further research is recommended to expand the scope by involving cigarette companies in other regions, thus providing a more comprehensive picture. Furthermore, future research could include other variables, such as management performance or member participation, thereby providing a more comprehensive description of the influencing factors.

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