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What Drives Performance in High-Risk Manufacturing? The Roles of Motivation and Discipline

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Abstract

Background: Work motivation and work discipline are widely recognized as determinants of employee performance; however, most empirical studies focus on general organizational contexts, with limited evidence from high-risk, safety-critical manufacturing environments. This gap is significant in flat glass production, where declining performance—reflected in rising absenteeism, tardiness, and disciplinary violations—may directly threaten operational reliability and safety compliance.
Objective: This study examines the partial and simultaneous effects of work motivation and work discipline on employee performance in a safety-sensitive industrial setting at PT Muliaglass Float 1 Division.
Methods: An associative quantitative approach was employed using data collected from 110 employees through a structured Likert-scale questionnaire. The data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) to assess measurement validity, construct reliability, and structural relationships.
Results: Work motivation and work discipline positively and significantly affect employee performance, explaining 70% of the variance (R^2 = 0.700). Work discipline demonstrates a stronger effect, highlighting the critical role of procedural compliance and behavioral consistency in high-risk production environments.
Conclusion: Work motivation and work discipline significantly influence employee performance in a safety-critical manufacturing environment, with discipline showing a stronger effect and jointly explaining 70% of performance variance. The findings highlight the central role of procedural compliance and safety adherence in stabilizing performance in high-risk settings. Practically, organizations should align motivational programs with strong disciplinary and safety systems. The study is limited by its cross-sectional design and single-company scope; therefore, future research should adopt longitudinal approaches and incorporate additional contextual variables to enhance generalizability.

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INTRODUCTION

Human resources are strategic assets that determine an organization's competitiveness, particularly in manufacturing industries where operational reliability, product quality, and safety compliance depend heavily on employee performance. In high-risk production environments such as flat glass manufacturing, employees' competence, discipline, and work behavior directly influence productivity, accident prevention, and overall organizational sustainability (Dede et al., 2022). In flat glass manufacturing, employee performance is crucial, as it directly impacts product quality, production continuity, timeliness, accountability, and compliance with safety regulations (Habaora et al., 2021). Beyond technical competence, performance in such environments is

heavily influenced by behavioral factors, particularly work motivation and work discipline (Hutomo, 2023).

Previous studies have consistently confirmed that both variables significantly influence employee performance, both individually and collectively (Rahmawati et al., 2024). Motivated employees tend to demonstrate higher levels of commitment and initiative, while disciplined employees demonstrate punctuality, procedural compliance, and behavioral consistency (Kirana et al., 2022). However, most empirical evidence has been obtained from general organizational contexts, such as service industries, public institutions, or manufacturing environments with relatively low operational risk. Empirical investigations examining work motivation and work discipline in high-risk, safety-critical production environments remain limited (Supriyadi et al., 2025).

Most prior studies have predominantly focused on service sectors, public institutions, or general manufacturing contexts where operational risk and safety compliance are not the primary determinants of performance (Alamsyah et al., 2021). Consequently, the behavioral dynamics of employees operating under strict procedural and safety requirements have received comparatively less scholarly attention (Alif & Sary, 2022). Moreover, studies employing robust analytical approaches such as PLS-SEM in safety-critical industrial contexts are still relatively scarce.

Specifically, limited research has compared the relative dominance of work discipline over work motivation in environments where adherence to operational standards directly affects reliability and accident prevention. Furthermore, empirical evidence from the flat glass manufacturing industry remains underrepresented in the literature. Therefore, a more context-specific investigation is necessary to clarify how motivational and disciplinary factors interact and which variable exerts a more decisive influence on performance in discipline-sensitive production systems.

This gap is particularly relevant in flat glass manufacturing, although similar challenges are also observed in other high-risk industrial sectors such as petrochemicals, mining, and heavy manufacturing, where operational errors may lead to serious safety incidents and production losses. However, flat glass manufacturing presents a uniquely discipline-sensitive production system characterized by continuous high-temperature processes, strict quality tolerances, and zero-defect expectations, where even minor deviations from standard operating procedures can result in product failure, equipment damage, or workplace accidents. This sector was selected as the focus of the study due to its high operational risk, strong reliance on procedural compliance, and limited empirical examination in prior behavioral performance research.

Investigating this context provides both theoretical relevance and practical urgency in understanding how motivation and discipline function within safety-critical manufacturing environments, where deviations from operational procedures and safety standards can result in workplace accidents, product defects, and production disruptions. In such a safety-critical context, work discipline serves not only as administrative control but also as a fundamental mechanism for maintaining operational reliability. At PT Muliaglass Float 1 Division, indications of declining employee performance were observed during the 2022–2024 period.

This decline was reflected in a decrease in the proportion of A–B performance ratings and an increase in C–D ratings, accompanied by increased absenteeism and tardiness. Previous studies have shown that such conditions are often associated with weakened motivation, lack of recognition, and declining work discipline, all of which negatively impact employee performance (Pardede & Dewi, 2023; Pradana & Santoso, 2022; Saepudin & Arifin, 2024). Furthermore, internal organizational records reveal repeated safety violations, suggesting that the mere existence of formal regulations is insufficient to ensure consistent compliance (Firman et al., 2024; Imama et al., 2021).

Previous studies consistently confirm that work motivation and work discipline significantly influence employee performance across service, public, and general manufacturing sectors. However, most research conceptualizes performance in non–safety-critical contexts and rarely situates these variables within high-risk production systems. Empirically, studies in hazardous and discipline-sensitive manufacturing environments remain limited, particularly those comparing the relative dominance of discipline over motivation.

Methodologically, the application of comprehensive structural modeling approaches in such contexts is still underexplored. Accordingly, this study addresses the following questions: (1) Do work motivation and work discipline significantly influence employee performance in a safety-critical manufacturing environment. (2) Which variable exerts a stronger effect? and (3) To what extent do both variables simultaneously explain performance variance in a discipline-sensitive production system.

This gap requires targeted studies that address the specifics of rigorous, safety-focused production. Therefore, this study examines how motivation and discipline impact performance at PT Muliaglass Float 1 Division, both separately and in combination, using Partial Least Squares Structural Equation Modeling (PLS-SEM). This research extends Self-Determination Theory (SDT) and organizational control theory by demonstrating that, in safety-critical manufacturing, work discipline functions as a structural control mechanism that more strongly stabilizes performance than motivation alone. The findings refine performance models by repositioning discipline from a peripheral compliance factor to a central determinant in high-risk organizational contexts.

LITERATURE REVIEW

Theoretical Conceptual and Hypothesis Development

This study is grounded in Self-Determination Theory (SDT) and organizational control theory. SDT explains that intrinsic and extrinsic motivation enhance performance through the fulfillment of autonomy, competence, and relatedness needs. Recent studies confirm that work motivation positively influences employee performance across industrial contexts. However, in safety-critical manufacturing, performance is not solely driven by motivational factors but also by behavioral regulation.

Organizational control theory emphasizes that formal rules, monitoring, and procedural compliance function as structural mechanisms that stabilize performance and reduce operational risk. Empirical evidence shows that work discipline significantly strengthens safety compliance and operational reliability in hazardous industries. Thus, employee performance in high-risk factories reflects the interaction between motivational drivers and disciplinary control systems.

Based on this framework, this study proposes that work motivation and work discipline positively affect employee performance, both partially and simultaneously. Furthermore, given the safety-sensitive context, work discipline is expected to exert a more dominant influence than motivation.

Work Motivation

Work motivation is defined as an internal driving force that influences employee behavior, effort, and persistence in achieving work goals (Andriyani et al., 2024). Work motivation encompasses both internal and external drivers that encourage individuals to optimize their abilities in performing work tasks (Andi et al., 2023). Recent empirical studies consistently demonstrate that financial and non-financial motivation significantly enhances employee performance by strengthening work commitment, improving efficiency, and increasing output quality (Vuong & Nguyen, 2022). These findings confirm motivation as a key determinant of productivity and performance effectiveness across organizational contexts. According to Edy Sutrisno (2023), motivation comprises five key dimensions: achievement orientation, responsibility and attendance, initiative, social relationships and cooperation, and the need for influence and recognition. These dimensions collectively reflect employees' drive to perform optimally, comply with organizational rules, proactively execute tasks, collaborate effectively, and seek acknowledgment for their contributions. Based on this theoretical and empirical foundation, the following hypothesis is proposed:

H1: Work motivation has a positive and significant influence on employee performance.

Work Discipline

Work discipline is defined as an employee's willingness to comply with established organizational rules and work standards (Abdullah et al., 2023). Empirical studies consistently report a positive and significant relationship between work discipline and employee performance, as discipline reduces deviant behavior, strengthens organizational commitment, and ultimately

increases productivity (Dehotman, 2023). According to the framework proposed by Edy Sutrisno (2023), work discipline comprises four key dimensions: adherence to time regulations, compliance with company rules, adherence to workplace behavioral norms, and compliance with other organizational regulations. These dimensions collectively represent employees' consistency in following procedures, maintaining appropriate conduct, fulfilling responsibilities, and responsibly utilizing organizational resources. Based on this theoretical and empirical foundation, the following hypothesis is proposed:
H2: Work discipline has a positive and significant influence on employee performance.

Employee Performance

Employee performance refers to the results and effectiveness of employees' work in achieving organizational goal (Zaeni et al., 2023). Work motivation and work discipline play complementary roles in shaping performance, where motivation serves as an internal driver for goal achievement, while discipline provides a behavioral framework that ensures consistency and order in the work process (Handayani & Kartika, 2023). Empirical evidence consistently shows that the simultaneous influence of work motivation and work discipline significantly increases productivity and supports the achievement of organizational goals (Layek & Koodamara, 2024). According to Annisa (2025), employee performance encompasses five key dimensions: work quality, work quantity, timeliness, responsibility, and cooperation and initiative. These dimensions reflect employees' ability to produce accurate and timely outputs, achieve performance targets, manage responsibilities, and actively contribute to organizational goals. Based on this theoretical and empirical foundation, the following hypothesis is proposed:
H3: Work motivation and work discipline simultaneously have a positive and significant influence on employee performance.

Conceptual Framework

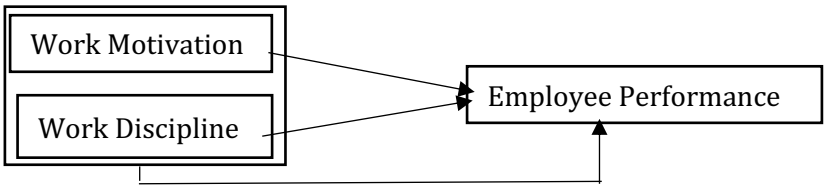

Figure 1. Conceptual Framework

Hypothesis

The research hypotheses can be formulated as follows:
H1: Work motivation has a significant positive effect on employee performance
H2: Work discipline has a significant positive effect on employee performance
H3: Work motivation and work discipline have a significant positive effect on employee performance

METHOD

Research Instrumentation

The research instrument was developed as a structured questionnaire comprising 37 items measuring work motivation, work discipline, and employee performance. The measurement of work motivation was adapted from the Self-Determination Theory framework developed by Guay (2022), particularly dimensions of intrinsic and extrinsic motivation. Work discipline items were adapted from recent studies on organizational control and safety compliance in manufacturing contexts. Employee performance indicators were derived from contemporary performance measurement literature in industrial settings.

The adaptation process involved three stages. First, item selection was conducted by reviewing validated instruments from prior empirical studies and mapping them to the conceptual definitions used in this research. Second, contextual modification was carried out to align the wording of items with the characteristics of safety-critical flat glass manufacturing, particularly regarding procedural compliance and safety standards. Third, content validity was assessed through expert judgment involving two academics in human resource management and

one industry practitioner to ensure clarity, relevance, and contextual suitability.

The questionnaire items were adapted from relevant previous studies and adjusted to the research context to ensure the validity and reliability of the measurements. Each statement was assessed using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) to consistently capture respondents' perceptions and support the analysis of latent variables. Details of the indicators and research variables are presented in Table 1.

Table 1. Operational Variable

Variable	Code	Item
Work Motivation	X1_1	I strive to complete my work optimally to deliver satisfactory results.
	X1_2	I have perseverance and a strong will to complete my work even when faced with difficulties.
	X1_3	I have a high work ethic because I feel happy when I can do my job well.
	X1_4	I am always on time in accordance with the company's rules and regulations.
	X1_5	I show strong commitment to the work I handle.
	X1_6	I take initiative without waiting for orders from my superiors.
	X1_7	I can find new ways or innovative solutions to complete work tasks.
	X1_8	I work harmoniously with my colleagues to achieve common goals.
	X1_9	I respect the opinions and differences that exist in my work environment.
	X1_10	I strive to perform well in accordance with my role and responsibilities.
	X1_11	I strive to be a role model for my colleagues through my positive behavior and work ethic.
Work Discipline	X2_1	I always arrive on time according to the established work schedule.
	X2_2	I complete my working hours as stipulated and do not leave work early.
	X2_3	I use my working time effectively and efficiently to complete tasks with optimal results.
	X2_4	I comply with all company policies and regulations in carrying out my work.
	X2_5	I dress neatly and in accordance with the company's applicable work regulations.
	X2_6	I show a polite attitude and respect my superiors and colleagues in every interaction.
	X2_7	I carry out my duties in accordance with established procedures and job responsibilities.
	X2_8	I maintain good coordination and communication with other departments in a professional manner to ensure smooth work operations.
	X2_9	I avoid actions that violate work procedures and strive to work in accordance with operational standards.
	X2_10	I do not use company facilities for personal gain without proper authorization.
	X2_11	I do not smoke in prohibited areas to maintain a comfortable and safe work environment.
	X2_12	I always pay attention to work safety in every task to prevent accidents.

Employee Performance	Y1_1	I always strive to complete my work according to company quality standards.
	Y1_2	I am thorough and accurate in completing every task.
	Y1_3	I am consistent in maintaining the quality of my work.
	Y1_4	I can complete the amount of work according to the given targets.
	Y1_5	I work productively in completing daily tasks.
	Y1_6	I can fulfill my workload according to the predetermined schedule.
	Y1_7	I always complete my work on time according to the set deadlines.
	Y1_8	I manage my time well to ensure that work is completed on schedule.
	Y1_9	I do not delay work without a clear reason.
	Y1_10	I complete each task with a high sense of responsibility.
	Y1_11	I am committed to the results of my work.
	Y1_12	I can perform tasks well even without direct supervision.
	Y1_13	I actively participate in team activities and cooperation.
	Y1_14	I provide ideas or solutions that can improve the performance of the team or company.

Source: Processed Data (2026)

Population and Sample

The target group of this study includes all employees of PT Muliaglass Float Division 1, totaling 150 people. We used a probability sampling approach with simple random sampling to select participants (Sugiyono, 2023). The number of respondents was calculated using the Slovin formula, with a margin of error of 5%, and the result was 110 people. This group size is quite large and meets the basic requirements of Partial Least Squares–Structural Equation Modeling, which suggests at least ten times the highest number of paths leading to the dependent variable (Hair Jr et al., 2021).

Data Collection and Data Analysis

Data for this study were collected through an online survey distributed via Google Forms to employees at PT Muliaglass Float 1 Division, resulting in 110 valid responses for analysis. The data were processed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) to investigate the relationship between work motivation, work discipline, and employee performance. The analysis prioritized the evaluation of the measurement model for convergent validity and construct reliability, followed by an examination of the structural model to test the proposed hypothese (Duryadi, 2021; Hair Jr et al., 2021).

RESULTS AND DISCUSSION

Result

Respondent Characteristics

The respondent profile indicates a highly homogeneous workforce. Of the 110 participants, 99.09% were male, reflecting the physically demanding and safety-sensitive nature of flat glass production. In terms of education, 89.09% held a high school diploma or equivalent, while 4.55% possessed a diploma and 6.36% a bachelor's degree; none had postgraduate qualifications. This distribution suggests that operational performance in this context relies more heavily on behavioral factors such as discipline and motivation than on advanced formal education.

Tabel 2. Characteristics of Respondents

Profile	Categories	Frequency	%
Gender	Man	109	99,09%
	woman	1	0,91%

Education	High School/Equivalent	98	89,09%
	Diploma	5	4,55%
	Bachelor's Degree	7	6,36%
	Postgraduate	0	0%

Source: Processed Data (2026)

Measurement Model Evaluation

The measurement model demonstrated satisfactory convergent validity and internal consistency. All outer loadings exceeded the 0.70 threshold, indicating adequate indicator reliability. Cronbach's alpha and Composite Reliability values were above 0.90 for all constructs, confirming strong internal consistency. The Average Variance Extracted (AVE) values for employee performance (0.819), work discipline (0.791), and work motivation (0.733) surpassed the 0.50 criterion, indicating sufficient variance explanation. Overall, the measurement model met established validity and reliability standards, supporting further structural analysis.

Tabel 3. Validity and Reliability Test Results

	Cronbach 's alpha	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**	**Average variance extracted**
Employee Performance	0.983	0.984	0.984	0.819
Work Discipline	0.976	0.976	0.978	0.791
Work Motivation	0.963	0.968	0.968	0.733

Source: Processed Data (2026)

Structural Model and Hypothesis Testing

The structural model exhibited substantial explanatory power, with an R^2 value of 0.700 (adjusted R^2 = 0.694), indicating that work motivation and work discipline jointly explained 70% of the variance in employee performance. Both constructs showed statistically significant effects: work motivation (p = 0.029) and work discipline (p = 0.009). Effect size analysis revealed that work discipline (f^2 = 0.282) had a stronger impact than work motivation (f^2 = 0.204), both within the medium range.

These findings confirm that while motivation enhances employee effort and engagement, discipline plays a more dominant role in stabilizing performance within a highly regulated, safety-critical manufacturing environment. The results highlight the centrality of procedural adherence and behavioral consistency in sustaining operational reliability.

Tabel 4. Hypothesis Test Result

Hypothesis	**Path**	**P-Value**	**Conclusion**
H1	WM -> EP	0.029	Supported
H2	WD-> EP	0.009	Supported

Note: WM: Work Motivation; WD: Work Discipline; EP: Employee Performance.

Source: Processed Data (2026)

Discussion

The findings indicate that both work motivation and work discipline significantly influence employee performance, explaining a substantial proportion of performance variance in this safety-critical manufacturing context. This result reinforces prior studies showing that behavioral factors are central to performance formation in structured production environments. While motivation enhances effort and engagement, discipline ensures procedural compliance and operational consistency. Notably, the stronger role of discipline in this study suggests that in high-risk industrial settings, performance stability depends more heavily on adherence to rules and safety standards than on motivational dynamics alone.

This study demonstrates that both work motivation and work discipline significantly

influence employee performance in the high-risk manufacturing context of PT Muliaglass Float 1 Division. The structural model shows an R^2 value of 0.700, indicating that 70% of the variance in employee performance can be explained by the two independent variables. This relatively high explanatory power confirms that behavioral factors play a central role in shaping performance outcomes in safety-critical industrial environments. In flat glass manufacturing, where operational precision, adherence to procedures, and safety compliance are essential, performance cannot be separated from employees' internal drive and their consistency in following established standards.

The positive and significant effect of work motivation on employee performance supports the theoretical assumption that motivation acts as an internal energy that directs effort, persistence, and goal orientation. Employees who demonstrate achievement orientation, initiative, responsibility, and cooperation tend to produce higher quality outputs, meet production targets, and complete tasks on time. In this study, motivated employees were more likely to show commitment to quality standards and actively contribute to team performance. This finding aligns with motivational theories emphasizing that individuals who experience intrinsic satisfaction and recognition are more likely to exert discretionary effort, which ultimately improves performance indicators such as productivity, timeliness, and responsibility.

However, the results also reveal that work discipline exerts a stronger influence on employee performance compared to work motivation, as indicated by the lower p-value (0.009) and larger effect size (f^2 = 0.282). This suggests that in a discipline-sensitive and high-risk production environment, procedural compliance and behavioral consistency are more decisive determinants of performance than motivational aspects alone. In flat glass manufacturing, deviations from operational standards can lead not only to reduced productivity but also to safety incidents and product defects. Therefore, discipline functions as a structural control mechanism that ensures employees adhere to time regulations, safety rules, and operational procedures. The dominance of discipline highlights that performance stability in hazardous manufacturing settings depends heavily on rule adherence and standardized behavior.

The stronger role of discipline can also be interpreted from a contextual perspective. The respondent profile shows that most employees possess a high school educational background and are directly involved in physically demanding production activities. In such settings, performance is less dependent on abstract knowledge and more reliant on routine compliance, punctuality, and consistent execution of standardized tasks. Discipline, therefore, becomes a behavioral safeguard that reduces variability in work processes. While motivation encourages employees to perform better, discipline ensures that performance is maintained within safe and reliable operational boundaries. This complementary relationship confirms that motivation and discipline do not operate in isolation; rather, discipline provides the structural framework within which motivation can be effectively translated into measurable performance outcomes.

Simultaneously, the findings confirm that the combined effect of work motivation and work discipline significantly enhances employee performance. This supports the conceptual framework that positions motivation as an internal driving force and discipline as an external regulatory mechanism. In high-risk manufacturing environments, the integration of motivational initiatives such as recognition, responsibility, and teamwork with strict procedural enforcement creates a balanced performance system. Organizations that focus solely on motivation without strengthening discipline may face inconsistencies in operational compliance, while excessive emphasis on discipline without motivational support may reduce employee engagement. Therefore, optimal performance is achieved when motivational strategies are embedded within a robust disciplinary and safety-oriented system.

Previous studies have reported similar findings regarding the importance of motivation and discipline in influencing employee performance. For example, research by Kirana (2022), in manufacturing companies found that both work discipline and work motivation positively and significantly affect employee performance, with discipline showing a relatively stronger contribution in structured production settings. Likewise, Dehotman (2023) demonstrated that disciplined work behavior directly enhances productivity and minimizes deviant actions, reinforcing the argument that adherence to rules is critical for stable performance outcomes.

Furthermore, studies by Anisah (2022), and Zaeni (2023) confirmed that the

simultaneous influence of motivation and work discipline significantly improves employee performance in public and private sector organizations. Thaeir findings emphasize that motivation strengthens employees' internal commitment, while discipline ensures consistent task execution and responsibility fulfillment. The present study extends these findings by demonstrating that in a high-risk, safety-critical manufacturing environment, discipline plays a more dominant role, thereby contributing new empirical insight into performance formation within hazardous industrial contexts.

CONCLUSION

This study concludes that work motivation and work discipline significantly influence employee performance at PT Muliaglass Float 1 Division. The structural model demonstrates an R^2 value of 0.700, indicating that 70% of the variance in employee performance is explained by the two independent variables. Hypothesis testing shows that work motivation has a positive and significant effect on performance, while work discipline also has a positive and significant effect with a stronger contribution, as reflected in its larger path coefficient (β) and effect size (f^2 = 0.282; p = 0.009). These findings empirically answer the research questions by confirming both the partial and simultaneous effects of motivation and discipline, as well as identifying discipline as the more dominant predictor within this safety-critical manufacturing context.

Practically, the results suggest that improving employee performance in high-risk production environments requires prioritizing consistent enforcement of work discipline particularly adherence to operational procedures, punctuality, and safety standards while simultaneously strengthening motivational aspects such as responsibility and teamwork. Nevertheless, the study is limited to a single organizational setting and uses a cross-sectional design, which restricts broader generalization and causal interpretation. Future research is recommended to replicate this model in similar manufacturing contexts and apply longitudinal approaches to examine the stability of the relationships between work motivation, work discipline, and employee performance over time.

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AUTHOR CONTRIBUTION STATEMENT

Aenun Najib was responsible for research conceptualization, literature review development, research design, data collection, data analysis using PLS-SEM, and manuscript drafting. Fetty Poerwita Sary contributed to research supervision, methodological refinement, interpretation of results, critical manuscript revision, and final approval of the manuscript for publication. Both authors have read and approved the final version of the manuscript.

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