Research Article

SEM Analysis of Contractor Performance in Accelerating Electrical Construction Project: Insights from Herzberg's Dual Factor Theory

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ABSTRACT

In the rapidly developing electrical construction industry, the success of organizations is directly linked to the performance of their business partners. This study focuses on Indonesia's state-owned electrical enterprises, where a notable decline in Key Performance Indicators (KPIs) has raised concerns, hypothesizing that deficiencies in contractor performance are a major barrier to timely completion of electrical construction projects. At the core of this issue is the role of human resources, identified as a pivotal factor in contractor performance that directly impacts the project completion. The aim of the research is to elucidate the complex dynamics between motivator and hygiene factors, which are fundamental to Herzberg's dual factor theory, and their impact on the performance of the contractor's employees. Using Structural Equation Modeling (SEM), the study analyzes data from questionnaires distributed to 250 industry professionals. The analysis provides key insights into how these factors significantly influence job satisfaction and ultimately employee performance. These insights play a critical role in strategically planning contractor management practices. By emphasizing the need to understand the key factors driving employee satisfaction and performance, the study lays a solid foundation for designing effective employment contracts and management strategies. The practical implications of this research are significant, offering a pathway for contractors to enhance employee satisfaction and performance. This ultimately leads to the delivery of high-quality electrical infrastructure projects efficiently and promptly, underlining the study's relevance and importance in the contemporary industrial landscape.

Keywords: contractor performance, job satisfaction, Herzberg theory, electrical construction project, SEM

INTRODUCTION

Electrical construction project is a cornerstone of modern infrastructure development which play a pivotal role in shaping the landscapes of cities and countries. Integral to these projects is the construction management which not only aims to improves investment efficiency but also has a significant impact on social and environmental benefits [1]. The importance of these projects extends to various scales, from mid-and small-scale electrical works to extensive power transmission lines, each requiring advanced quality control and specialized attention [2]. In addition, the incorporation of intelligent technology and automation in building electrical construction project is advancing the field, highlighting a global shift towards more efficient, technologically integrated construction practices [3]. These advancements, coupled with the challenges of managing costs and implementing effective site management [4], underscore the complexity and significance of electrical construction projects in contemporary infrastructure development.

Indonesia has been at the forefront of enhancing its electricity infrastructure, achieving a remarkable power reserve capacity that frequently exceeds the 30 percent mark. This robust reserve is a direct manifestation of the country's continuous investment in and dedication to infrastructure development [5]. The year 2022 was characterized by an audacious target of adding 5,988.6 megawatts (MW) to the nation's generating capacity. The achievement of 5,338.1

MW, accounting for 89.14% of the intended goal, is a testament to the country's efforts. This accomplishment has significantly contributed to elevating the total installed capacity of Indonesia's power plants to an estimated 79.7 gigawatts (GW) [6]. The expansive distribution of power plants, substations, and transmission lines across the Indonesian archipelago is indicative of a strategic and broad-based approach to national electricity development. Indonesia's State-Owned Electricity Enterprise (SOEE), or PT Perusahaan Listrik Negara (PT.PLN) – in Indonesian, holds a strategic position in the country's electrical construction sector, playing a pivotal role in both the domestic market and global industry. The strategic importance of the enterprise extends beyond their operational roles, as they also contribute to the development of infrastructure and technology that support the wider goals of Indonesia's energy sector. The SOEE are not only central to the nation's economic growth but also to its position as a significant player in the global energy market.

The scale and complexity of large-scale electrical construction projects managed by the SOEE have necessitated a significant involvement of contractors, engineers, and consultants. Managing these projects involves navigating complex contracts, employment relationships, limited control, and the need for effective coordination among various stakeholders [7]. The performance of these diverse stakeholders is closely intertwined with the overall success and efficiency of the projects, where effective collaboration and management are essential. Therefore, managing these large-scale electrical construction projects requires a holistic approach that addresses these varied and complex challenges.

Crucial to the success of organizations within the electrical construction project is the performance of the project contractors. The critical relationship between organizational success and the performance of project contractors is evident through various research studies. Contractor performance significantly impacts project timelines, cost-efficiency, and adherence to safety and quality standards. Studies have shown that factors such as contractor financial efficiency, political and economic stability, project manager competence, and clarity of contract documents are crucial for the success of large-scale electrical construction projects [8]. Furthermore, contractor performance is closely related to the satisfactory completion of projects in terms of time, cost, and quality [9]. These partnerships between clients (the project owner) and contractors are not merely transactional but deeply integrated, where the efficiency, reliability, and quality of work provided by contractors directly influence the overall success of projects. In the context of Indonesia, however, the SOEE often encounter significant challenges in managing contractor performance for the successful completion of electrical construction projects. A key issue is the limited knowledge and decision-making processes of contractors, leading to costly losses [10]. These challenges highlight the need for strategic improvements in contractor management to enhance the overall performance and efficiency of Indonesia's electrical construction projects managed by the SOEE.

Essential attribute to these challenges lies in the broad array of resources encompassed, including but not limited to, capital investment, human resources, technological advancement of equipment, innovative work methods, high-quality materials, and timely information [11]-[13]. The human resource, however, stands out as the linchpin in this development, with workers' professionalism, discipline, loyalty, motivation, and competence being pivotal to the realization of the nation's corporate and infrastructural ambitions [14]-[16]. The emphasis on these attributes underscores their critical importance, as these human factors are not just beneficial but fundamental to the successful and timely completion of Indonesia's construction projects.

The performance of contractor employees, in particular, is a crucial in the successful completion of construction projects. In the South African construction industry, improving employee performance is essential for delivering completed projects on schedule, emphasizing the direct impact of workforce efficiency on project timelines [17]. This is echoed globally, as contractor performance closely relates to the satisfactory completion of construction projects in terms of time, cost, and quality [18]. Furthermore, performance appraisal of contractors is recognized as essential for improvement and ultimate success in construction projects [19]. The commitment of contractors to contract agreements significantly influences project performance, contributing to improved overall performance, client satisfaction, and labor productivity [20]. In essence, the performance of contractor employees plays a pivotal role in determining the success of construction projects, highlighting the importance of skilled, committed, and well-managed construction labor forces.

Nusa Tenggara Main Development Unit (Unit Induk Pembangunan Nusa Tenggara, UIP NUSRA – in Indonesian), as one of organizational units of the SOEE, oversees the construction of electricity generators and networks in the Nusa Tenggara region. Their primary focus is on ensuring the effective and efficient development of power plants and networks construction, with a key emphasis on cost, quality, and time management. As a leading provider of electricity in Indonesia, the SOEE is committed to delivering exceptional service, which hinges on the expertise and dedication of its human resources. The successful and efficient completion of electricity construction projects by the organization significantly depends on employee performance, ultimately enabling the SOEE to deliver high-quality services to the community. Emphasizing employee performance is crucial for fostering discipline and commitment among employees, aligning them with the goals, vision, and mission of UIP NUSRA [21].

In the operational domain of the UIP NUSRA, ongoing electricity projects are primarily concentrated in the regions of West Nusa Tenggara Province and East Nusa Tenggara Province, encompassing the construction of 2 generators, 4 substations, and 3 transmission lines. Evaluating the Key Performance Indicators (KPIs) of the UIP NUSRA over the past three years reveals a notable decline in performance achievement by mid-2022. Specifically, performance indicators for power plant construction reached 77.12% in 2019, surged to 88.75% in 2020, achieved 100% in 2021, but experienced a significant drop to only 29% of the 75% target by mid-2022 [22]. However, construction targets for substations and transmission lines have consistently met or exceeded expectations, reaching 100% by mid-2022. The projected failure to meet KPI targets for power plant construction in the upcoming year is anticipated, with indications pointing to incomplete construction due to underperforming Partners/Contractors [23],[24]. The root cause of this underperformance lies in various factors related to human resources that require a thorough understanding [25]. These issues raise questions about the balance between extrinsic factors (Hygiene Factors) and intrinsic factors (Motivator Factors) influencing job satisfaction and worker performance in completing electricity generation construction projects. Specifically, are the human resources, particularly the contractors, lacking in both extrinsic and intrinsic motivation factors, leading to a lack of accountability in completing the construction of electricity generators?

Numerous studies have explored how motivator and hygiene factors impact customer satisfaction and employee performance, aiming to expedite the completion of electricity construction projects [26]-[30]. For example, Mardanov [26] investigated how the organizational environment and intrinsic and extrinsic motivation factors correlate with various latent variables, ultimately influencing employee satisfaction. This satisfaction, in turn, significantly boosts job performance, satisfaction, and retention intention. Notably, job satisfaction has a more pronounced effect on retention intention compared to overall employee satisfaction. Motivation plays a pivotal role in sustaining or enhancing current employee productivity while also preparing them for organizational transitions [27],[29]. Additionally, both hygiene and motivator factors significantly influence the level of job satisfaction among contractor employees [28],[30].

However, previous research in the construction sector primarily focused on ranking factors influencing work productivity without thoroughly examining their interrelationships. Besides, some studies only measured the influence of hygiene factors on job satisfaction, along with the impact of training and motivation on employee performance. Given the complexity of selecting an electricity contractor, there is a pressing need for the SOEE to address this multifaceted challenge. Therefore, this research aims to fill this gap by studying the variables (hygiene and motivator factors) that influence employee satisfaction and performance, thereby accelerating the completion of electricity construction projects. By identifying the variables that significantly affect employee satisfaction and performance, this study aims to provide valuable insights for strategic management planning among contractors tasked with electricity project construction. These insights can inform decision-making processes, facilitating the selection of contractors and expediting project development.

METHODS

In numerous studies, job satisfaction is significantly influenced by hygiene and motivator factors [31]-[33]. However, several factors substantially impact job satisfaction as an intervening variable in employee performance [34]-[36]. Figure 1 presents the proposed model of this study. The Structural Equation Modeling (SEM) approach, which
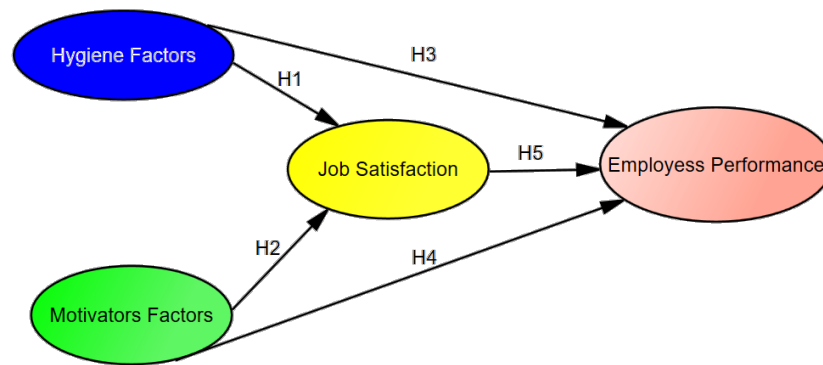
Figure 1. Proposed Model of the Influence of Each Variable for the Acceleration of Electricity Construction Development

integrates factor analysis and simultaneous equation modeling statistical techniques, is employed to identify the determinants of employee performance and job satisfaction. SEM is utilized to assess the strength of the relationships among the model's variables. Furthermore, SEM elucidates the effects of one variable on another, either directly or through an intermediary variable (referred to as an intervening or mediating variable) positioned between the two variables [37],[38].

This research is grounded in Herzberg's theory of motivation, which categorizes human needs and their fulfillment into two groups: hygiene factors and motivators. Hygiene factors pertain to the fundamental requirements of employees, encompassing extrinsic elements that contribute to physical well-being. In contrast, motivators are intrinsic factors essential for psychological growth, such as the sense of accomplishment derived from completing tasks and receiving personal recognition directly related to work performance [39]. Herzberg's theory serves as a crucial framework for understanding job satisfaction and employee performance, particularly in the context of electricity generation construction. By addressing both hygiene factors and motivators, this theory can help ensure that workers are motivated and responsible in completing their tasks, thereby enhancing overall performance and job satisfaction in the construction of power plants. Job satisfaction refers to an employee's emotional response to their job, encompassing feelings of happiness or unhappiness, and overall satisfaction or dissatisfaction at work. Employee performance, on the other hand, is defined as the measurable output an individual produces when completing assigned tasks, influenced by factors such as time management, dedication, experience, and skills [40]. This study aims to identify critical factors that enhance job satisfaction and, in turn, improve employee performance by examining the interrelationships among these aspects.

The model was tested using a Likert scale questionnaire administered to a sample of 250 respondents. Respondents were selected through purposive sampling, based on the researcher's judgment of which samples were most appropriate, useful, and representative of a population of electricity contractors collaborating with PLN UIP Nusa Tenggara. The estimation method employed was Maximum Likelihood (ML), which identifies parameter values that most likely produce the highest covariance or correlation of the existing data. Data analysis was conducted using AMOS 23.0 software, following the procedures outlined in the AMOS 23.0 User's Guide. The ML estimation method is advantageous due to its conceptual simplicity and the possibility of proceeding with a numerical approach to obtain parameter estimates if explicit results are achieved. The indicators used to measure job satisfaction and worker performance are detailed in Table 1.

The hypotheses for this research are designed to explore the relationships between job satisfaction and worker performance, as well as the influence of various factors on these variables. Specifically, the hypotheses aim to test the direct impact of hygiene and motivator factors on job satisfaction, and subsequently, the effect of job satisfaction on employee performance. These hypotheses are formulated to provide a comprehensive understanding of the dynamics at play and to identify key determinants that enhance job satisfaction and performance among electricity contractors working with PLN UIP Nusa Tenggara. The detailed hypotheses are presented in Table 2.

Table 1. Indicators List of The Proposed Research

Construct	Indicators	Label
1. Hygiene Factors	1. Company regulations and procedures	HF1
	2. Interactions with coworkers	HF2
	3. Relationship with boss	HF3
	4. Wage/salary	HF4
	5. K3	HF5
	6. Supervision	HF6
2. Motivator Factors	1. The job itself	MF1
	2. Achievements	MF2
	3. Opportunity to move forward	MF3
	4. Recognition of others	MF4
	5. Responsibility	MF5
3. Job Satisfaction	1. Achievement of work performance	JS1
	2. Feel comfortable interacting with co-workers	JS2
	3. Get compliments on work completed	JS3
	4. Feel comfortable with the way the boss handles complaints from subordinates	JS4
	5. Have the opportunity to be independent in completing work	JS5
4. Employee Performance	1. Work Quality	EP1
	2. Work Quantity	EP2
	3. Employee work attitude	EP3
	4. Work responsibilities	EP4

Table 2. Research Hypothesis

Hypothesis	Description
H1	Hygiene factors (extrinsic factors) have a positive effect on job satisfaction
H2	Motivator factors (Intrinsic Factors) have a positive effect on job satisfaction
H3	Hygiene factors (extrinsic factors) have a positive effect on employee performance
H4	Motivator Factors (Intrinsic Factors) have a positive effect on employee performance
H5	Job satisfaction has a positive effect on employee performance

RESULT AND DISCUSSION

This study seeks to empirically investigate the hypothesis positing that the adverse impacts stemming from inadequate hygiene and motivator factors on contractor employees' performance in executing electrical construction projects can be elucidated by their influence on job satisfaction. More precisely, this research endeavors to apply Herzberg's two-factor theory within the context of contractors overseeing electrical construction endeavors.

In this section, we delve into a comprehensive examination of the model, traversing through multiple stages of evaluation. Initially, we depict the intricate relationships between variables and indicators through the construction of path diagrams within the framework of Structural Equation Modeling (SEM). This visual representation serves as a fundamental tool for conceptualizing the complex interplay between various constructs. Subsequently, we explore the critical phase of analyzing indicator validity. This process entails scrutinizing each indicator to ensure its appropriateness and effectiveness in capturing the underlying constructs accurately. Rigorous assessment of validity is indispensable for safeguarding the integrity and reliability of the ensuing analysis. Finally, the culmination of this methodological journey lies in hypothesis testing. Herein, we systematically evaluate the proposed hypotheses against empirical data, seeking to corroborate or refute the hypothesized relationships elucidated by Herzberg's
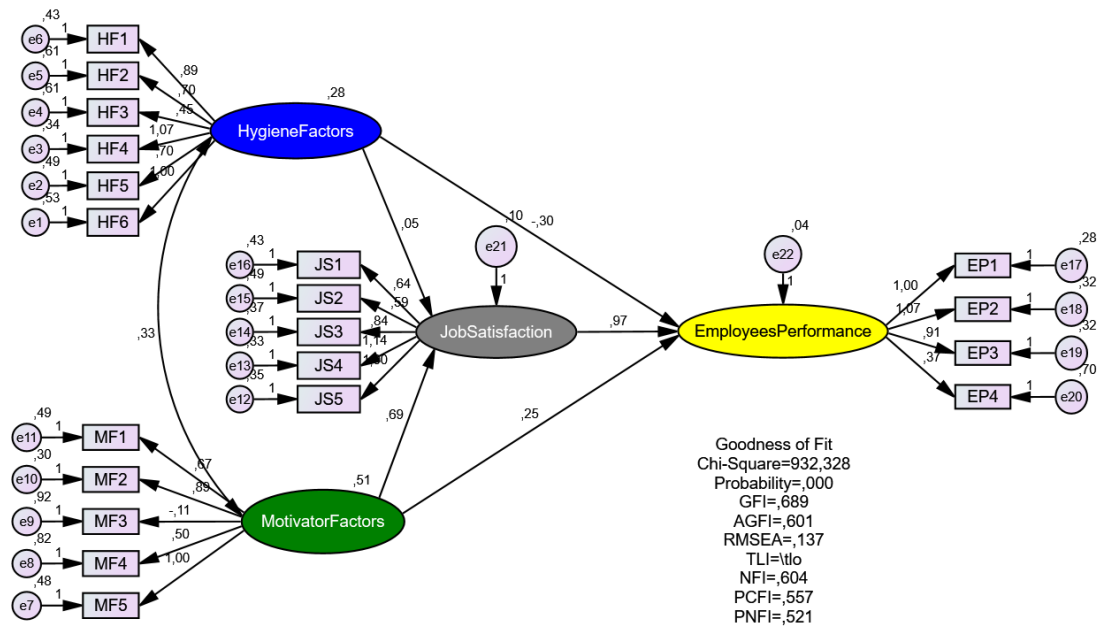
Figure 2. Path diagram of the SEM model

theory. Through this rigorous analytical framework, we aim to contribute to a deeper understanding of the intricate dynamics governing job satisfaction and employee performance within the realm of electrical construction contracting.

Path Diagram

The initial step in the analysis involves constructing a path diagram that visually represents the relationships between variables and their corresponding indicators, as shown in Figure 2. This diagram is essential for conceptualizing the model structure and serves as the foundation for subsequent data analysis. Utilizing AMOS software for data processing, the preliminary results from the initial model indicated the necessity for refinements to achieve a P value greater than 0.05, signifying an acceptable model fit. Model improvement was attempted by addressing high error values through appropriate adjustments and connections. Despite these efforts, the subsequent data revealed that the Probability value remained at 0.000, which is still below the critical threshold of 0.05 required for model fit. This persistent issue indicated that the model was not yet adequately fitting the data. As a result, the model was deemed unfit, necessitating further evaluation. The next steps involved conducting validity tests on each model indicator to determine their suitability and contribution to the model. This process was essential for identifying and addressing any indicators that failed to meet the validity criteria, thereby ensuring that the final model would be both robust and reliable.

Validity and Reliability Test

After The loading factor values are essential for assessing the validity of the indicators in the model. These values, obtainable from the standardized regression weights in the AMOS output, indicate how well each indicator contributes to the respective latent variables. According to established criteria, an indicator is deemed valid if its loading factor exceeds 0.5 [41]. In the current analysis, the AMOS results revealed that several indicators—namely HF5, HF3, HF2, MF4, MF3, JS1, JS2, and EP4—exhibited loading factor values below the 0.5 threshold, thus failing the validity test. As a result, these indicators do not adequately measure their respective constructs and should be excluded from the model. The necessity to re-estimate the model by removing these invalid indicators is paramount to enhance the overall model fit and ensure the reliability and validity of the results. This process aims to refine the model, ensuring that only robust indicators with significant contributions are retained, thereby improving the accuracy and interpretability of the study's findings.
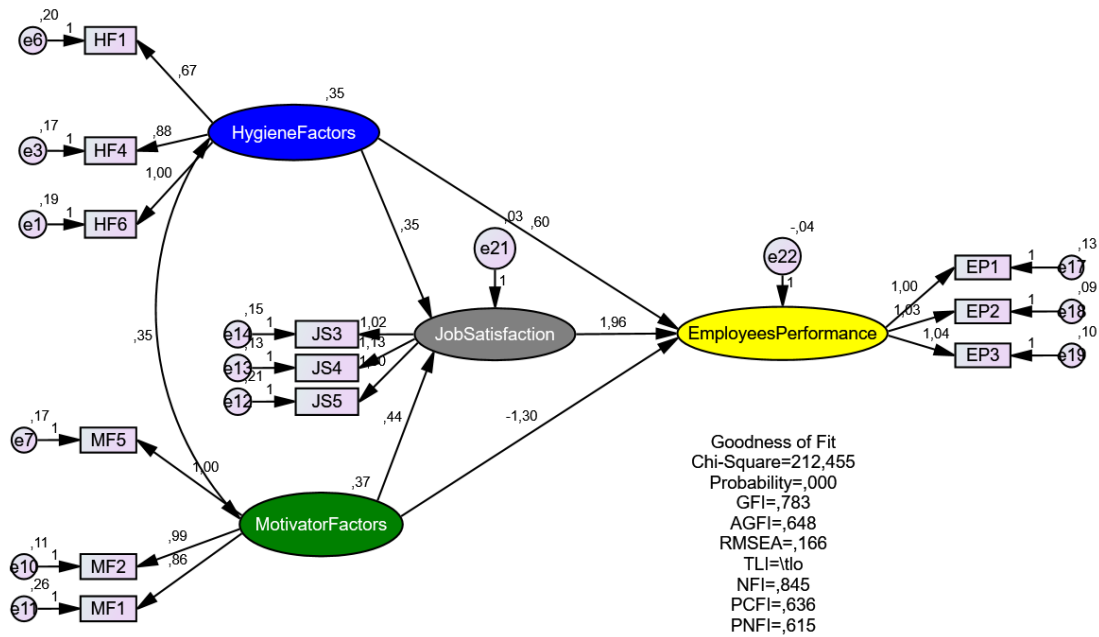
Figure 3. Indicators that passed the validity

To enhance the model, necessary adjustments were implemented, and the refined models are depicted in Figure 3. Concurrently, the results of the validity tests are detailed in Table 3. Within the Structural Equation Modeling (SEM) framework, reflective indicators are expected to exhibit robust associations with their respective latent variables. The reduction of indicators should not compromise the significance of the latent variables, as all indicators should maintain strong correlations. A crucial benchmark is the outer loading value, where an indicator is deemed to contribute substantially to constructing the latent variable if its loading value surpasses 0.5 [42]. Following the re-estimation process, the results presented in Table 4 indicate that the loading values of the indicators exceed the 0.5 threshold. This validates all indicators and permits the continuation of the model evaluation process. These findings affirm the reliability and appropriateness of the refined model, ensuring the integrity of subsequent analyses.

In order to ascertain the instrument's precision, consistency, and accuracy in measuring constructs, a rigorous reliability assessment was conducted. Reliability, in essence, delineates the extent of consistency and stability inherent in a measuring instrument's performance over repeated administrations. It serves as a crucial metric to gauge the internal consistency of the indicators comprising a construct, thereby elucidating the extent to

Table 3. Model Validity Test

Construct (Latent Variable)	Indicators	Loading Factor	Decision
Hygiene Factors	HF6	0.539	Valid
	HF4	0.629	Valid
	HF1	0.571	Valid
Motivator Factors	MF5	0.702	Valid
	MF2	0.765	Valid
	MF1	0.555	Valid
Job Satisfaction	JS5	0.768	Valid
	JS4	0.803	Valid
	JS3	0.565	Valid
Employee Performance	EP1	0.773	Valid
	EP2	0.794	Valid
	EP3	0.722	Valid

Table 4. Result of Construct Reliability

Construct	Indicators	λ	δ	CR	Decision
Hygiene Factors	HF6	0.539	0.575	0.68155	Acceptable
	HF4	0.629	0.397		
	HF1	0.571	0.441		
Motivator Factors	MF5	0.702	0.498	0.76157	Acceptable
	MF2	0.765	0.288		
	MF1	0.555	0.494		
Job Satisfaction	JS5	0.768	0.295	0.81934	Acceptable
	JS4	0.803	0.285		
	JS3	0.565	0.426		
Employee Performance	EP1	0.773	0.285	0.85229	Acceptable
	EP2	0.794	0.300		
	EP3	0.722	0.323		

which each indicator aptly reflects the underlying construct. A widely acknowledged criterion for evaluating construct reliability (CR) posits that a CR value exceeding 0.7 is imperative for confirmatory studies, indicative of robust reliability, while values ranging between 0.6 and 0.7 are deemed acceptable for exploratory research [43]. These benchmarks provide researchers with invaluable guidance in interpreting the reliability coefficients, thereby informing the reliability assessment process. By employing specific formulas tailored to the measurement context, researchers calculated the CR values, thus quantifying the reliability of the instrument. Subsequent examination of the CR values revealed that the motivator factor, job satisfaction, and employee performance variables surpassed the threshold of 0.70, indicating strong reliability. Furthermore, the hygiene factor variable exhibited a CR value exceeding 0.60, which is deemed acceptable for research purposes. This comprehensive assessment underscores the suitability of all variables for inclusion in the model, bolstering the methodological robustness and validity of the study.

Direct, Indirect, and Total Effect

In this study, Structural Equation Modeling (SEM) emerged as the methodological cornerstone, providing a robust analytical framework to untangle the intricate network of relationships among the variables comprising the model. This advanced statistical technique allowed for a nuanced examination of the direct, indirect, and total effects shaping the interplay between the latent variables under scrutiny. Direct effects, denoted by arrows connecting latent variables, signify the immediate impact one variable exerts on another within the model. These direct pathways offer invaluable insights into the primary drivers of influence within the conceptual framework. Conversely, indirect effects elucidate the more subtle, cascading pathways through which variables indirectly influence each other via one or more intermediary latent variables. These indirect pathways unveil the complex interdependencies and ripple effects inherent in the model structure, providing a deeper understanding of the underlying mechanisms at play.

The combination of direct and indirect effects culminates in the total effect, encapsulating the overall relationship between the latent variables. This holistic perspective offers a comprehensive lens through which to assess the broader implications of the model's constructs on each other. The result presented in Table 5 synthesizes the magnitudes of influence exerted by each latent variable, both directly and indirectly, as well as the total effect. Notably, the data elucidate significant direct influences of the motivator and hygiene factor variables on job satisfaction, highlighting their pivotal roles in shaping employee perceptions. Furthermore, the profound direct effect of job satisfaction on employee satisfaction underscores its central importance as a determinant of overall employee well-being and engagement. Interestingly, the nuanced findings also reveal differential indirect effects of the hygiene and motivator factors on employee performance. While both factors exert indirect influence, the hygiene factor demonstrates a more pronounced impact on employee performance

Table 5. Results of Direct, Indirect, and Total Effects

Effects Between Variables	Direct Effects	Indirect Effects	Total Effects
Motivator Factor → Job Satisfaction	0.337	-	0.337
Hygiene Factor → Job Satisfaction	0.538	-	0.538
Motivator Factor → Employee Performance	0.368	0.304	0.672
Hygiene Factor → Employee Performance	-0.337	0.484	0.147
Job Satisfaction → Employee Performance	0.900	-	0.900

compared to the motivator factor. This nuanced observation underscores the multifaceted nature of employee motivation and satisfaction dynamics within the organizational context. Through this comprehensive analysis, we gain invaluable insights into the complex mechanisms driving employee satisfaction and performance, laying the groundwork for informed decision-making and strategic interventions aimed at enhancing organizational effectiveness and employee well-being.

Hypothesis test

The hypotheses underwent rigorous testing to ascertain the potential positive impact of the hygiene factor, motivator factor, hygiene factor on employee performance, motivator factor on employee performance, and the job satisfaction variable on employee performance on job satisfaction. Utilizing the sophisticated analytical capabilities of AMOS, hypothesis testing was conducted to scrutinize these relationships. The findings of this empirical examination are detailed in Table 6. The critical ratio (C.R.) values presented in Table 6 were computed by dividing the estimated values by the standard error (S.E.). A higher C.R. value signifies greater significance. Furthermore, accompanying each C.R. value is a p-value, which indicates the statistical significance of the estimate. Notably, a p-value less than 0.05 is conventionally deemed significant, suggesting that the observed effect is unlikely to have occurred by chance. Conversely, a p-value above 0.05 suggests no statistically significant difference, indicating that the data analyzed may not sufficiently support the proposed model. These statistical metrics serve as vital indicators of the robustness and validity of the hypothesized relationships within the model.

The empirical analysis substantiates the pivotal role of hygiene factors in shaping job satisfaction dynamics, thereby affirming the acceptance of Hypothesis 1 (H1). It elucidates that in organizational contexts, the fulfilment of basic hygiene conditions mitigates employee discontentment. This underscores the notion that once these fundamental needs are met, additional motivators may not be as critical in fostering satisfaction among employees. Delving deeper into the specific indicators of hygiene factors influencing job satisfaction, the study highlights the importance of factors such as effective supervision, equitable salary structures, and adherence to company policies and regulations. These facets resonate with established literature, which underscores the significance of comprehensive hygiene factors, including equitable pay systems, competent management practices, conducive corporate cultures, and conducive work-life balance initiatives, in nurturing employees' sense of contentment [25]. Moreover, the study's findings align with broader scholarly discourse, which acknowledges the multifaceted nature of hygiene factors' impact on job satisfaction. This encompasses various dimensions such as job security, efficient policy administration, harmonious interpersonal relationships, conducive working conditions, effective technical supervision, recognition of employee status, fair remuneration, and fostering workplace cohesion [44]. By corroborating these established findings, the study not only enriches our understanding of organizational behaviour but also provides practical

Table 6. Hypothesis test

Hypothesis	Variable	Estimate	S.E.	C.R.	P	Label
H1	Hygiene Factors → Job Satisfaction	0.441	0.237	1.861	0.063	Significant
H2	Motivator Factors → Job Satisfaction	0.393	0.349	1.127	0.260	Not significant
H3	Hygiene Factors → Employee Performance	-0.301	0.227	-1.328	0.184	Not significant
H4	Motivator Factors → Employee Performance	0.469	0.329	1.423	0.155	Not significant
H5	Job Satisfaction → Employee Performance	0.983	0.276	3.560	***	Significant

insights for organizational leaders and HR practitioners. It underscores the importance of prioritizing hygiene factors alongside motivators to cultivate a conducive work environment that fosters employee satisfaction and well-being. This nuanced understanding can inform strategic HR interventions aimed at enhancing organizational effectiveness and fostering a positive organizational culture.

The analysis yielded compelling insights regarding the motivator factor's impact on job satisfaction, leading to the rejection of Hypothesis 2 (H2). Contrary to expectations, the motivator factor demonstrated no statistically significant effect on job satisfaction within the context of this study. This underscores the complex interplay between intrinsic motivators and employee satisfaction. Traditionally, the motivator factor encompasses intrinsic conditions that, when present, engender a heightened sense of motivation among workers, thereby enhancing job performance. Conversely, the absence of these conditions may result in diminished job satisfaction. The rejection of H2 underscores the imperative to bolster factors such as responsibility, job performance, and the intrinsic nature of the work itself to augment job satisfaction levels.

This nuanced understanding suggests that while high hygiene factors may mitigate certain grievances, the absence of significant motivator factors may lead to a sense of disengagement among employees. In such instances, employees may view their roles merely as a means of earning a salary, rather than deriving intrinsic fulfilment from their work. This finding underscores the importance of addressing both hygiene and motivator factors to cultivate a work environment conducive to employee satisfaction and engagement. It highlights the need for organizational leaders and managers to foster a culture that not only addresses basic hygiene needs but also cultivates intrinsic motivators to nurture a sense of purpose and fulfilment among employees. Through strategic interventions aimed at enhancing both hygiene and motivator factors, organizations can foster a more enriching and fulfilling work experience for their employees.

Moreover, the analysis unveiled that neither the hygiene factor nor the motivator factor exhibited a statistically significant effect on employee performance, leading to the rejection of Hypotheses 3 and 4 (H3 and H4). Conversely, the findings revealed a noteworthy positive association between job satisfaction and employee performance, thus validating Hypothesis 5 (H5). This underscores the intrinsic link between job satisfaction and employee performance, wherein a conducive work environment that fosters job satisfaction can have a tangible impact on the quality, quantity, and overall attitude towards work among contractors. Specifically, when a job affords contractors autonomy in task completion, mechanisms for addressing grievances, and recognition for accomplishments, it is likely to enhance job satisfaction, consequently bolstering contractor performance.

This finding resonates with prior research, which has underscored the reciprocal relationship between job satisfaction and employee performance [42]. Notably, job satisfaction parameters encompass a range of factors, including promotions, salary and wages, rewards, growth opportunities, and safe working conditions. Similarly, employee performance parameters encompass the quantity of work, employee proficiency, resilience under pressure, time management skills, and planning aptitude. By leveraging the insights gleaned from this research, organizations such as PLN UIP Nusa Tenggara can proactively identify strategies to enhance both job satisfaction and performance among their work partners involved in electricity projects. By prioritizing factors that foster job satisfaction and performance, companies can mitigate the risk of declining Key Performance Indicators (KPIs) and ensure the sustained success of their projects. This underscores the importance of a holistic approach to human resource management, wherein attention to both job satisfaction and performance optimization is paramount for organizational success.

CONCLUSION

In conclusion, the findings of this study provide compelling evidence that the hygiene factor significantly influences both job satisfaction and employee performance among contractors in electricity construction projects. Key parameters associated with the hygiene factor, such as supervision, salary, and adherence to company policies, emerged as crucial drivers of job satisfaction among contractors. Consequently, when contractors experience a work environment that allows them autonomy in completing tasks, fosters effective complaint handling by superiors, and

acknowledges their achievements, it positively impacts their performance. This suggests that enhancing job satisfaction leads to tangible improvements in work quality, quantity, and overall attitude, thereby expediting project development. While the study focused on a specific region, future research could extend nationwide, providing insights for organizational development and project management on a larger scale. Recommendations include investing in partners' skills through training and recognition schemes, refining supervision techniques, and revisiting working hour allocation. Employing engaging communication mediums can enhance rule socialization efforts, fostering a culture of continuous improvement and professional development within the workforce. Broadening the scope of research to encompass contractors nationwide can lead to a more comprehensive understanding of the factors influencing job satisfaction and performance, thereby informing robust strategies for organizational development and project management on a national scale.

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CONFLICT OF INTEREST

The author declares that there are no conflicts of interest regarding the authorship or publication of this research.

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References

[1] Y. Wang and L. Chen, "Analysis of Electrical Engineering Project Management in Construction," Advanced Materials Research, vol. 671-674, pp. 2982-2985, 2013, doi: 10.4028/www.scientific.net/AMR.671-674.2982.

[2] J. Heng, "Construction management of mid-and small-scale electrical works," Guangxi Water Resources and Hydropower Engineering, 2008.

[3] Y. Huang, "Application of Electrical Engineering and Automation Intelligent Technology in Building Electrical," ESTA, vol. 8, pp. 31-34, 2021, doi: 10.18686/ESTA.V8I3.197.

[4] B. Sovacool, A. Gilbert, and D. Nugent, "An international comparative assessment of construction cost overruns for electricity infrastructure," Energy Research and Social Science, vol. 3, pp. 152-160, 2014, doi: 10.1007/s10902-022-00567-6.

[5] R. Nasrudin, Q. Quarina, and T. Dartanto, "Revisiting the Energy-Happiness Paradox: A Quasi-Experimental Evidence of Electricity Access in Indonesia," Journal of Happiness Studies, vol. 23, no. 7, pp. 3549–3576, Oct. 2022, doi: 10.1007/s10902-022-00567-6.

[6] K. E. Direktorat Jenderal Ketenagalistrikan, "Laporan Kinerja Tahun Anggaran 2022 Direktorat Jenderal Ketenagalistrikan," Jakarta Selatan, 2023.

[7] Q. Guo, S. Chen, J. Wang, and X. Pan, "Research and Design of Electric Power Engineering Project Management System Based on Blockchain Technology," in 2022 International Conference on Blockchain Technology and Information Security (ICBCTIS), pp. 80-84, 2022, doi: 10.1109/ICBCTIS55569.2022.00029.

[8] H. Al-Ageeli and A. Alzobaee, "Critical Success Factors in Construction Projects (Governmental Projects as a Case Study)," The Journal of Engineering, vol. 22, pp. 129-147, 2016.

[9] N. Jasim, "Evaluation of Contractors Performance in Iraqi Construction Projects Using Multiple Criteria Complex Proportional Assessment Method (COPRAS)," IOP Conference Series: Materials Science and Engineering, vol. 1076, 2021, doi: 10.1088/1757-899X/1076/1/012106.

[10] E. Putri, "Competing Market Leader in Indonesia's Construction Industry," Advanced International Journal of Business, Entrepreneurship and SMEs, 2021, doi: 10.35631/aijbes.38005.

[11] C. Liu, T. Hale, and J. Urpelainen, "Explaining the energy mix in China's electricity projects under the belt and road initiative," Environmental Politics, pp. 1–23, Jun. 2022, doi: 10.1080/09644016.2022.2087355.

[12] H. Apostoleris, S. Sgouridis, M. Stefanich, and M. Chiesa, "Evaluating the factors that led to low-priced solar electricity projects in the Middle East," Nature Energy, vol. 3, no. 12, pp. 1109–1114, Oct. 2018, doi: 10.1038/s41560-018-0256-3.

[13] G. A. S. K. Silva and B. N. F. Warnakulasooriya, "Criteria for Construction Project Success: A Literature Review," SSRN Electronic Journal, 2016, doi: 10.2139/ssrn.2910305.

[14] O. V. Yuryeva, G. N. Butov, I. G. Malganova, and O. V. Pratchenko, "Civil Public Service: Human Resources Aspect," Mediterranean Journal of Social Sciences, Feb. 2015, doi: 10.5901/mjss.2015.v6n1s3p486.

[15] J. S. Armacanqui, "The Innovations Friendly Organization: Effective Introduction of New Technologies and Innovations in Oil and Gas Companies," in Day 1 Mon, September 14, 2015, SPE, Sep. 2015, doi: 10.2118/175876-MS.

[16] A. Banerjee, "Human resource aspects in global indirect virtual supply chain syndrome," International Journal of Industrial and Systems Engineering, vol. 24, no. 1, p. 62, 2016, doi: 10.1504/IJISE.2016.078009.

[17] S. Chauke, N. Mashwama, C. Aigbavboa, and W. Thwala, "Investigating Employee Performance for Improved Learning Curve in the South African Construction Industry," IOP Conference Series: Materials Science and Engineering, vol. 1218, 2022, doi: 10.1088/1757-899X/1218/1/012028.

[18] N. Jasim, "Evaluation of Contractors Performance in Iraqi Construction Projects Using Multiple Criteria Complex Proportional Assessment Method (COPRAS)," IOP Conference Series: Materials Science and Engineering, vol. 1076, 2021, doi: 10.1088/1757-899X/1076/1/012106.

[19] S. H. Mat Yahya and S. Ismail, "Performance Appraisal Amongst Contractors in Construction Project in Malaysia," Applied Mechanics and Materials, vol. 735, pp. 154-158, 2015, doi: 10.4028/www.scientific.net/AMM.735.154.

[20] L. Nguyen and T. Watanabe, "The Impact of Project Organizational Culture on the Performance of Construction Projects," Sustainability, vol. 9, no. 5, p. 781, 2017, doi: 10.3390/SU9050781.

[21] T. A. Judge, S. Zhang, and D. R. Glerum, "Job Satisfaction," in Essentials of Job Attitudes and Other Workplace Psychological Constructs, 1st Edition., Routledge, 2020.

[22] PT PLN (Persero) UIP Nusra, "Laporan KPI PT PLN (Persero) 2022 Nilai Kinerja Organisasi," Mataram, Jun. 2022.

[23] S. Durdyev and M. R. Hosseini, "Causes of delays on construction projects: a comprehensive list," International Journal of Managing Projects in Business, vol. 13, no. 1, pp. 20–46, Apr. 2019, doi: 10.1108/IJMPB-09-2018-0178.

[24] A. A. Fashina, M. A. Omar, A. A. Sheikh, and F. F. Fakunle, "Exploring the significant factors that influence delays in construction projects in Hargeisa," Heliyon, vol. 7, no. 4, p. e06826, Apr. 2021, doi: 10.1016/j.heliyon.2021.e06826.

[25] B. Lee, C. Lee, I. Choi, and J. Kim, "Analyzing Determinants of Job Satisfaction Based on Two-Factor Theory," Sustainability, vol. 14, no. 19, p. 12557, Oct. 2022, doi: 10.3390/su141912557.

[26] I. Mardanov, "Intrinsic and extrinsic motivation, organizational context, employee contentment, job satisfaction, performance and intention to stay," Evidence-based HRM: a Global Forum for Empirical Scholarship, vol. 9, no. 3, pp. 223–240, Jul. 2021, doi: 10.1108/EBHRM-02-2020-0018.

[27] A. A. Tabassi, M. Ramli, and A. H. A. Bakar, "Effects of training and motivation practices on teamwork improvement and task efficiency: The case of construction firms," International Journal of Project Management, vol. 30, no. 2, pp. 213–224, Feb. 2012, doi: 10.1016/j.ijproman.2011.05.009.

[28] E. Suryani, S. Wahyulina, and S. A. Hidayati, "Analisis dan Identifikasi Hygiene Factors dan Pengaruhnya terhadap Kepuasan Kerja pada Mitra Kerja PT. PLN UIP Nusa Tenggara," Jurnal Sosial Ekonomi dan Humaniora, vol. 6, no. 1, pp. 78–86, Jun. 2020, doi: 10.29303/jseh.v6i1.77.

[29] A. Kazaz, E. Manisali, and S. Ulubeyli, "Effect of Basic Motivational Factors on Construction Workforce Productivity in Turkey (Pagrindinių Motyvacijos Veiksnių Įtaka Statybos Produktyvumui Turkijoje)," Journal of Civil Engineering and Management, vol. 14, no. 2, pp. 95–106, Jun. 2008, doi: 10.3846/1392-3730.2008.14.4.

[30] I. Lukman, D. Hastuti, Asbah, Iskandar, and A. A. Gani, "Identification of hygiene factor in the working environment at Owned State Electrical Company of Mataram City," IOP Conf Ser Earth Environ Sci, vol. 413, no. 1, p. 012024, Jan. 2020, doi: 10.1088/1755-1315/413/1/012024.

[31] B. L. Holston-Okae and R. J. Mushi, "Employee Turnover in the Hospitality Industry using Herzberg's Two-Factor Motivation-Hygiene Theory," International Journal of Academic Research in Business and Social Sciences, vol. 8, no. 1, Feb. 2018, doi: 10.6007/IJARBSS/v8-i1/3805.

[32] H. Van Pham and H. T. H. Nguyen, "The effect of motivation and hygiene factors on employees' work motivation in textile and apparel enterprises," Management Science Letters, pp. 2837–2844, 2020, doi: 10.5267/j.msl.2020.4.025.

[33] S. Jarupathirun and M. De Gennaro, "Factors of Work Satisfaction and Their Influence on Employee Turnover in Bangkok, Thailand," International Journal of Technology, vol. 9, no. 7, p. 1460, Dec. 2018, doi: 10.14716/ijtech.v9i7.1650.

[34] C. B. Nelson, K. Zivin, H. Walters, D. Ganoczy, S. MacDermid Wadsworth, and M. Valenstein, "Factors Associated With Civilian Employment, Work Satisfaction, and Performance Among National Guard Members," Psychiatric Services, vol. 66, no. 12, pp. 1318–1325, Dec. 2015, doi: 10.1176/appi.ps.201400334.

[35] M. Ibrahim, "Analysis of work satisfaction on work achievement of employees Indonesian local government," International Journal of Advanced and Applied Sciences, vol. 6, no. 8, pp. 39–44, Aug. 2019, doi: 10.21833/ijaas.2019.08.006.

[36] A. Pinayungan Dongoran, Nazaruddin, and R. Purnomo Wibowo, "Analysis of effect of leadership style, work motivation and work ability to employee satisfaction in increasing performance of harvesters," in IOP Conference Series: Materials Science and Engineering, May 2020, p. 012073, doi: 10.1088/1757-899X/801/1/012073.

[37] B. Xiong, M. Skitmore, and B. Xia, "A critical review of structural equation modeling applications in construction research," Automation in Construction, vol. 49, pp. 59–70, Jan. 2015, doi: 10.1016/j.autcon.2014.09.006.

[38] D. Sakaria, S. M. Maat, and M. E. E. Mohd Matore, "Examining the Optimal Choice of SEM Statistical Software Packages for Sustainable Mathematics Education: A Systematic Review," Sustainability, vol. 15, no. 4, p. 3209, Feb. 2023, doi: 10.3390/su15043209.

[39] H. A. Halepota, "Motivational Theories and Their Application in Construction," Cost Engineering, vol. 47, no. 3, pp. 14–18, Mar. 2005.

[40] A. H. Memon, S. H. Khahro, N. A. Memon, Z. A. Memon, and A. Mustafa, "Relationship between Job Satisfaction and Employee Performance in the Construction Industry of Pakistan," Sustainability, vol. 15, no. 11, p. 8699, May 2023, doi: 10.3390/su15118699.

[41] C. Fornell and D. F. Larcker, "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," Journal of Marketing Research, vol. 18, no. 1, p. 39, Feb. 1981, doi: 10.2307/3151312.

[42] J. F. Hair, C. M. Ringle, and M. Sarstedt, "PLS-SEM: Indeed a Silver Bullet," Journal of Marketing Theory and Practice, vol. 19, no. 2, pp. 139–152, Apr. 2011, doi: 10.2753/MTP1069-6679190202.

[43] I. Ghozali and H. Latan, Partial Least Squares Konsep Teknik dan Aplikasi dengan Program Smart PLS 3.0. Semarang: Universitas Diponegoro Semarang, 2015.

[44] Z. M. Thant and Y. Chang, "Determinants of Public Employee Job Satisfaction in Myanmar: Focus on Herzberg's Two Factor Theory," Public Organization Review, vol. 21, no. 1, pp. 157–175, Mar. 2021, doi: 10.1007/s11115-020-00481-6.

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