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Original Article

Job Satisfaction and Employee Engagement of Generation X, Y, and Z in the Industrial Timber Plantation Sector of Kalimantan: The Role of Work Environment, Organizational Culture, and Digital Literacy

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Abstract:

This study explores the effects of Work Environment, Organizational Culture, and Digital Literacy on Job Satisfaction and Employee Engagement, with Generational Cohort (X, Y, and Z) as a moderating variable. Data were collected through an online questionnaire from 501 respondents representing 135 Industrial Forest Plantation (HTI) companies across Kalimantan. Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. The findings indicate that Work Environment, Organizational Culture, and Digital Literacy positively and significantly influence Job Satisfaction ($R^2 = 0.727$) and Employee Engagement ($R^2 = 0.802$). Job Satisfaction also exerts a strong effect on Employee Engagement ($\beta = 0.734$; $p < 0.001$). However, the moderating role of Generational Cohort was largely insignificant, except for a weak negative moderation on the Digital Literacy → Job Satisfaction path ($\beta = -0.070$; $p = 0.013$), indicating minimal generational differences. These results highlight that organizational factors outweigh generational differences in shaping employees' work attitudes. Theoretically, this research extends the Job Demands–Resources (JD-R) model by incorporating digitalization dimensions, while practically, it offers insights for HR management to develop inclusive, technology-driven work environments that enhance satisfaction and engagement across generations.

Keywords: Job satisfaction, employee engagement, digital literacy, organizational culture, generational cohort, forest plantation

Introduction

Human Resources (HR) have become a critical element within organizations and must be managed carefully as the primary resource that can ensure sustainability and competitive advantage. In today's era, HR management must take into account digital transformation and the integration of technology, such as recruitment

automation, people analytics, and performance management platforms. Digital HR strategies have been proven to influence organizational performance (Bastida et al., 2025; Kamalakannan, 2024).

On the other hand, changes in the character of the employee generation, such as differences in values, career expectations, and work styles between Generations X, Y, and Z, have posed unique challenges in designing policies, organizational culture, and effective communication approaches (Suryadi, 2025). Furthermore, the pressure of global technological changes and economic fluctuations forces organizations to be more agile, making flexibility in structure and HR adaptation crucial. This is especially true for Industrial Timber Plantation (HTI) companies, which operate in remote work locations with limited infrastructure. Managing HR by integrating digital elements, generational sensitivity, and responsiveness to global economic dynamics has become a strategic step that cannot be ignored.

Several factors influence job satisfaction and employee engagement in modern organizations, including in industrial sectors like HTI. One of the main factors is the work environment, which encompasses physical, social, and psychological conditions that support job comfort and safety (Voordt & Jensen, 2023; Wularsih & Octafian, 2024), and corporate culture, which is the system of values, norms, and shared practices within an organization (Procter, 2024). Another factor in the digital age is digital literacy, which refers to employees' ability to understand, use, and leverage digital technologies that facilitate the adoption of new work systems, effective digital communication, and automation, all of which support employee engagement (Karimi & Alavi, 2024; O'Connor & Martinez, 2024). It is essential to understand the dynamics of job satisfaction and employee engagement from the generational perspective.

Many previous studies have addressed job satisfaction and employee engagement and the various factors that influence them in modern industrial sectors. However, research in HTI companies, which have limited social and public facilities, is still scarce. The remote locations characteristic of HTI in Kalimantan present unique challenges in HR management, particularly regarding the provision of facilities that support employee welfare and comfort. Studies in other industrial sectors, such as plantations, which are similar to HTI companies, have shown that the lack of social facilities can negatively impact job satisfaction, which, in turn, affects employee engagement with the organization (Ansari, 2022; Raihan, 2024; Veritia et al., 2024) .

Previous research by Sipayung (2025) showed that work environment and digital literacy significantly affect job satisfaction and employee engagement in the HTI sector. However, it did not include the element of corporate culture and did not specifically mention the research location in Kalimantan. Additionally, it was stated that job satisfaction is a strong predictor of employee engagement, although moderation results revealed that Generations X, Y, and Z only influenced the relationship between work environment and job satisfaction and engagement, but had no effect on the relationship between digital literacy and these two variables. A study in the forestry sector in Korea by Lee & Kim (2024), found that job satisfaction and turnover intention among workers were greatly influenced by job characteristics such as employment status, work location (indoor vs outdoor), and education level. The results showed that non-regular workers and those working outdoors had lower job satisfaction and higher turnover intentions compared to regular office workers. Therefore, a study on the relationship between work environment, corporate culture, and digital literacy on job satisfaction and employee engagement in the HTI context

could contribute to the development of HR management in Indonesia's industrial forestry sector.

This research presents novelty in three key aspects: (1) examining the relationships between variables within the unique forestry industry context, which has been underexplored; (2) adding digital literacy as a contemporary variable in the era of digital transformation; and (3) exploring the differences in perceptions of Generations X, Y, and Z regarding job satisfaction and engagement in the Kalimantan HTI sector.

Literature Review

Job satisfaction is a positive emotional state that results from an individual's evaluation of their work experience (Robbins & Judge, 2022). In the modern context, job satisfaction is no longer measured solely by financial rewards, but also by non-material factors such as managerial support, career development opportunities, work-life balance, and a comfortable work environment (Rai & Maheshwari, 2021). According to Lee dan Kim (2024), job satisfaction in the forestry sector is significantly influenced by physical working conditions, employment status, and the location of work (indoor or outdoor), where workers in field areas generally report lower satisfaction levels. Sipayung (2025) found that, in the context of HTI (Industrial Timber Plantation) industries in Indonesia, job satisfaction is strongly influenced by the work environment and digital literacy, which helps employees adapt to technology-based work systems.

Employee engagement refers to a psychological condition where an individual demonstrates emotional involvement and high commitment to their work and the organization they work for (Kahn, 1990; Kossyva et al., 2023). Based on the Job Demands–Resources (JD-R) theory, engagement levels increase when employees have adequate work resources such as organizational support, autonomy, and positive feedback to cope with job demands (Bakker & Demerouti, 2008). Several studies show that factors driving employee engagement include job characteristics: 1) the scope, variety, and meaningfulness of tasks performed; 2) organizational support: attention to employees' needs, welfare, and provided facilities; 3) supervisory support: positive supervision, open communication, and direct managerial support; 4) rewards & recognition: reward systems, praise, and recognition of achievements; and 5) organizational justice: perceptions of fairness in the systems and policies implemented by the company (Al-Haziazi, 2024). According to Rameshkumar (2020), factors promoting engagement include a supportive work environment, development opportunities, participative leadership, and reward systems. Furthermore, recent studies on engagement have involved exploring antecedents (e.g., corporate social responsibility, perceived organizational support, organizational culture, work-life balance) and consequences (e.g., job satisfaction, organizational commitment, employee performance, organizational citizenship behavior). However, further research is needed to explore the impact of various leadership styles, digital technologies, and new work practices on employee engagement (Kişi, 2023). According to Gede & Huluku (2024) dan Gallup (n.d.), the outcomes of engagement include increased organizational commitment, work performance, and job satisfaction. Findings from cross-sector studies indicate that the dimensions of vigor, dedication, and absorption in engagement are directly related to improved individual and organizational performance, making engagement a key determinant of organizational

success in the digital era and across generations (Gallup, 2020; Poorani & Pradap, 2024).

The work environment can be understood as the overall physical, social, and psychological conditions accompanying daily work activities, including aspects of safety, comfort, facilities, social support, communication, and workload balance (healthy and safe work environment) (Indergård & Hansen, 2025; Oyedeji et al., 2025). Generally, the work environment is considered a combination of physical, organizational, and psychological aspects that shape daily work experiences (McCoy, 2002). According to Greig et al. (2021), the work environment can be defined as a combination of physical conditions, social conditions, and organizational support that together influence employee performance and well-being.

According to Simanjutak et al. (2023), a conducive work environment positively and significantly affects job satisfaction and employee engagement. Job satisfaction also acts as a mediator between the work environment and employee engagement. Meanwhile, Hadianto et al. (2025) stated that both physical and non-physical work environments have a significant impact on job satisfaction, engagement, and work motivation. A comfortable work environment and effective communication drive employee engagement and satisfaction. According to Cipta & Hwihanus (2024), work facilities and employee engagement do not significantly affect job satisfaction, but job satisfaction mediates the influence of employee engagement on performance. A study by Baktiar dkk. (2024) showed that work discipline significantly affects job satisfaction, but the work environment did not have a significant effect on job satisfaction.

According to Graham et al. (2022), corporate culture is an informal institution that encompasses cultural values and norms. These values and norms shape organizational structure, behavior, decision-making, and the way organizational members interact and work. Meanwhile, Schein (2010), defines corporate culture as a pattern of basic assumptions created, discovered, or developed by a group of people to learn how to cope with external adaptation and internal integration, and is taught to new members as the correct way to perceive, think, and feel about those issues. According to Aggarwall (2024), a significant positive influence of corporate culture on employee performance and satisfaction, as well as their engagement with the organization, has been found. Positive culture strengthens motivation and loyalty. The study by Cherian et al. (2021) found that an appropriate corporate culture positively contributes to employee attitudes, motivation, and performance, including job satisfaction and employee engagement. On the other hand, research by Van Rooij & Fine (2018) stated that if corporate culture does not align with employee values and expectations, disengagement, high turnover, and lower job satisfaction may arise. Sipayung (2024) also stated that employee engagement significantly mediates the perception of corporate culture towards employees' intention to quit. In contrast, a study by Mandang et al (2025), found that although corporate culture has a positive effect on job satisfaction and loyalty, job satisfaction does not significantly moderate the relationship between culture and loyalty, indicating the complexity of the relationship between cultural factors and employee outcomes.

According to Sari et al (2024) digital literacy is the ability to effectively use digital technologies and the internet, including competencies to access, evaluate, manage, and create information through digital platforms while considering ethical and digital security aspects. Meanwhile, Pangrazio et al (2020) describe digital literacy

as the ability to understand and use various formats of digital information from different sources, enabling communication and problem-solving in the modern information society. This includes proficiency with digital tools and applications (hardware/software), the ability to access, evaluate, and critically select digital information, the ability to create and share digital content effectively, knowledge and awareness of ethics, privacy, and data security, and the ability to adapt to technological changes and the digitization of the work environment.

According to Putro dan Permana (2024), good digital literacy enhances employee engagement by strengthening organizational trust and reducing digital communication barriers in the workplace. Digital literacy also positively affects job satisfaction because employees who can effectively use digital technologies feel more productive, independent, and able to meet the demands of modern work, which impacts their happiness and work motivation (Hamdani, 2024). It is known that digital competence (a core component of digital literacy) is directly related to higher engagement levels and lower role stress. Digitally skilled employees feel more confident, can leverage work technology effectively, collaborate efficiently, and become more emotionally and cognitively engaged with the organization, showing that company investments in digital literacy enhancement can improve employee engagement (Oberländer & Bipp, 2022). Digital literacy enables employees to adapt more easily to technological changes in the work environment, which also drives higher engagement in company tasks and goals (Caroline et al., 2025).

Methods

This study employs an explanatory quantitative research design to analyze the influence of the work environment, organizational culture, and digital literacy on job satisfaction and employee engagement across generations in the HTI sector of Kalimantan.

The study utilizes a cross-sectional survey design conducted from May to August 2025. The instrument used is an electronic questionnaire (e-questionnaire) created on Google Forms and distributed through three channels: (1) email, (2) HTI worker networks, and (3) WhatsApp groups of employees in HTI companies in Kalimantan. The population framework refers to the 135 companies registered with the Indonesian Forest Entrepreneurs Association (APHI), and the sampling technique used is proportional random sampling, where respondents are randomly selected from the entire population of employees in HTI companies in Kalimantan.

The research instrument uses a closed-ended Likert scale questionnaire (1–5), except for the respondent identity section. There are 17 items related to the work environment, 13 items on organizational culture, 18 items on digital literacy, 16 items on job satisfaction, and 12 items on employee engagement, all adapted from the Gallup Q12, to measure respondents' perceptions in a structured and quantitative manner.

Out of 569 returned questionnaires, 501 were deemed valid for analysis after screening for completeness and consistency of responses (valid response rate ≈ 88.0%).

Data analysis in this study is conducted in two stages. The first stage uses SPSS version 23 for descriptive analysis, while the second stage uses SmartPLS 4 for inferential analysis based on Partial Least Squares–Structural Equation Modeling (PLS-SEM). This includes testing the measurement model (outer model) to assess the validity and reliability of constructs, and the structural model (inner model) to test the

relationships between variables and the strength of their effects.

Results

Sub 1 Descriptive Analysis

Based on the data collection and analysis using SPSS, the respondents in this study come from all operational areas of the Industrial Timber Plantation (HTI) companies in Kalimantan. The description of the respondents is as shown in the table below:

Table 1. Respondent Description

Characteristic	Category	Number (People)	Percentage (%)
Province	Kalimantan Barat	106	20.3
	Kalimantan Tengah	128	24.6
	Kalimantan Selatan	37	7.1
	Kalimantan Timur	206	39.5
	Kalimantan Utara	24	4.6
Gender	Male	455	87.3
	Female	66	12.7
Generation Cohort	Gen X	76	14.6
	Gen Y	282	54.1
	Gen Z	139	26.7
	Baby Boomer (Not analyzed)	4	0.8
Total Valid Respondents		501	100.0

Based on education level, the majority of respondents are bachelor's degree graduates, with 234 people (46.7%), followed by high school graduates (SLTA) with 187 people (37.3%), diploma holders with 34 people (6.8%), and the remaining are elementary/junior high school graduates (3%) and master's degree holders (6.2%).

Among the respondents, 455 people (90.8%) have permanent employment contracts (PKWTT), and the remaining 46 people (9.2%) are on fixed-term contracts (PKWT). In terms of position, 51.3% of the respondents are staff/technicians or field foremen, followed by assistant managers/heads of sections (33.9%), managers/departments heads/district heads (13.8%), and the remaining are division heads/directors (1%). Regarding work duration, most respondents have been working for more than 7 years (45.7%), followed by 8.6% with 5–7 years, 11.2% with 3–5 years, 23.4% with 1–3 years, and the remaining 11.2% with less than 1 year of work experience.

Sub 2 Measurement Model Analysis (Outer Model)

The results of the outer model analysis using SmartPLS 4 show that not all indicators meet the threshold loading factor value of ≥ 0.70. Therefore, several items with low loading values were eliminated from the measurement model to meet the criteria for convergent validity. After the filtering process, the number of indicators used in the final analysis includes 7 items for the Work Environment (WE) variable, 12 items for Corporate Culture (CC), 14 items for Digital Literacy (DL), 16 items for Job Satisfaction (JS), and 11 items for Employee Engagement (EE). This indicates that the validity and reliability requirements have been met, making the model suitable for the

next stage of structural model testing (inner model).

The validity and reliability test results show that all research variables meet the criteria for good measurement quality, as presented in the table below:

Table 2. Cronbach's Alpha, Composite Reliability, and AVE for Each Construct

Construct	Cronbach's Alpha	Composite Reliability (ρa)	Composite Reliability (ρc)	AVE
Corporate Culture (CC)	0.950	0.951	0.957	0.648
Employee Engagement (EE)	0.933	0.934	0.943	0.600
Job Satisfaction (JS)	0.960	0.961	0.964	0.628
Work Environment (WE)	0.874	0.876	0.905	0.615
Digital Literacy (DL)	0.949	0.951	0.954	0.566

Cronbach's Alpha values range from 0.874 to 0.960, and Composite Reliability (ρa and ρc) values are above 0.876, indicating very high internal consistency of the instrument. The Average Variance Extracted (AVE) for all constructs also exceeds 0.50, meeting the convergent validity criterion (Hair Jr et al., 2021). Based on these results, all constructs are valid and reliable, and thus suitable for structural model testing in the next phase.

The Heterotrait-Monotrait Ratio (HTMT) analysis results show that all ratio values between constructs are below the threshold of 0.90 (Hair Jr et al., 2021), indicating that discriminant validity is met, or that each latent variable in the study does not exhibit multicollinearity. The discriminant validity test results based on the Fornell-Larcker criteria show that the square root of AVE for each construct is higher than the correlations between constructs. This indicates that each construct can empirically distinguish itself from other constructs.

Collinearity statistics (VIF) test results show that all indicators have VIF values between 1.59 and 3.64, well below the threshold of 5.0 (Hair Jr et al., 2021; Sarstedt et al., 2021). This indicates that there are no multicollinearity issues among the indicators in each latent construct. Therefore, all indicators are independent of one another and meet the validity criteria for proceeding to the next phase of inner model testing.

Sub 3 Inner Model Analysis (Structural Model)
1.   *Model Fit (Goodness of Fit)*

Before interpreting the relationships between variables, the structural model was tested for goodness of fit with empirical data. The model fit was evaluated using SRMR (Standardized Root Mean Square Residual) and NFI (Normed Fit Index). The model fit test results are presented in the table below:

Table 3. Goodness of Fit Indices with SRMR and NFI Estimates Based on SmartPLS

Index	Saturated Model	Estimated Model	Criteria (Hair et al., 2021)	Interpretation
SRMR	0.051	0.051	≤ 0.08 (Good fit)	Model fits empirical data
NFI	0.807	0.807	≥ 0.80 (Acceptable fit)	Model has moderate fit

The evaluation results of the structural model goodness of fit, shown in the table above, indicate that the SRMR value of 0.051 signifies a very good model fit, as it is below the recommended threshold of 0.08 (Hair Jr et al., 2021; Henseler et al., 2016). Additionally, the NFI value of 0.807 falls within the acceptable fit category, indicating that the model overall has a satisfactory fit to the empirical data. Therefore, this study's model is deemed acceptable and suitable for interpreting the relationships between constructs.

2. *Structural Model Adequacy (R² and Adjusted R²)*

The structural model testing results show that the R^2 for the EE variable is 0.802 and the Adjusted R^2 is 0.798, while the R^2 for the JS variable is 0.727 and the Adjusted R^2 is 0.724. According to the criteria of Hair Jr. et al. (2021), an R^2 value above 0.67 is categorized as strong, 0.33 as moderate, and 0.19 as weak. Thus, this result indicates that the combination of the Work Environment, Corporate Culture, and Digital Literacy variables can explain 80.2% of the variation in Employee Engagement and 72.7% of the variation in Job Satisfaction. This finding shows that the research model has high predictive power and is suitable for further analysis in the next phase of testing latent variable relationships (path analysis).

3. *Path Coefficient and Significance Testing*

The path coefficient testing results show that the relationship between Corporate Culture (CC) and Employee Engagement (EE) is positive at 0.017, while the relationship between Corporate Culture (CC) and Job Satisfaction (JS) has a much higher coefficient of 0.630, indicating that organizational culture plays a significant role in improving job satisfaction. The relationship between Work Environment (WE) and Employee Engagement (EE) is also positive (0.125), and with Job Satisfaction (JS), it is 0.153, suggesting that a conducive work environment enhances both engagement and satisfaction simultaneously.

Meanwhile, Digital Literacy (DL) has a positive influence on Employee Engagement (EE) (0.122) and Job Satisfaction (JS) (0.136), indicating that improving employees' digital competence contributes to higher motivation and attachment to their work in the increasingly digitized industrial timber plantation sector.

For the moderation variables, the results show that the interaction between Generation and Work Environment-WE (0.062) and Corporate Culture-CC (0.014) have a positive effect on Employee Engagement (EE). This shows that generational differences (X, Y, Z) do not strongly moderate these relationships. Similarly, the interaction of Generation × Digital Literacy (DL) (0.042) has a weak positive effect on engagement, while Generation × Job Satisfaction-JS (-0.064) shows a negative relationship, indicating that job satisfaction perceptions across generations in the HTI context tend to vary and are not always aligned.

When significance testing is conducted using the bootstrapping feature in SmartPLS, the relationships between variables can be seen in the table below:

Table 4. Path Coefficient Values and Significance Test Between Variables

Relationship Between Variables	Path Coefficient	t-statistic	p-value	Interpretation

	(O)			
CC → EE	-0.001	0.023	0.982	Not significant
CC → JS	0.608	12.086	0.000	Significant
DL → EE	0.120	3.936	0.000	Significant
DL → JS	0.133	3.973	0.000	Significant
WE → EE	0.107	2.732	0.006	Significant
WE → JS	0.190	3.349	0.001	Significant
JS → EE	0.734	17.056	0.000	Significant
Generation Cohort → EE	0.022	1.051	0.293	Not significant
Generation Cohort → JS	0.014	0.540	0.589	Not significant
Generation Cohort × JS → EE	0.053	1.538	0.124	Not significant
Generation Cohort × WE → JS	0.035	0.741	0.459	Not significant
Generation Cohort × CC → EE	0.026	0.556	0.578	Not significant
Generation Cohort × CC → JS	0.042	0.768	0.443	Not significant
Generation Cohort × DL → EE	0.037	1.243	0.214	Not significant
Generation Cohort × DL → JS	-0.070	2.476	0.013	Significant (Negative)
Generation Cohort × JS → EE	-0.061	1.149	0.251	Not significant

The results of the relationship tests between constructs, as explained in Table 2, show that not all paths significantly influence the dependent variables. To provide a more comprehensive view of the direction and strength of the influence between constructs, the figure below displays the structural model with SmartPLS estimation results along with the path coefficients and p-values for each tested relationship.
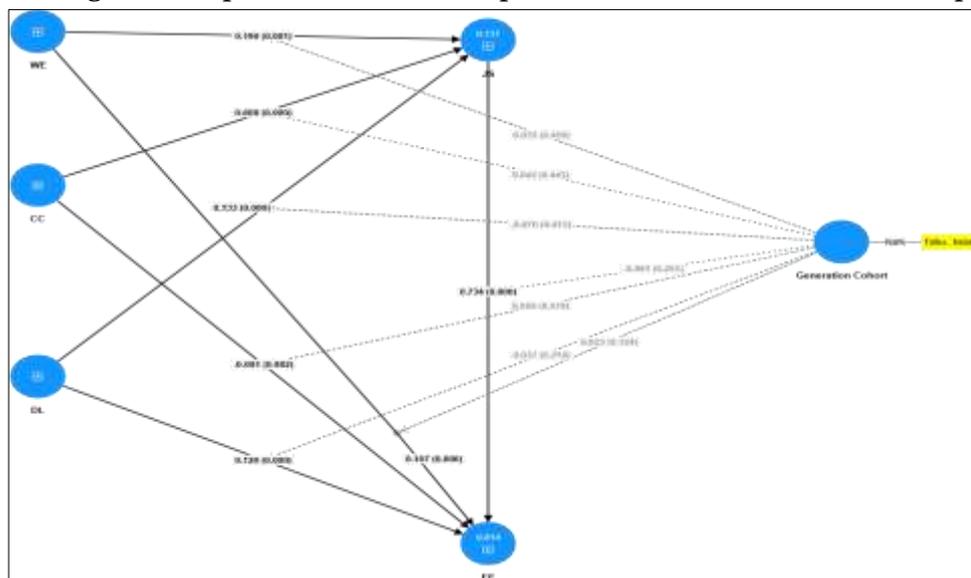
Source: Ringle, C. M., Wende, S., and Becker, J.-M. (2022). "SmartPLS 4." Oststeinbek: SmartPLS GmbH, http://www.smartpls.com

Figure 1. Structural Model Analysis Results (Path Coefficient and p-value)

The results of the bootstrapping analysis in the table above show that of all the direct relationships tested, the Corporate Culture (CC) variable significantly affects Job Satisfaction (JS) with a coefficient of 0.608 (p = 0.000), but has no significant effect on Employee Engagement (EE) (p = 0.982). The Work Environment (WE) variable has a significant positive effect on both Job Satisfaction (JS) (β = 0.190; p = 0.001) and Employee Engagement (EE) (β = 0.107; p = 0.006). Meanwhile, Digital Literacy (DL)

also shows a significant positive effect on both Job Satisfaction (JS) (β = 0.133; p = 0.000) and Employee Engagement (EE) (β = 0.120; p = 0.000).

Furthermore, Job Satisfaction (JS) is found to have the strongest effect on Employee Engagement (EE) (β = 0.734; p = 0.000), indicating that a higher level of job satisfaction encourages greater emotional involvement and commitment from employees in their work in the industrial timber plantation sector.

On the other hand, the Generation (X, Y, Z) variable does not have a significant direct effect on Job Satisfaction (JS) or Employee Engagement (EE) (p > 0.05). Of all the interactions tested, only the Generation × Digital Literacy interaction on Job Satisfaction is significantly negative (β = -0.070; p = 0.013), indicating that the positive effect of digital literacy on job satisfaction tends to decrease in certain generations (e.g., Generation X, which is less adaptable to technology).

These findings confirm that the main factors that increase job satisfaction and employee engagement in the HTI sector of Kalimantan are organizational culture, work environment, and digital literacy, while generational differences only provide limited moderating effects.

4.   *Effect Size*

After obtaining the path coefficient and R-square values, the next step is to assess the contribution or effect size (f^2) of each independent variable on the dependent variables. This analysis is used to identify how much influence each construct in the model has on the endogenous variables (Job Satisfaction and Employee Engagement). The f^2 value reflects how much change occurs in the R-square of the dependent variable when one independent construct is removed from the model (Hair Jr et al., 2021). According to Cohen (2013) criteria, an f^2 value of $0.02 \leq f^2 < 0.15$ indicates a small effect, $0.15 \leq f^2 < 0.35$ indicates a medium effect, and $f^2 \geq 0.35$ indicates a large effect.

The effect size (f^2) calculations for each construct in the model are shown in the table below. The f^2 value provides an overview of the relative contribution of each independent variable to the dependent variables in this structural model:

Table 5. Effect Size (f^2) for Each Construct Based on SmartPLS 4.0 Analysis

No	Relationship Between Constructs	f^2	Category (Cohen, 1988)
1	Corporate Culture (CC) → Job Satisfaction (JS)	0.513	Large ($f^2 > 0.35$)
2	Digital Literacy (DL) → Employee Engagement (EE)	0.044	Small ($0.02 \leq f^2 < 0.15$)
3	Digital Literacy (DL) → Job Satisfaction (JS)	0.041	Small ($0.02 \leq f^2 < 0.15$)
4	Work Environment (WE) → Employee Engagement (EE)	0.022	Small ($0.02 \leq f^2 < 0.15$)
5	Work Environment (WE) → Job Satisfaction (JS)	0.051	Small ($0.02 \leq f^2 < 0.15$)
6	Generation Cohort → Employee Engagement (EE)	0.002	Negligible (< 0.02)
7	Generation Cohort → Job Satisfaction	0.001	Negligible (< 0.02)

	(JS)		
8	Generation Cohort × WE → EE	0.007	Negligible (< 0.02)
9	Generation Cohort × WE → JS	0.002	Negligible (< 0.02)
10	Generation Cohort × CC → EE	0.001	Negligible (< 0.02)
11	Generation Cohort × CC → JS	0.003	Negligible (< 0.02)
12	Generation Cohort × DL → EE	0.005	Negligible (< 0.02)
13	Generation Cohort × DL → JS	0.015	Small (0.02 ≤ f² < 0.15)
14	Generation Cohort × JS → EE	0.005	Negligible (< 0.02)

Based on the table above, Corporate Culture (CC) provides the largest effect size on Job Satisfaction (JS) with an f^2 of 0.513, which is categorized as a large effect. Meanwhile, Digital Literacy (DL) shows a small effect on Employee Engagement (EE) (f^2 = 0.044) and Job Satisfaction (JS) (f^2 = 0.041). Work Environment (WE) has a small effect on EE (f^2 = 0.022) and JS (f^2 = 0.051), showing a noticeable but not dominant contribution to the model.

The moderating effect of Generation Cohort on the relationships between constructs has very low f^2 values (< 0.02), such as Generation Cohort × DL → JS (f^2 = 0.015) and Generation Cohort × WE → EE (f^2 = 0.007), categorized as negligible. This result indicates that generational differences do not strongly moderate the relationship between organizational factors (Corporate Culture, Work Environment, and Digital Literacy) and job satisfaction or employee engagement.

Overall, these results show that Corporate Culture (CC) is the most dominant factor in improving job satisfaction, while Digital Literacy (DL) and Work Environment (WE) contribute more moderately to employee engagement. Therefore, the main influences in this model are organizational factors, not generational differences, suggesting that HR management strategies in the Industrial Timber Plantation sector should focus on strengthening organizational culture and creating a conducive work climate.

5. *Predictive Relevance (Q^2)*

The predictive relevance (Q^2) analysis through the blindfolding technique shows the following data:

Table 6. Predictive Relevance (Q^2) for Each Construct Based on SmartPLS 4.0 Analysis

No	Construct	Q^2	Interpretation
1	Job Satisfaction (JS)	0.470	Large predictive relevance
2	Employee Engagement (EE)	0.493	Large predictive relevance

From the table above, it can be seen that the endogenous constructs, Job Satisfaction (Q^2 = 0.47) and Employee Engagement (Q^2 = 0.49), have strong predictive relevance to the observed data. A positive Q^2 value (>0) indicates that the structural model has good predictive relevance (Hair Jr et al., 2021) .

The Q^2 values indicate how well the model can predict the actual behavior of

respondents in the field based on the variables used. The high Q² values for Job Satisfaction (0.47) and Employee Engagement (0.49) indicate that the combination of the work environment, organizational culture, and digital literacy factors tested in this model is highly relevant and significantly impacts employee satisfaction and engagement in the HTI sector. Practically, this confirms that the combination of work environment, organizational culture, and digital literacy significantly contributes to predicting employees' psychological well-being and commitment/engagement in the HTI sector.

6.   *Moderation Analysis of Generation Cohort*
        The moderation effect analysis was conducted to determine whether the influence of the work environment, organizational culture, and digital literacy on job satisfaction and employee engagement varies across generational cohorts (X, Y, and Z). This test is important because the differences in life experiences and value orientations across each generation are believed to influence how they respond to work environments and organizational policies (Parry, 2017).
        Based on the bootstrapping results from SmartPLS 4.0, only the interaction between Generation Cohort × Digital Literacy and Job Satisfaction showed a significant effect (β = −0.070; p = 0.013). This indicates that generational differences moderate the relationship between digital literacy and job satisfaction. This finding suggests that the digital aspect becomes a key differentiator across generations in the industrial timber plantation sector. To clarify the interaction between generation and digital literacy on job satisfaction, a moderation plot analysis is used, as shown below:
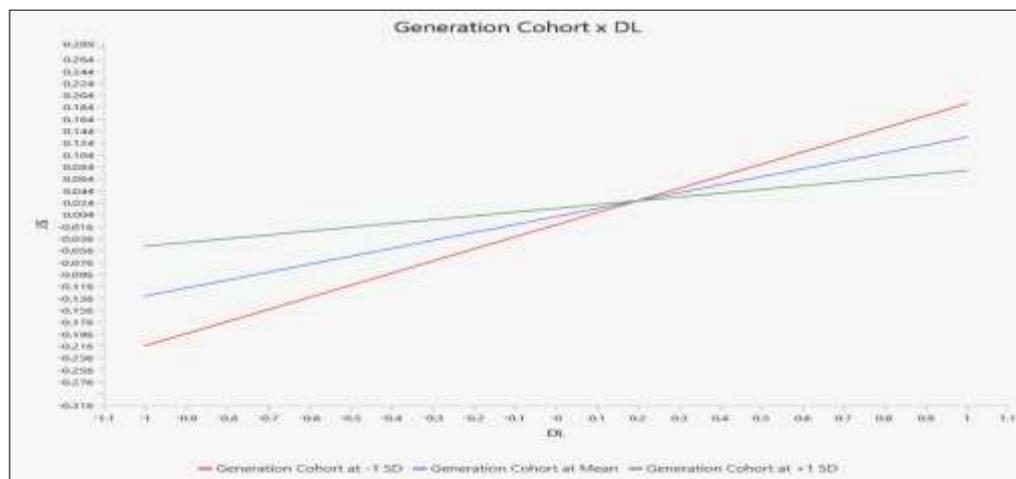

Figure 2. Interaction Diagram Between Generation Cohort × Digital Literacy (DL) on Job Satisfaction (JS)

        The figure above shows that increasing digital literacy generally enhances job satisfaction across all generational cohorts. However, the level of influence varies: older generations (Generation X) show a more significant increase in job satisfaction when digital literacy increases, while for younger generations (Generation Z), the increase in digital literacy no longer has a significant effect on job satisfaction because their level of digital adaptation is already high. These findings are consistent with Herdati & Rachmawati (2025) which state that younger generations adapt faster to digital environments and no longer view digital literacy as a key factor in job

satisfaction. Thus, this visual result reinforces the moderation test finding that the effect of digital literacy on job satisfaction varies across generations, with older generations experiencing a greater improvement in satisfaction from increased digital skills than younger generations. Generation Z tends to be more adaptive and considers digital literacy a key factor in determining work comfort and satisfaction. In contrast, Generations X and Y place more value on non-digital factors such as organizational culture and work climate as primary sources of job satisfaction. These findings support the results of Fuada et al (2025) and Cerasi & Balcioglu (2024), who stated that Generation Z's digital-native characteristics make them value organizations that provide efficient, transparent, and technologically flexible work systems, including the use of social media. However, Santoso et al (2025) argue that digital literacy is a double-edged sword and should be balanced with human-centered workplace policies to maintain satisfaction and productivity in the digital era for Generation Z. Hamdani (2024) stated that digital literacy contributes to work happiness, which in turn improves performance and employee engagement, but there are indications that high digital literacy does not always directly improve performance, making its indirect impact through job satisfaction more important.

Meanwhile, the moderating effect of generation on the relationship between work environment–job satisfaction, corporate culture–job satisfaction, and other variables on employee engagement was not significant ($p > 0.05$), which indicates a relatively consistent pattern of influence across generations on non-digital dimensions. This means that the influence of work environment and corporate culture on job satisfaction and employee engagement is relatively similar across generational cohorts. This result is supported by findings from Costanza (2012) and Lee et al (2023), which state that generational differences in job satisfaction and organizational commitment are very small and practically insignificant. Therefore, the claims of a broad generational effect on work attitudes are not supported by adequate data. The same was also noted by Parry & Uwin (2011) and Rudolp et al (2021), who stated that there is a mix of impacts and interactions between generations and other variables in supporting job satisfaction and employee performance, and thus caution is needed when linking work attitudes/results to generations. They recommend using alternative explanations (e.g., age/tenure or work conditions) rather than generational terms.

Conclusion

Based on the analysis using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) approach, several important findings have been obtained that address all the proposed hypotheses.

First, the results of the testing indicate that the Work Environment has a significant positive effect on both Job Satisfaction and Employee Engagement. This confirms that a safe, comfortable work environment that supports collaboration contributes greatly to enhancing employees' satisfaction and emotional engagement with the organization, including organizations in the Industrial Timber Plantation sector in Kalimantan.

Second, Corporate Culture is found to significantly affect Job Satisfaction, but not Employee Engagement, indicating that a strong organizational culture can improve satisfaction but does not necessarily foster engagement unless accompanied by a work system that provides space for participation and personal recognition.

Third, Digital Literacy has a significant positive effect on both Job Satisfaction and

Employee Engagement, meaning that the higher employees' digital competence, the easier they are to adapt to modern work systems, which increases their effectiveness and satisfaction at work.

Furthermore, the study also confirms that Job Satisfaction has a strong and significant effect on Employee Engagement, emphasizing that satisfaction is a key internal factor that fosters loyalty and emotional commitment to the organization. However, the interaction of Generation Cohort does not significantly moderate most of the relationships between variables. This indicates that the influence of organizational factors on job satisfaction and employee engagement does not differ substantially across generations (X, Y, and Z). The only relationship that shows a weak interaction is between Digital Literacy and Job Satisfaction, where the effect is slightly higher in younger generations. Overall, these findings support the view that generational differences in the context of modern work are not always substantial, and organizational contextual factors remain the main determinants of employee work behavior across ages.

Practically, the results of this study imply that organizations, including those in the Industrial Timber Plantation sector in Kalimantan, need to prioritize improvements in the work environment and enhance digital literacy for all employees, regardless of generational differences. Investment in developing digital work systems, transparent internal communication, and technology adaptation training can strengthen satisfaction and engagement across all age groups. Additionally, although corporate culture has positively impacted satisfaction, it is essential to revitalize the organizational values to be more participatory and adaptable to technological changes and the dynamic nature of the workforce.

Theoretically, this study affirms that the theory of cross-generational work behavior needs to be reconsidered, particularly regarding the claims of work-related character differences between generations that are still widely discussed. For future research, it is recommended to add psychological mediation variables, such as perceived organizational support, work engagement climate, or technostress resilience, to explain more deeply the psychological mechanisms that connect digital literacy and the work environment to job satisfaction and employee engagement across generations.

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