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The Effect of Employee Engagement and Digital HR Service Quality on Employee Loyalty through Job Satisfaction as a Mediation Variable: A Study on HPC Scrap Metal Timor-Leste

Original Article

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Abstract

This study aims to analyze the influence of employee engagement and digital human resource (HR) service quality on employee loyalty, both directly and indirectly through job satisfaction as a mediating variable, among employees of HPC Scrap Metal Timor-Leste. The study used an explanatory quantitative approach with a survey of 100 employee respondents through a 45-item questionnaire on a 5-point Likert scale. Data were analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0. The results showed that digital HR service quality had a positive and significant effect on job satisfaction ($\beta = 0.386$; $p = 0.009$), and job satisfaction had a positive and significant effect on employee loyalty ($\beta = 0.405$; $p < 0.001$). Employee engagement did not have a significant effect on job satisfaction or employee loyalty, and digital HR service quality did not have a direct effect on employee loyalty. Job satisfaction fully mediated the effect of digital HR service quality on employee loyalty ($\beta = 0.156$; $p = 0.035$), but did not mediate the effect of employee engagement. The relatively weak R^2 values (0.111 for job satisfaction and 0.151 for employee loyalty) indicate that other factors outside the model also play a role. These findings indicate that improving the quality of digital HR services, when genuinely perceived as an increase in job satisfaction, is a key strategy for building employee loyalty in metalworking companies in developing countries.

Keywords: Employee Engagement, HR Digital Service Quality, Job Satisfaction, Employee Loyalty, PLS-SEM

1. Introduction

Human resources (HR) are the strategic asset that most determines organizational success amid increasingly dynamic business competition, and employee loyalty is not merely an indicator of retention but a foundation for the sustainability of organizational performance. The *State of the Global Workplace* report shows that only about 23% of the global workforce is truly engaged in their work, and this low engagement is estimated to cost the equivalent of about 9% of global Gross Domestic Product (Gallup, 2024). This figure underscores the importance of understanding the factors that shape employee attachment and loyalty, particularly in industrial sectors that demand a high degree of physical and mental involvement.

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As digital transformation proceeds, HR services delivered through digital systems and platforms (electronic HRM) have become an integral part of modern employee management (Bondarouk et al., 2021; Dipoatmodjo et al., 2026; Vrontis et al., 2022). Employees act as internal users of these services, so their perceptions of the reliability, responsiveness, and ease of use of digital HR services can be viewed as digital HR service quality (Parasuraman et al., 1988; DeLone & McLean, 2003). Empirical evidence indicates that the successful implementation of HR information systems is related to job satisfaction and employee engagement (Maamari & Osta, 2021; Miswar & Nohong, 2026). Meanwhile, job satisfaction theoretically occupies a strategic position as the link between work experience and organizational attitudes. Two-Factor Theory positions satisfaction as the result of hygiene factors and motivators (Herzberg et al., 1959), while Value-Percept Theory explains it as the fit between what employees consider important and what they obtain from their work (Locke, 1976). Job satisfaction is also seen as contributing to the formation of affective commitment to the organization (Meyer & Allen, 1991).

The Timor-Leste context provides an interesting yet challenging setting. The formal sector remains relatively limited, while industrial companies face a shortage of skilled labor, competency gaps, and limited institutional capacity in managing employment relations. One company operating under these conditions is HPC Scrap Metal Timor-Leste, a company engaged in processing and trading recycled metal that has operated since January 2012 and exports its products abroad. Based on initial observations and internal company data, three problem indications were identified: a relatively high employee turnover rate, uneven and low-quality implementation of digital HR services, and employee engagement programs that are not yet optimal. These conditions have the potential to reduce job satisfaction and weaken employee loyalty.

In terms of the literature, there are several research gaps. First, most studies examine employee engagement in relation to performance without considering job satisfaction as a linking mechanism (Bakker & Demerouti, 2017). Second, studies on digital HR service quality still focus largely on large companies in developed countries. Third, job satisfaction is more often positioned as an outcome variable or as an intermediary toward engagement and performance, and few studies have extended its path to employee loyalty (Maamari & Osta, 2021; Miswar & Nohong, 2026). Studies that integrate employee engagement and digital HR service quality in a single model to explain employee loyalty in industrial companies in Timor-Leste remain very limited. The novelty of this study lies in developing an empirical model that combines these two variables with job satisfaction as a mediator in the context of the metal processing industry in a developing country.

The development of the hypotheses draws on the following theoretical frameworks. According to the Job Demands-Resources (JD-R) Model, job resources trigger engagement, which in turn increases motivation and satisfaction (Bakker & Demerouti, 2007), and findings among employees in Poland show a positive association between work engagement and employee satisfaction (Sypniewska et al., 2023). On this basis, H1 is proposed: employee engagement has a positive effect on job satisfaction. Based on Two-Factor Theory and the information systems success model, reliable and easy-to-use digital HR services function as hygiene factors that reduce dissatisfaction and increase user satisfaction, so H2 is proposed: digital HR service quality has a positive effect on job satisfaction. Based on Social Exchange Theory (Blau, 1964) and organizational commitment theory (Meyer & Allen, 1991), employees who are engaged and receive organizational support tend to reciprocate with loyalty (Saks, 2022), so H3 and H4 are proposed: employee engagement (H3) and digital HR service quality (H4) have a positive effect on employee loyalty. Furthermore, job satisfaction is expected to

be a direct antecedent of loyalty (H5) and to mediate the effects of employee engagement (H6) and digital HR service quality (H7) on employee loyalty. Accordingly, this study aims to test these seven hypotheses among employees of HPC Scrap Metal Timor-Leste, with the hope of providing a theoretical contribution to HR management research in developing countries as well as practical input for HR management in industrial companies.

2. Research Questions

Based on the background described above, the research questions in this study are as follows:

1) Does employee engagement have a positive effect on the job satisfaction of employees of HPC Scrap Metal Timor-Leste?

2) Does digital HR service quality have a positive effect on the job satisfaction of employees of HPC Scrap Metal Timor-Leste?

3) Does employee engagement have a positive effect on the loyalty of employees of HPC Scrap Metal Timor-Leste?

4) Does digital HR service quality have a positive effect on the loyalty of employees of HPC Scrap Metal Timor-Leste?

5) Does job satisfaction have a positive effect on the loyalty of employees of HPC Scrap Metal Timor-Leste?

6) Does job satisfaction mediate the effect of employee engagement on the loyalty of employees of HPC Scrap Metal Timor-Leste?

7) Does job satisfaction mediate the effect of digital HR service quality on the loyalty of employees of HPC Scrap Metal Timor-Leste?

3. Methods

This study used a quantitative approach with an explanatory research design to explain causal relationships among variables through hypothesis testing (Sugiyono, 2022). The research was conducted at HPC Scrap Metal Timor-Leste, a scrap metal processing and recycling company with permanent and contract employees across various operational divisions. The location was chosen because the company has a reasonably structured HR management system, there are indications of problems related to employee engagement and digital HR services, and the researcher had adequate access to data and respondents.

The research population was all 115 active employees of HPC Scrap Metal Timor-Leste. The sampling technique was total sampling of employees who met the inclusion criteria: having permanent or active contract status, having worked for at least six months, having access to the company's digital HR services, and being willing to complete the questionnaire voluntarily. Based on these criteria, 100 respondents were obtained (about 87% of the population), most of whom (84 respondents) came from core operational units, namely collection and quality control, weighing, pressing, packing, and export.

Primary data were collected through a closed-ended questionnaire using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), distributed in person and through Google Forms for employees at different locations, while secondary data were obtained from company documentation such as personnel data and the organizational structure. The instrument consisted of 45 items measuring four constructs: employee engagement (9 items; vigor, dedication, absorption; Schaufeli et al., 2002), digital HR service quality (9 items; reliability, responsiveness, ease of use; Parasuraman et al., 1988; DeLone & McLean, 2003), job

satisfaction (18 items; six dimensions; Spector, 1997), and employee loyalty (9 items; affective commitment, intention to stay, positive work behavior; Meyer & Allen, 1991). A summary of the operationalization of the variables is presented in Table 1.

Table 1. Operationalization of Research Variables

Variable	Dimensions/Indicators	Items
Employee Engagement (X1)	Vigor, dedication, absorption	9
Digital HR Service Quality (X2)	Reliability, responsiveness, ease of use	9
Job Satisfaction (M)	The work itself, pay/benefits, promotion and career, supervisor, coworkers, working conditions	18
Employee Loyalty (Y)	Affective commitment, intention to stay, positive work behavior	9

Source: Research data processed (2026)

Data analysis was carried out using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0, which is suitable for testing mediation models with a relatively limited sample size (Hair et al., 2019). Evaluation of the measurement model (outer model) included convergent validity (outer loading > 0.70 and Average Variance Extracted/AVE > 0.50), discriminant validity through the Heterotrait-Monotrait Ratio (HTMT < 0.90; Henseler et al., 2015), and construct reliability (Cronbach's Alpha and Composite Reliability > 0.70). Evaluation of the structural model (inner model) used the coefficient of determination (R^2; Chin, 1998) and effect size (f^2) with thresholds of 0.02 (small), 0.15 (medium), and 0.35 (large) (Cohen, 1988). Hypothesis testing was conducted using the bootstrapping procedure; a hypothesis was accepted if the t-statistic > 1.96 and $p < 0.05$. Mediation effects were assessed through the specific indirect effect: if the indirect effect is significant while the direct effect is not, the mediation is classified as full; if both are significant, the mediation is classified as partial; if the indirect effect is not significant, there is no mediation. Variable achievement levels were categorized as low (1.00–2.33), moderate (2.34–3.66), and high (3.67–5.00).

4. Results and Discussion

4.1. Respondent Characteristics and Variable Description

The respondents consisted of 57 men (57.0%) and 43 women (43.0%), which reflects the characteristics of the metal processing industry, which requires considerable physical and technical labor. Most respondents were aged 25–35 years (46.0%) and 36–45 years (40.0%), so 86.0% were of productive age. In total, 80.0% of respondents had worked for more than three years, and 62.0% held a diploma (D3) or bachelor's degree (S1). This composition shows that the respondents had adequate experience with working conditions and digital HR services, so their answers can be considered credible.

All variables fell into the high category (Table 2). Employee engagement obtained the highest mean (4.40), followed by employee loyalty (4.09), digital HR service quality (3.95), and job satisfaction (3.90). The high employee engagement score is worth noting because, as shown in the following sections, this variable was not found to have a significant effect in the structural model.

Table 2. Description of Research Variables (n = 100)

Variable	Mean	Category
Employee Engagement (X1)	4.40	High
Digital HR Service Quality (X2)	3.95	High
Job Satisfaction (M)	3.90	High
Employee Loyalty (Y)	4.09	High

Source: SmartPLS output and primary data processed (2026)

4.2. Measurement Model Evaluation (Outer Model)

All indicators had outer loadings above 0.70 (range 0.730–0.931), so no indicators were eliminated, and the AVE values of all constructs were above 0.50 (0.685–0.818) (Table 3). Discriminant validity was satisfied, as shown by all HTMT values being below 0.90, with the highest value being 0.530 (between X1 and X2). Cronbach's Alpha and Composite Reliability of all constructs were in the range of 0.957–0.976, so the instrument was deemed reliable. These very high values (> 0.95) may indicate redundancy among items, which should be considered in future research.

Table 3. Measurement Model Evaluation Results

Construct	Outer loading	AVE	Cronbach's α	CR (rho_c)
Employee Engagement (X1)	0.837–0.931	0.818	0.973	0.976
Digital HR Service Quality (X2)	0.846–0.930	0.806	0.970	0.974
Job Satisfaction (M)	0.730–0.905	0.685	0.973	0.975
Employee Loyalty (Y)	0.773–0.916	0.744	0.957	0.963

Source: SmartPLS output (2026)

4.3. Structural Model Evaluation (Inner Model)

The R^2 value for job satisfaction of 0.111 (adjusted 0.093) shows that employee engagement and digital HR service quality together explain only 11.1% of the variance in job satisfaction. The R^2 for employee loyalty of 0.151 (adjusted 0.124) shows that the three predictors explain 15.1% of the variance in loyalty. Both are weak, so other factors such as compensation, leadership style, organizational culture, and the physical work environment may also play a role. Based on effect size, job satisfaction made the largest contribution to loyalty (f^2 = 0.172; medium), followed by digital HR service quality on job satisfaction (f^2 = 0.124), while the direct contributions of employee engagement and digital HR service quality to loyalty were very small (f^2 = 0.022 and 0.021). The hypothesis testing results are presented in Table 4 and discussed in the following sections.

Table 4. Hypothesis Testing Results

Hypothesis	Path	β	*t*	*p*	f^2	Decision
H1	X1 → M	−0.218	1.389	0.165	0.040	Rejected
H2	X2 → M	0.386	2.629	0.009	0.124	Accepted
H3	X1 → Y	0.162	1.012	0.312	0.022	Rejected
H4	X2 → Y	−0.164	1.143	0.253	0.021	Rejected
H5	M → Y	0.405	3.831	<0.001	0.172	Accepted
H6	X1 → M → Y	−0.088	1.286	0.199	–	Rejected
H7	X2 → M → Y	0.156	2.115	0.035	–	Accepted (full mediation)

Source: SmartPLS output, bootstrapping (2026). X1 = Employee Engagement; X2 = Digital HR Service Quality; M = Job Satisfaction; Y = Employee Loyalty.

4.4. The Effect of Employee Engagement on Job Satisfaction (H1)

Employee engagement did not have a significant effect on job satisfaction (β = −0.218; *t* = 1.389; *p* = 0.165), so H1 was rejected. This finding is not in line with the JD-R Model proposition that positions engagement as a pathway to satisfaction (Bakker & Demerouti, 2007, 2017), nor with the positive association between engagement and satisfaction reported by Sypniewska et al. (2023). The direction of the coefficient was even negative, although not statistically significant.

Several plausible explanations can be offered. First, there are indications of a ceiling effect: the mean employee engagement score reached 4.40 out of a maximum of 5, with all

indicators in the range of 4.25–4.45, so the variation in answers among respondents was limited. A variable with low variance has difficulty statistically explaining the variation in another variable, even though its value is substantively high. Second, in the operational units that dominate the sample, job satisfaction is likely determined more by the hygiene factors of Two-Factor Theory (Herzberg et al., 1959), such as physical working conditions, occupational safety, compensation, and clarity of procedures, than by psychological engagement with the work. In other words, employees may be highly dedicated, yet their satisfaction is still shaped by structural factors outside engagement itself. Third, the small effect size (f^2 = 0.040) reinforces the conclusion that engagement is not the dominant mechanism shaping satisfaction in this context. This explanation is interpretive because hygiene factors were not measured in this study.

4.5. The Effect of Digital HR Service Quality on Job Satisfaction (H2)

Digital HR service quality had a positive and significant effect on job satisfaction (β = 0.386; t = 2.629; p = 0.009), so H2 was accepted. This finding supports Two-Factor Theory, in that reliable, responsive, and easy-to-use digital HR services function as hygiene factors that reduce administrative burden and dissatisfaction (Herzberg et al., 1959), and it is in line with the information systems success model, which states that service quality affects user satisfaction (DeLone & McLean, 2003). The finding is also consistent with studies linking the successful implementation of HR information systems and digital service quality to job satisfaction (Maamari & Osta, 2021; Miswar & Nohong, 2026; Windarsari & Arif, 2026).

Digital HR service quality was the strongest predictor of job satisfaction in this model (f^2 = 0.124). In context, the mean of this variable (3.95) is lower than that of employee engagement (4.40), so there remains real room for improvement. A significant effect was detected precisely for the variable with greater variation in perceptions, which suggests that improving digital HR services has the potential to make a real difference to employee satisfaction.

4.6. The Effect of Employee Engagement on Employee Loyalty (H3)

Employee engagement did not have a significant effect on employee loyalty (β = 0.162; t = 1.012; p = 0.312), so H3 was rejected. This result differs from the expectations of Social Exchange Theory (Blau, 1964) and the literature linking engagement to commitment (Saks, 2022). Besides the issue of limited variance, two explanations are possible. First, engagement refers to attachment to the work (vigor, dedication, absorption), whereas loyalty refers to attachment to the organization, so dedication to daily tasks does not automatically become long-term commitment. The decision to stay may be influenced more by economic considerations and the availability of alternative jobs (continuance commitment) than by affective bonds (Meyer & Allen, 1991). Second, social exchange requires a perception of reciprocity; if engaged employees do not perceive an equivalent return in the form of recognition, career development, or organizational support, the exchange chain is broken. The very small f^2 value (0.022) is consistent with this interpretation, but both explanations need further testing because continuance commitment and perceived reciprocity were not measured separately.

4.7. The Effect of Digital HR Service Quality on Employee Loyalty (H4)

Digital HR service quality did not have a direct effect on employee loyalty (β = −0.164; t = 1.143; p = 0.253), so H4 was rejected. This does not mean the variable is irrelevant to loyalty, because its effect proved significant through the indirect path (H7). Conceptually, digital HR services function as a hygiene factor that prevents dissatisfaction and does not necessarily

build long-term affective commitment (Herzberg et al., 1959). Easy access to payslips, fast leave request processing, or accurate personnel data increase work comfort, but they affect the decision to stay only after being internalized as overall job satisfaction. The non-significant negative coefficient can be understood as a statistical consequence of a full mediation pattern, in which the direct coefficient tends to approach zero in simultaneous estimation.

4.8. The Effect of Job Satisfaction on Employee Loyalty (H5)

Job satisfaction had a positive and significant effect on employee loyalty (β = 0.405; t = 3.831; p < 0.001), so H5 was accepted. This is the strongest path in the model (f^2 = 0.172; medium) and the most solid empirical confirmation in this study. The finding is in line with organizational commitment theory, which places satisfaction as an antecedent of affective commitment (Meyer & Allen, 1991), and with Value-Percept Theory, which explains that satisfaction forms when the job fulfills the values that employees consider important (Locke, 1976).

In this model, job satisfaction is not merely a mediating variable but the only significant predictor of employee loyalty. Neither employee engagement nor digital HR service quality affects loyalty directly; their influence is realized only through job satisfaction.

4.9. The Mediating Role of Job Satisfaction in the Relationship between Employee Engagement and Employee Loyalty (H6)

The indirect effect of employee engagement on employee loyalty through job satisfaction was not significant (β = −0.088; t = 1.286; p = 0.199), so H6 was rejected. Mediation can occur only if both segments of the path, X1 → M and M → Y, work adequately. In this study the second segment was very strong (β = 0.405; p < 0.001), but the first segment was not significant (β = −0.218; p = 0.165), so there was no effect that could be channeled through the mediator. Thus, the problem lies not in the mediation mechanism of job satisfaction, which proved to function in H7, but in the weak relationship between employee engagement and job satisfaction. Theoretically, the engagement–satisfaction–loyalty exchange chain does not appear to apply universally but depends on context, such as industry characteristics, the structure of operational work, and the local work culture.

4.10. The Mediating Role of Job Satisfaction in the Relationship between Digital HR Service Quality and Employee Loyalty (H7)

The indirect effect of digital HR service quality on employee loyalty through job satisfaction was significant (β = 0.156; t = 2.115; p = 0.035), so H7 was accepted. Because the direct effect of X2 → Y was not significant (p = 0.253), the mediation that occurred is classified as full mediation. The proposed mechanism, namely that quality digital HR services increase job satisfaction and subsequently build loyalty, was empirically confirmed.

This finding corrects the study's initial assumption, which allowed for partial mediation. Full mediation indicates that job satisfaction is the only mechanism linking digital HR service quality to loyalty. In practical terms, investment in digital HR services has an optimal impact on loyalty only if the improvements are genuinely perceived by employees as an increase in job satisfaction; purely technical digitalization risks having no impact on loyalty.

4.11. Theoretical and Managerial Implications

Theoretically, this study strengthens the role of job satisfaction as a mediator between digital HR practices and employee loyalty, clarifies the position of digital HR services as a hygiene factor operating at the level of daily work experience, and shows that the relationship between work engagement and organizational outcomes is contingent on context. The findings

also sharpen the distinction between attachment to the work and attachment to the organization, thereby opening room for further research on contextual moderating variables.

Managerially, there are three implications. First, the management of HPC Scrap Metal Timor-Leste needs to prioritize improving the quality of digital HR services, particularly ease of access, speed of response, and data accuracy, accompanied by socialization and measurement of employees' perceived benefits. Second, before developing more complex engagement programs, management needs to ensure that basic hygiene factors are met, such as occupational safety, fair compensation and overtime pay, clear procedures, and decent working conditions, while also reviewing engagement programs so that they address real needs such as career paths and skills development. Third, job satisfaction should be made a central point of intervention and a key performance indicator of the HR function through periodic surveys.

5. Conclusion and Recommendations

Based on the results of the analysis, it can be concluded that digital HR service quality has a positive and significant effect on job satisfaction, and job satisfaction has a positive and significant effect on the loyalty of employees of HPC Scrap Metal Timor-Leste. Employee engagement does not have a significant effect on either job satisfaction or employee loyalty, and digital HR service quality does not have a direct effect on employee loyalty. Job satisfaction fully mediates the effect of digital HR service quality on employee loyalty, but does not mediate the effect of employee engagement. Thus, three of the seven hypotheses were accepted (H2, H5, and H7), and employee loyalty is shaped more by job satisfaction that stems from digital HR service quality than by employee engagement directly.

For the company, it is recommended to continuously improve the quality of digital HR services, especially on the aspects with the lowest scores, to re-evaluate the employee engagement program by considering local contextual factors, and to make job satisfaction the main indicator for evaluating the performance of the HR function. This study has several limitations: the R^2 values of both endogenous variables are weak; the cross-sectional design does not capture dynamics over time; the sample is limited to one company, so generalization must be made with caution; and the use of self-report questionnaires may give rise to common method bias. For future research, it is suggested to (1) retest the non-significant paths, particularly the employee engagement construct, using an instrument better suited to the work culture of Timor-Leste and taking the ceiling effect into account; (2) add variables such as compensation, occupational safety, leadership style, and organizational culture; (3) use a longitudinal design; (4) expand the sample to several similar companies; and (5) test contextual moderating variables such as job type, length of service, and education level.

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