

Human Resource Management Practices and Organizational Commitment: The Mediating Role of Work Engagement and The Integration of Necessary Condition Analysis

PRÁCTICAS DE GESTIÓN DE RECURSOS HUMANOS Y COMPROMISO ORGANIZACIONAL: EL ROL MEDIADOR DEL ENGAGEMENT LABORAL Y LA INTEGRACIÓN DEL ANÁLISIS DE CONDICIONES NECESARIAS

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Abstract

Purpose: This study examines how Human Resource Management (HRM) practices influence organizational commitment in private security companies, considering work engagement as a mediating variable.

Methodology: Post-positivist and quantitative design were applied using PLS-SEM and Necessary Condition Analysis (NCA). Data were collected from 312 security agents in Metropolitan Lima using validated Likert-scale instruments.

Results: Selection and recruitment, job security, and performance appraisal were positively associated with work engagement, which strongly predicted organizational commitment. NCA revealed that work engagement exhibited the strongest necessary condition effect, followed by smaller necessity effects for job security, employee participation, and performance appraisal.

Implications: Findings suggest prioritizing rigorous selection processes, stable employment policies, and fair appraisal systems to improve retention and strengthen commitment in high-turnover sectors. The results offer guidance for HRM practices, workforce professionalization, and public policy in private security services.

Originality: This study integrates PLS-SEM with NCA to provide both sufficient and necessary conditions, offering a novel methodological approach and empirical evidence in a sector particularly within high-turnover private security settings in Latin America.

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Resumen

Propósito: Este estudio examina cómo las prácticas de Gestión de Recursos Humanos (GRH) influyen en el compromiso organizacional en empresas de seguridad privada, considerando el engagement laboral como variable mediadora.

Metodología: Se aplicó un diseño postpositivista y cuantitativo utilizando PLS-SEM y el Análisis de Condiciones Necesarias (NCA). Los datos se recopilieron de 312 agentes de seguridad en Lima Metropolitana mediante instrumentos validados con escala Likert.

Resultados: La selección y reclutamiento, la seguridad laboral y la evaluación del desempeño incrementaron significativamente el engagement laboral, el cual predijo fuertemente el compromiso organizacional. El NCA reveló que el engagement laboral presentó el efecto de condición necesaria más fuerte, seguido de efectos de necesidad menores para la seguridad laboral, la participación de los empleados y la evaluación del desempeño.

Implicaciones: Los hallazgos sugieren priorizar procesos rigurosos de selección, políticas de empleo estables y sistemas justos de evaluación para mejorar la retención y fortalecer el compromiso en sectores con alta rotación. Los resultados ofrecen orientaciones para las prácticas de GRH, la profesionalización de la fuerza laboral y las políticas públicas en los servicios de seguridad privada.

Originalidad: Este estudio integra PLS-SEM con NCA para proporcionar condiciones suficientes y necesarias, ofreciendo un enfoque metodológico novedoso y evidencia empírica en un sector escasamente examinado en América Latina.

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INTRODUCTION

Private security firms depend heavily on human resource management because service quality, regulatory compliance, and risk prevention are directly shaped by how personnel are selected, trained, motivated, and retained (Belenay & Özbakir, 2023; Grunwald et al., 2024). Although organizational commitment is widely discussed in HRM research (Saks, 2006), its relationship with HRM practices remains underexplored among private security personnel, a workforce characterized by demanding conditions and high turnover (De Waard, 1999; Grunwald et al., 2024).

Organizational commitment reflects the psychological bond between the employee and the organization, and it predicts satisfaction, performance, and tenure. It does not arise spontaneously; rather, it is linked to engagement, energy, dedication, and absorption. Social Exchange Theory suggests that when workers

perceive genuine investment in their well-being, they respond with loyalty and deeper commitment. This is especially relevant in private security, where motivation, emotional stability, and perception of fairness have a strong effect on performance (Belenay & Özbakir, 2023; Saks, 2006).

Research has shown appropriate selection, continuous training, employee participation, and well-being policies can strengthen work engagement (Alam et al., 2024; Albrecht et al., 2015; Wilkinson et al., 2010). However, the literature remains unclear about which HRM practices are necessary to foster strong organizational commitment. This gap is particularly relevant in high-turnover contexts like private security (De Waard, 1999; Grunwald et al., 2024). Necessary Condition Analysis (NCA) (Dul, 2015) offers a complementary perspective: not all factors contribute equally, and some conditions may be required—even if they are not sufficient to achieve organizational commitment. NCA helps identify these conditions and can

complement techniques such as regression and correlation (Dul et al., 2023).

This research provides-empirical evidence from the private security sector in Lima, integrating PLS-SEM with NCA, and identifies HRM practices associated with work engagement and organizational commitment.

This study aims to identify the most critical HRM practices for building organizational commitment in private security companies characterized by high turnover and considerable psychological demands. It examines the link between HRM practices and organizational commitment, with work engagement acting as a mediating mechanism, and uses NCA as a complementary methodological framework (Dul, 2015; Dul et al., 2023). The analysis also incorporates Social Exchange Theory (Cropanzano & Mitchell, 2005) and high-performance work practices (Albrecht et al., 2015) to support sustainability, retention, and competitiveness within the sector. The study offers evidence-based guidance for developing more effective people management strategies.

In the light of the theoretical and practical gaps identified, this study addresses the following research questions:

RQ1: Which human resource management practices are significantly associated with work engagement in private security companies?

RQ2: Does work engagement mediate the relationship between HRM practices and organizational commitment?

RQ3: Which HRM practices constitute necessary conditions for achieving high organizational commitment?

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Theoretical Foundations

The model is grounded in Social Exchange Theory, the Job Demands–Resources (JD-R) model, and Meyer and Allen’s three-component view of organizational commitment. Social Exchange Theory explains why employees

reciprocate fair HRM practices with loyalty and discretionary effort (Blau, 1964). The JD-R model frames HRM practices as job resources that can strengthen engagement when they help employees cope with job demands (Demerouti et al., 2001; Bakker & Demerouti, 2008). Finally, Meyer and Allen’s (1991) model explains commitment as a psychological attachment to the organization, especially in its affective dimension. Together, these perspectives support a model in which HRM practices influence work engagement, which then contributes to organizational commitment.

Dependent Variable: Organizational Commitment (CO)

Organizational commitment refers to the extent to which employees identify with their organization, internalize its goals, and intend to remain within it (Meyer & Allen, 1991). It has been linked to lower turnover, higher satisfaction, improved performance, and stronger organizational citizenship behaviors (Saks, 2006).

According to Meyer and Allen’s (1991) three-component model, organizational commitment comprises affective, continuance, and normative dimensions. This study focuses on affective commitment, as it is most closely associated with retention, cultural identification, and proactive behavior particularly relevant in private security settings (Grunwald et al., 2024).

Mediating Variable: Work Engagement (CL)

Work engagement is a positive and persistent psychological state characterized by vigor, dedication, and absorption (Schaufeli, 2013). It predicts key outcomes such as performance, retention, satisfaction, and employee well-being (Saks, 2006). Within the JD-R framework (Bakker & Demerouti, 2008), engagement emerges when organizational resources such as training, recognition, participation, and job stability adequately counterbalance job demands. These resources act as drivers that strengthen employees’ engagement levels.

In this study, work engagement functions as the mechanism through which HRM practices are associated with organizational commitment. This mediating role is supported theoretically

and empirically (Bakker & Demerouti, 2008; Meyer et al., 2002), offering a clearer understanding of how HRM policies shape organizational outcomes.

Selection and Recruitment (SYR) and Their Relationship with Work Engagement (CL) (H1)

Selection and recruitment are core HRM practices aimed at attracting and identifying candidates who fit the organization's strategic needs (Delery & Doty, 1996). Beyond technical skills, these processes assess behavioral attributes and person-job and person-organization fit. Evidence suggests that structured and transparent selection strengthens organizational justice, candidate experience, and early work engagement (Albrecht et al., 2015; Barrick & Parks-Leduc, 2019). Within private security, where reliability, discipline, and stress tolerance are crucial, rigorous selection may reduce early turnover and align personnel with operational demands.

From Social Exchange Theory (Blau, 1964), employees respond positively when selection practices are fair, transparent, and professional, fostering reciprocity and higher commitment (Cropanzano & Mitchell, 2005). A structured and fair process builds trust and shapes the initial psychological contract that supports affective commitment and participation (Barrick & Parks-Leduc, 2019; Cropanzano & Mitchell, 2005). Consequently:

H1. Selection and recruitment (SYR) have a significant and positive effect on work engagement (CL)

Training and Development (CYD) and Their Effect on Work Engagement (CL) (H2)

Training and development involve planned efforts to enhance employees' technical, cognitive, and attitudinal skills, preparing them for future responsibilities (Aguinis & Kraiger, 2009). Organizationally, these practices both address performance gaps and strengthen human capital to create sustained competitive advantages. In high-turnover sectors such as private security, continuous training is essential for maintaining service quality, complying with new regulations, and coping with demanding

environments. Empirical evidence shows that employees display greater work engagement when they perceive that the organization invests in their professional and personal development (Bartlett, 2001).

From the JD-R perspective, training acts as a resource that enhances self-efficacy and perceived organizational support, thereby fostering engagement (Bakker & Demerouti, 2008). It also reinforces reciprocity, as outlined in Social Exchange Theory, strengthening employees' affective bond with the organization (Blau, 1964).

H2. Training and development (CYD) have a significant and positive effect on work engagement (CL)

Rewards and Compensation (RYC), and Work Engagement (CL) (H3)

Rewards and compensation encompass monetary and non-monetary incentives designed to recognize employees' contributions to organizational goals (Noorazem et al., 2021). These mechanisms range from salary and benefits to recognition systems, performance bonuses, and internal promotions. Perceived fairness in compensation is a key predictor of motivation, satisfaction, and commitment (Noorazem et al., 2021).

Within the JD-R model, rewards function as resources that buffer job demands, enhance employees' psychological energy, and strengthen engagement (Bakker & Demerouti, 2008). Social Exchange Theory also suggests that fair rewards trigger positive emotional responses, reinforcing affective commitment (Cropanzano & Mitchell, 2005).

Recent empirical studies confirm this relationship in contexts comparable to private security, where fair pay increases commitment and reduces turnover intentions (Noorazem et al., 2021). This link is especially relevant in high-risk, physically demanding sectors, where feeling adequately rewarded shapes employees' evaluation of their job and organization.

H3. Rewards and compensation (RYC) have a significant and positive effect on employees' work engagement (CL).

Job Security (SL) and Its Relationship with Work Engagement (CL) (H4)

Job security refers to employees' perception of continuity and stability in their employment relationship (Delery & Doty, 1996). This sense of permanence signals organizational commitment to its workforce and fosters psychological safety—highly valued in high-turnover, high-stress sectors such as private security. Within the JD-R model, stability functions as a resource that reduces uncertainty and enables employees to focus on their tasks and manage job demands more effectively. Social Exchange Theory also posits that perceived stability fosters loyalty and reciprocity, strengthening affective commitment (Blau, 1964).

Empirical evidence shows that employees who feel secure tend to be more committed, satisfied, and willing to exert higher effort (Delery & Doty, 1996). In the security sector, providing stability not only reduces turnover but also creates predictability, allowing cohesive teams and better operational planning.

H4. Perceived job security (SL) has a significant and positive effect on work engagement (CL).

Employee Participation (PE) and Its Effect on Work Engagement (CL) (H5)

Employee participation refers to the extent to which workers can share their views, take part in decisions, and influence matters concerning their jobs (Wilkinson et al., 2010). This includes both formal and informal mechanisms such as operational meetings, climate surveys, suggestion systems, and continuous improvement committees. Within the JD-R framework, participation acts as a resource that strengthens autonomy, competence, and belonging, thereby enhancing work engagement (Schaufeli, 2013). Social Exchange Theory also suggests that when organizations listen to and value employees' ideas, workers respond with greater affective identification and discretionary effort (Cropanzano & Mitchell, 2005).

Empirical evidence indicates that participation increases perceptions of organizational justice, improves the work climate, and reduces

hierarchical distance—all of which support higher engagement (Saks, 2006). In hierarchical contexts such as private security, participation opportunities reinforce agents' sense of belonging and connection to the organization's mission.

H5. Employee participation (PE) positively influences work engagement (CL).

Performance Appraisal (ED) and Its Relationship with Work Engagement (CL) (H6)

Performance appraisal is a systematic process used to measure employee performance and provide feedback relative to organizational goals (Alainati et al., 2024). Appraisals may be formal, such as structured annual reviews, or informal through ongoing feedback. When evaluations are perceived as fair, developmental, and useful, they foster stronger affective commitment and motivation to improve (Aguinis & Kraiger, 2009). Within the JD-R model, appraisal offers clarity about expectations and growth opportunities, functioning as a resource that promotes engagement. By reinforcing feelings of achievement and recognition, it energizes employees (Bakker & Demerouti, 2008). Empirical evidence shows that positive perceptions of performance appraisal are linked to higher engagement and satisfaction, particularly when paired with genuine opportunities for development (Alainati et al., 2024).

H6. Performance appraisal (ED) perceived as fair and development-oriented positively influences work engagement (CL).

Work Engagement (CL) and Its Relationship with Organizational Commitment (CO) (H7)

Work engagement is widely recognized as an immediate antecedent of organizational commitment because it reflects an affective and cognitive state that can develop into a stronger, long-term attachment to the organization (Schaufeli, 2013). When employees feel energetic, dedicated, and absorbed in their work, they adopt a more positive attitude toward their organizational environment, increasing their identification with collective goals (Saks, 2006).

Within the JD-R model, work engagement is a channel through which job resources influence

macro-level outcomes such as organizational commitment. Research shows that highly engaged employees exhibit stronger affective commitment, lower voluntary turnover, and greater willingness to exert extra effort (Meyer et al., 2002; Saks, 2006). In private security where work is often demanding and repetitive high engagement may buffer against professional strain while strengthening voluntary retention.

H7. Work engagement (CL) has a significant and positive effect on organizational commitment (CO).

Mediating Effect of Work Engagement Between HRM and Organizational Commitment (H8a – H8f)

Current literature highlights that the link between HRM practices and organizational commitment is not linear but mediated by psycho-affective variables such as work engagement (Albrecht et al., 2015). HRM practices create conditions that stimulate engagement, which in turn nurture emotional and moral attachment to the organization.

According to Zhao et al. (2010), mediation occurs when a mediator (M) partially or fully transmits the effect of an independent variable (X) on a dependent variable (Y). In this study work engagement (CL) mediates the relationship between HRM practices (SYR, CYD, RYC, SL, PE, ED) and organizational commitment (CO). Multiple studies support this model, showing that training, recognition, participation, and job security increase engagement, which then leads to greater organizational commitment (Saks, 2006; Albrecht et al., 2015).

H8a: SYR → CL → CO

H8b: CYD → CL → CO

H8c: RYC → CL → CO

H8d: SL → CL → CO

H8e: PE → CL → CO

H8f: ED → CL → CO

METHODOLOGY

Epistemological Approach and Research Design

The study adopts a post-positivist paradigm, which assumes an objective reality that can be examined through empirical observation while acknowledging limitations in measurement, interpretation, and inference (Hair & Alamer, 2022). This approach is suitable for analyzing complex, multicausal phenomena in social and organizational contexts, such as the influence of HRM practices on work and organizational commitment (Albrecht et al., 2015).

Accordingly, the research employs a non-experimental, cross-sectional, and correlational design, aimed at identifying relationships between variables at a single point in time without manipulating conditions—an appropriate choice given the exploratory nature of the study and the operational constraints of the private security sector (Saks, 2006).

Participants and Procedure

The target population consisted of operational staff from private security companies in Metropolitan Lima. A convenience non-probability sampling approach was used, given the limited access to front-line personnel and the logistical constraints typical of studies in hard-to-reach occupational groups (Hair & Alamer, 2022). This approach is suitable when the objective is to identify association patterns rather than make population-level inferences.

The final sample included 312 participants, exceeding the minimum recommended by Hair and Alamer (2022), who suggest a threshold of ten times the number of indicators of the most complex construct (minimum = 60). A statistical power test using G*Power ($\alpha = 0.05$, power = 0.80, $f^2 = 0.15$) indicated a minimum of 92 cases was required, confirming that the obtained sample having at least six adequate statistical power (Hair & Alamer, 2022).

Inclusion criteria were: (a) holding a current formal employment contract, (b) at least six months of tenure, and (c) occupying operational or surveillance roles. Administrative and supervisory staff were excluded to maintain functional homogeneity. Data were collected

exclusively through an online survey, following written informed consent, ensuring confidentiality, anonymity, and voluntary participation. This procedure ensured standardized data collection conditions for all respondents.

To further assess potential common method bias, the full collinearity test was conducted by examining variance inflation factors (VIF) for all constructs, following the procedure proposed by Kock (2015). All full collinearity VIF values were below the recommended threshold of 3.3, suggesting that common method bias is unlikely to be a serious concern in this study.

A total of 312 valid responses were retained after eliminating incomplete questionnaires. All retained cases met the inclusion criteria, and no missing demographic data were identified. Percentages reported in the demographic table are therefore based on the total valid sample ($N = 312$).

Measurement Instruments

The items used to measure human resource management practices (selection and recruitment, training and development, rewards and compensation, job security, employee participation, and performance appraisal) were adapted from established scales in the human resource management literature.

A structured survey was used to operationalize eight constructs: six HRM practices (selection and recruitment, training and development, rewards and compensation, job security, employee participation and performance appraisal), work engagement, and organizational commitment. All constructs were measured with 5-point Likert items (1 = strongly disagree; 5 = strongly agree) adapted from validated scientific scales.

The scales were translated, back-translated, reviewed by HRM and private security specialists, and pilot-tested with 20 employees to ensure clarity, contextual relevance, and adequate reliability ($\alpha > 0.70$).

The items and reference sources were: (a) Selection and recruitment, 4 items (Alam et al., 2024), (b) Training and development, 5 items

(Bartlett, 2001), (c) Rewards and compensation, 4 items (Noorazem et al., 2021), (d) Job security, 3 items (Mixafenti et al., 2025), (e) Participation, 4 items (Belenay & Özbakır, 2023), (f) Performance appraisal, 4 items (Alainati et al., 2024), (g) Work engagement, 6 items (Schaufeli et al., 2002), (h) Organizational commitment, 6 items (Meyer & Allen, 1991). This scale captures employees' emotional attachment and identification with their organization.

Data Analysis

The data were analyzed using partial least squares structural equation modeling (PLS-SEM) in SmartPLS 4, an appropriate technique for complex models with multiple latent variables, especially in exploratory studies with moderately sized samples (Hair & Alamer, 2022).

Necessary Condition Analysis (NCA) was employed as a complementary method to identify conditions that are necessary but not sufficient for achieving high levels of organizational commitment (Dul et al., 2023). The analysis was conducted in R (4.0.0) using the NCA package and visualized through the Bottleneck Analysis method. Cut-off lines were set using percentiles (90% ceiling line), and both linear and upper-restriction necessity relationships were examined. This study is pioneering within the private security field, as it identifies HRM practices in a context of high turnover and operational risk (Grunwald et al., 2024).

Common Method Bias

Because the data were collected using self-reported Likert scales in a cross-sectional design, potential common method bias (CMB) was addressed through both procedural and statistical remedies. Procedurally, anonymity and confidentiality were guaranteed, and questionnaire sections were separated to reduce evaluation apprehension. Statistically, the full collinearity test proposed by Kock (2015) was applied. All VIF values were below the threshold of 3.3; suggesting that common method bias is unlikely to threaten the validity of the results.

Ethical Considerations

The study was approved by the Ethics Committee of the University of Lima. All data will be stored on the university's encrypted servers, accessible only to the research team, and retained for five years for potential audits, in compliance with the Personal Data Protection Law (Law No. 29733, Peru). After that period, the data will be securely deleted. The informed consent form outlines the purpose of the study, confidentiality measures, and participants' rights.

RESULTS AND DISCUSSION

Demographic Data

Table 1 presents the demographic profile of the sample. Participants were predominantly male, distributed across different age groups, and mostly reported 1 to 3 years of tenure, reflecting the high-turnover nature of the private security sector.

Table 1. Demographic characteristics of operational personnel in private security companies in metropolitan Lima.

Variable	Category	Frequency	%
Gender	Male	228	73.08
	Female	84	26.92
Age	18 - 29	78	25.00
	30 - 39	72	23.08
	40 - 49	89	28.53
	> 50	73	23.40
Years of Service in the Company	1 - 3	193	61.86
	4 - 6	48	15.38
	7 - 9	33	10.58
	> 10	38	12.18
Number of coworkers in the unit	1 - 3	69	22.12
	4 - 6	54	17.31
	7 - 9	41	13.14
	> 10	148	47.44

Source: Own elaboration.

Note: Percentages are calculated based on the total valid sample ($N = 312$). The sample includes only operational security personnel with a formal employment relationship and at least six months of tenure.

Evaluation of the Measurement Model

The measurement model was validated using partial least squares structural equation modeling (PLS-SEM) in SmartPLS 4, following the methodological recommendations of Hair and Alamer (2022). The PLS algorithm was estimated using the path weighting scheme with a convergence criterion of 10^{-7} , following standard recommendations for PLS-SEM analysis. All constructs in the model were specified as reflective constructs and estimated using Mode A in the PLS algorithm. This specification is consistent with prior

research in human resource management and organizational behavior, where the observed indicators are assumed to reflect the underlying latent constructs.

Internal Reliability

The reliability coefficients (Cronbach's α and composite ρ) ranged from 0.808 to 0.947, exceeding the 0.70 cutoff (Hair & Alamer, 2022), demonstrating strong internal consistency among the items (Table 2).

Table 2. Descriptive statistics, internal consistency reliability, and convergent validity of the reflective constructs.

Construct	Average Factor Loadings (λ)	Cronbach's α	rho_A	AVE
Organizational Commitment (CO)	0.820	0.891	0.913	0.569
Work Engagement (CL)	0.810	0.921	0.935	0.594
Selection and Recruitment (SYR)	0.770	0.826	0.878	0.590
Training and Development (CYD)	0.870	0.891	0.925	0.757
Rewards and Compensation (RYC)	0.900	0.882	0.927	0.809
Job Security (SL)	0.850	0.808	0.887	0.724
Employee Participation (PE)	0.880	0.855	0.911	0.774
Performance Appraisal (ED)	0.900	0.925	0.947	0.817

Source: Own elaboration.

Note: λ = average factor loading; Cronbach's α = Cronbach's alpha; rho_A = Dijkstra–Henseler's rho; AVE = Average Variance Extracted. All constructs exceeded the recommended thresholds for reliability and convergent validity (Hair & Alamer, 2022). CO = Organizational Commitment; CL = Work Engagement; SYR = Selection and Recruitment; CYD = Training and Development; RYC = Rewards and Compensation; SL = Job Security; PE = Employee Participation; ED = Performance Appraisal.

Convergent Validity

The average variance extracted (AVE) for all constructs exceeded the 0.50 threshold, confirming convergent validity. Individual factor loadings ranged from 0.71 to 0.93, indicating strong item convergence.

Discriminant Validity

The Fornell–Larcker criterion showed that the square root of each construct's AVE was greater than its correlations with other constructs (Appendix Table A1 and Table 3), demonstrating

conceptual discrimination among them. The HTMT index remained below 0.85 (Henseler et al., 2015), further supporting the distinctiveness of the dimensions. However, the strong correlation between work engagement and organizational commitment ($r = 0.82$) suggests a strong conceptual overlap, as both constructs represent stages of the same psychological bonding process (Meyer & Allen, 1991).

Although work engagement and organizational commitment are conceptually related, HTMT values below 0.85 and stronger indicator loadings on their respective constructs support discriminant validity.

Table 3. Heterotrait–Monotrait ratio (HTMT) matrix for assessing discriminant validity.

HTMT	01 CO	02 CL	03 SYR	04 CYD	05 RYC	06 SL	07 PE	08 ED
01 CO								
02 CL	0.815							
03 SYR	0.658	0.750						
04 CYD	0.634	0.658	0.841					
05 RYC	0.583	0.574	0.665	0.676				
06 SL	0.778	0.744	0.714	0.688	0.689			
07 PE	0.656	0.658	0.759	0.794	0.629	0.778		
08 ED	0.588	0.582	0.651	0.629	0.578	0.620	0.649	

Source: Own elaboration.

Note: HTMT values below 0.85 indicate adequate discriminant validity between constructs (Henseler et al., 2015). CO = Organizational Commitment; CL = Work Engagement; SYR = Selection and Recruitment; CYD = Training and Development; RYC = Rewards and Compensation; SL = Job Security; PE = Employee Participation; ED = Performance Appraisal.

Evaluation of the Structural Model

The structural coefficients (β) were estimated using bootstrapping with 10,000 subsamples. Given the theoretically grounded directional hypotheses derived from Social Exchange Theory (Blau, 1964) and the Job Demands–Resources framework (Demerouti et al., 2001; Bakker & Demerouti, 2008), a one-tailed test was applied to assess statistical significance (Hair & Alamer, 2022).

Collinearity

Before examining the structural relationships, collinearity among predictors was evaluated to ensure that the independent variables did not exhibit problematic levels of multicollinearity. Variance inflation factor (VIF) values ranged from 1.78 to 2.79, remaining below the recommended threshold of 3.3 (Hair & Alamer, 2022). These results indicate that multicollinearity is not a concern and that each predictor contributes unique information to the model.

Structural model results and hypothesis testing

Once the absence of collinearity problems was **confirmed**, the structural relationships

were examined. The bootstrapping results indicate that four hypotheses were statistically supported ($p < 0.05$). Specifically, selection and recruitment (H1), job security (H4), and performance appraisal (H6) showed significant positive associations with work engagement. In turn, work engagement demonstrated a strong positive relationship with organizational commitment (H7).

Conversely, training and development (H2), rewards and compensation (H3), and employee participation (H5) did not exhibit statistically significant relationships with work engagement ($p > 0.05$).

These findings suggest that HRM practices related to stability, fair evaluation, and rigorous recruitment processes are more strongly associated with work engagement than practices related to compensation or participation in this specific sector. The detailed results of the structural paths are presented in Table 6, while Figure 1 illustrates the estimated structural relationships.

In addition to path coefficients and significance levels, effect sizes (f^2) were calculated to assess the relative impact of each predictor on the endogenous constructs. According to Hair and Alamer (2022), the results indicate small effect sizes for selection and recruitment, job security, and employee development on

work engagement, whereas the relationship between work engagement and organizational commitment shows a large effect size,

highlighting the central role of engagement as the main explanatory mechanism in the model.

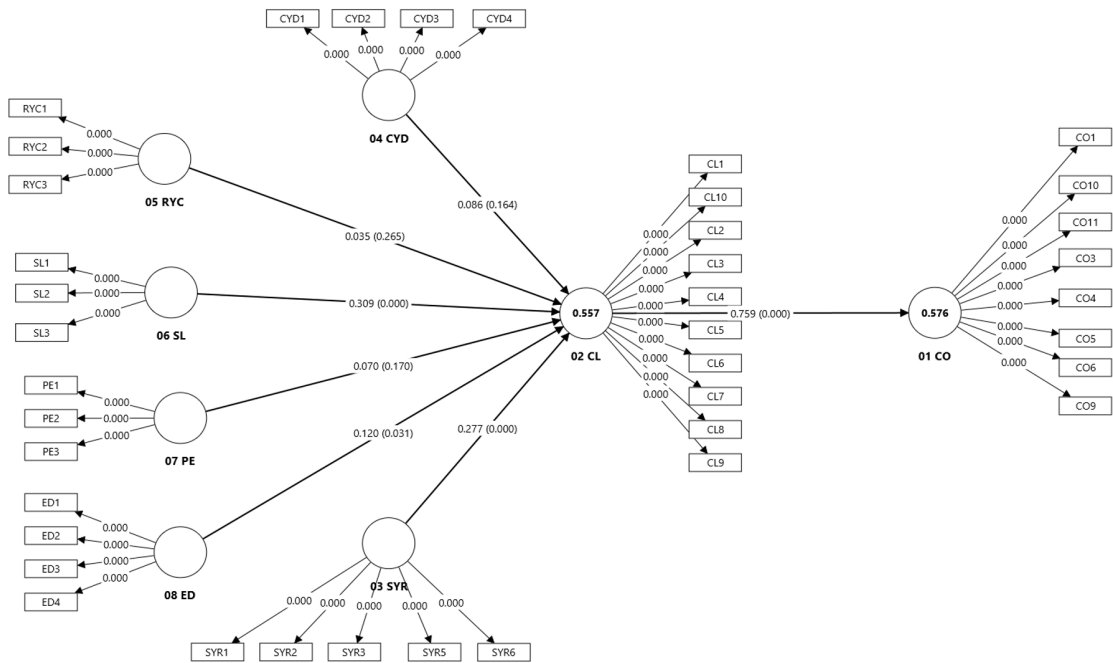


Figure 1. Structural coefficients and significance. Source: Own elaboration.

Table 4. Structural coefficients and significance.

Hypothesis	Structural relationship	Coefficient β	p-value	Significance
H1	SYR \rightarrow CL	0.277	0.000	Significant
H2	CYD \rightarrow CL	0.086	0.164	Not significant
H3	RVC \rightarrow CL	0.035	0.265	Not significant
H4	SL \rightarrow CL	0.309	0.000	Significant
H5	PE \rightarrow CL	0.070	0.170	Not significant
H6	ED \rightarrow CL	0.120	0.031	Significant
H7	CL \rightarrow CO	0.759	0.000	Significant

Source: Own elaboration.

Mediation

Work engagement partially mediate the relationship between human resource practices and organizational commitment. The strongest associations were found with job security ($\beta = 0.234$), recruitment and selection ($\beta = 0.210$), and performance evaluation ($\beta = 0.091$), all of which were significant ($p < 0.05$). This result

is comparable to those of Albrecht et al. (2015), who state that practices that strengthen stability and fairness create an affective bond with the organization. These findings suggest that work engagement translates HRM experiences into stronger loyalty and retention-oriented attitudes. The mediation results are presented in Table 6.

Table 5. Indirect effects and mediation analysis of work engagement between HRM practices and organizational commitment.

Hypothesis	Mediated path	(β)	p value	Decision
H8a:	SYR → CL → CO	0.210	0.000	Supported (partial mediation)
H8b:	CYD → CL → CO	0.065	0.164	Not Supported
H8c:	RYC → CL → CO	0.026	0.265	Not Supported
H8d:	SL → CL → CO	0.234	0.000	Supported (partial mediation)
H8e:	PE → CL → CO	0.053	0.170	Not Supported
H8f:	ED → CL → CO	0.091	0.031	Supported (partial mediation)

Note: Mediation effects were estimated using bootstrapping procedures in SmartPLS 4. Significant indirect effects indicate partial mediation through work engagement.

CL = Work Engagement; CO = Organizational Commitment; SYR = Selection and Recruitment; CYD = Training and Development; RYC = Rewards and Compensation; SL = Job Security; PE = Employee Participation; ED = Performance Appraisal.

Source: Own elaboration.

Table 6. Structural model results, confidence intervals, and effect sizes.

Hypothesis	Relationship	β	t-value	p-value	95% CI	f ²	Effect size	Decision
H1	SYR → CL	0.277	3.735	<0.001	[0.154, 0.394]	0.077	Small	Supported
H2	CYD → CL	0,086	0,979	0.164	[-0.068, 0.221]	0.007	Negligible	Not supported
H3	RYC → CL	0,035	0,628	0.265	[-0.052, 0.127]	0.001	Negligible	Not supported
H4	SL → CL	0,309	4,466	<0.001	[0.194, 0.420]	0.095	Small–moderate	Supported
H5	PE → CL	0.07	0,952	0.17	[-0.052, 0.190]	0.005	Negligible	Not supported
H6	ED → CL	0.12	1,864	0.031	[0.033, 0.243]	0.014	Small	Supported
H7	CL → CO	0.759	22,207	<0.001	[0.690, 0.806]	0.576	Large	Supported

Source: Own elaboration.

Note: β = standardized path coefficient; CI = confidence interval; f² = effect size. Statistical significance was estimated using bootstrapping with 10,000 subsamples. Effect sizes were interpreted following Hair and Alamer (2022).

CL = Work Engagement; CO = Organizational Commitment; SYR = Selection and Recruitment; CYD = Training and Development; RYC = Rewards and Compensation; SL = Job Security; PE = Employee Participation; ED = Performance Appraisal.

Endogeneity Analysis

Potential endogeneity was assessed using the Gaussian copula method recommended by Hult et al. (2018), with age, gender, education, and firm size included as control variables directed toward organizational commitment. Both control paths and copulas were non-significant ($p > 0.05$), indicating the absence of endogeneity.

Predictive Analysis (PLSpredict)

To assess the out-of-sample predictive validity of the structural model, the PLSpredict procedure proposed by Shmueli et al. (2019) and implemented in SmartPLS 4 was used. This method compares the predictive power of the PLS-SEM model with a linear regression model (LM) through k-fold cross-validation to estimate average prediction error. The algorithm was

configured with 6 folds and 10 repetitions, using the observable indicators of organizational commitment as dependent variables. Results showed positive Q^2 values (0.112–0.157), indicating predictive relevance. Moreover, the PLS RMSE values were lower than the LM model values for most indicators, demonstrating superior predictive performance.

Following Hair and Alamer (2022), a model has high predictive validity when at least 70% of dependent-variable indicators show lower prediction error in PLS than in LM. In this study, 83% accuracy was achieved, supporting the predictive validity of the proposed model for estimating organizational commitment in similar business settings.

Explanatory and predictive capacity.

The R^2 values for Work Engagement (0.557) and Organizational Commitment (0.576) indicate moderate to high explanatory power (Hair & Alamer, 2022), meaning that human resource management practices account for more than 55% of the variance in the dependent variables. The Q^2_{predict} values (0.527 and 0.482) further confirm the model's predictive capability (Hair & Alamer, 2022). This finding supports the statistical robustness of the PLS-SEM method used.

Conditional Necessity Analysis (NCA)

In addition to the sufficiency logic assessed through PLS-SEM, Necessary Condition Analysis (NCA) was conducted to identify the conditions essential for the attainment of high levels of organizational commitment (Dul et al., 2023). NCA examines whether certain predictors function as necessary but not sufficient conditions by estimating a ceiling line that separates feasible and infeasible observations in the predictor–outcome space.

The analysis was performed using both CE-FDH (Ceiling Envelopment – Free Disposal Hull) and CR-FDH (Ceiling Regression – Free Disposal Hull) techniques, which are recommended for robustness when assessing necessity relationships (Dul, 2015). The results

indicate that work engagement (CL) exhibits the strongest necessity effect for organizational commitment (CO) (CE-FDH = 0.362; CR-FDH = 0.334; $p < 0.001$), suggesting that high levels of commitment are unlikely to occur in the absence of sufficient engagement. Smaller but meaningful necessity effects were also observed for job security (SL) (CE-FDH = 0.127; CR-FDH = 0.128), employee participation (PE) (CE-FDH = 0.095; CR-FDH = 0.065), and performance appraisal (ED) (CE-FDH = 0.133; CR-FDH = 0.117). In contrast, recruitment and selection (SYR), training and development (CYD), and rewards and compensation (RYC) did not show meaningful necessity effects.

To enhance managerial interpretation, a bottleneck table was calculated reporting the minimum levels of each predictor required to reach specific percentiles of the outcome (CO). The percentiles of the outcome were estimated at 10% intervals (0–100%), which is a standard approach in NCA for identifying progressive constraints in the outcome variable.

The bottleneck results indicate that achieving higher levels of organizational commitment requires increasing minimum levels of certain predictors. For example, reaching approximately 80% of organizational commitment ($CO \approx 4.2$) requires at least $CL = 3.85$, $SL = 2.47$, $PE = 2.00$, and $ED = 2.50$. To achieve 90% commitment ($CO \approx 4.6$), the minimum required levels increase to $CL = 4.08$, $SL = 2.47$, $PE = 2.53$, and $ED = 3.50$. These thresholds suggest that insufficient levels of engagement, employment stability, participation, or performance evaluation practices may constrain the possibility of reaching high commitment levels, regardless of the presence of other HRM practices.

Overall, the NCA results complement the PLS-SEM findings by revealing that, beyond statistically significant relationships, certain HRM practices operate as necessary structural conditions for achieving high organizational commitment in the private security sector. Figure 2 presents the scatterplots and ceiling lines, while Tables 10 and 11 report the bottleneck thresholds and the ceiling line effect sizes (CE-FDH and CR-FDH).

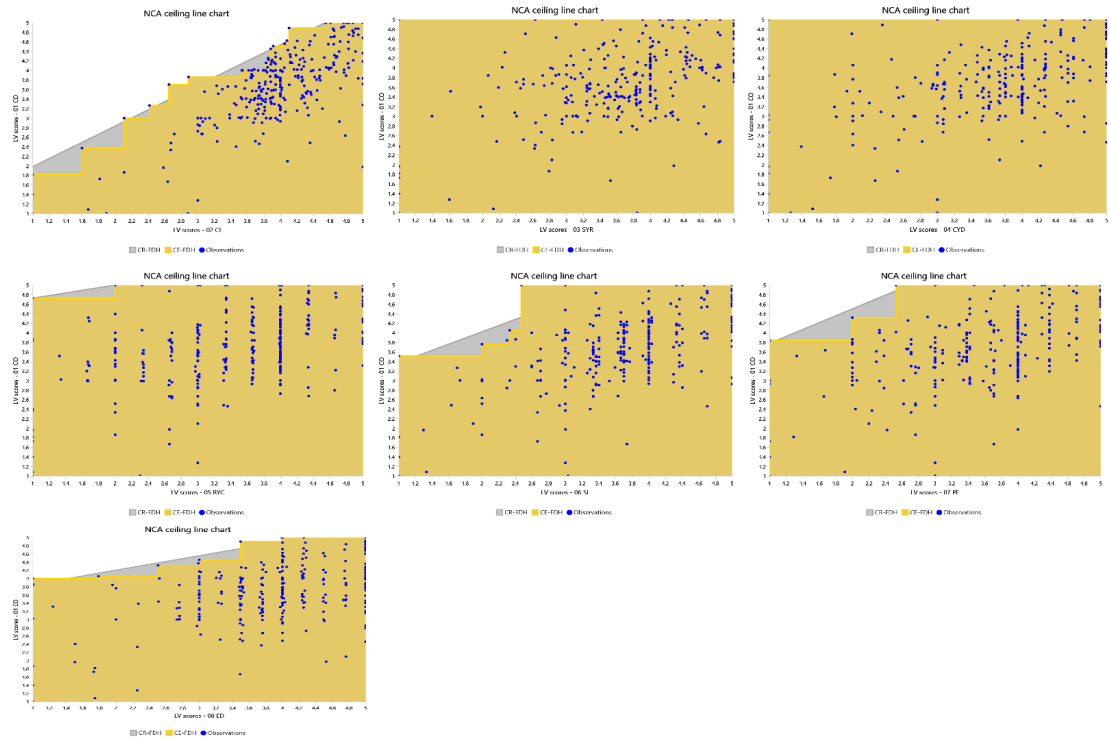


Figure 2. Scatterplots and Ceiling Lines of the Necessary Condition Analysis (NCA) for Organizational Commitment. Source: Own elaboration.

DISCUSSION

The findings offer partial support for the proposed structural model and provide additional insight into how HRM practices influence employee attitudes in private security settings. In line with the results reported in Table 4, four hypotheses were statistically supported. Specifically, selection and recruitment (H1), job security (H4), and performance appraisal (H6) were positively associated with work engagement, while work engagement, in turn, demonstrated a strong positive relationship with organizational commitment (H7).

The positive association between selection and recruitment and work engagement is consistent with prior research suggesting that fair and structured selection processes foster perceptions of organizational justice and person–organization fit (Barrick & Parks-Leduc, 2019). From the perspective of the Social Exchange Theory, when employees perceive that they were selected through transparent and merit-based procedures, they may interpret

this as an initial organizational investment, which is reciprocated through higher levels of psychological involvement. In high-demand environments such as private security, where role clarity and reliability are central, rigorous selection appears to be particularly relevant.

Similarly, job security demonstrated a significant association with work engagement. This finding aligns with the Job Demands–Resources (JD-R) framework (Demerouti et al., 2001; Bakker & Demerouti, 2008), which conceptualizes stability as a contextual resource that reduces uncertainty and enables employees to allocate cognitive and emotional energy to their tasks. Perceived continuity of employment may function as a signal of organizational support, thereby reinforcing affective attachment mechanisms described by Meyer and Allen (1991). In operational sectors characterized by turnover and contractual instability, employment security appears to play a structurally important role.

Performance appraisal also exhibited a statistically significant, though comparatively

smaller, relationship with work engagement. When evaluation systems are perceived as fair and development-oriented, they may enhance clarity of expectations and reinforce feelings of competence (Aguinis & Kraiger, 2009). Within the JD-R model, feedback can operate as a motivational resource that sustains vigor and dedication (Bakker & Demerouti, 2008). However, the modest magnitude of this association suggests that appraisal practices alone may not be sufficient to generate high engagement levels unless embedded within broader organizational conditions.

In contrast, training and development (H2), rewards and compensation (H3), and employee participation (H5) did not show statistically significant relationships with work engagement in this sample. Although prior studies have documented positive links between developmental investments and engagement (Bartlett, 2001; Albrecht et al., 2015), the absence of significant associations here may reflect contextual characteristics of the private security sector. Training programs in this industry often emphasize procedural compliance rather than personal growth, potentially limiting their motivational impact. Likewise, standardized compensation structures may reduce perceived differentiation, thereby weakening the psychological salience of monetary incentives (Saks, 2006). Participation mechanisms, while theoretically aligned with autonomy and empowerment (Wilkinson et al., 2010), may be constrained in hierarchical and tightly regulated operational environments.

Regarding mediation, the results indicate that work engagement partially mediates the relationships between selection and recruitment, job security, performance appraisal, and organizational commitment (H8a, H8d, H8f). This pattern is consistent with prior research positioning engagement as a proximal attitudinal mechanism linking HRM systems to broader organizational outcomes (Albrecht et al., 2015). In this sense, engagement appears to function as the psychological pathway through which specific organizational resources are translated into affective attachment, reinforcing the reciprocity logic proposed by Social Exchange Theory.

The integration of Necessary Condition Analysis (NCA) provides an additional perspective that complements the sufficiency logic of PLS-SEM.

While the structural model identifies statistically significant associations, NCA indicates that work engagement is the strongest necessary condition for high organizational commitment, followed by smaller necessity effects for job security, employee participation, and performance appraisal. Following Dul (2015) and Dul et al. (2023), these results suggest that engagement is not merely an outcome variable but may operate as a structural prerequisite for elevated commitment levels.

Taken together, the results suggest that not all HRM practices contribute equally to engagement and commitment in private security organizations. Practices that signal stability, fairness, and initial organizational investment such as rigorous selection and employment security appear more strongly associated with engagement than those centered exclusively on procedural training or standardized rewards. These findings refine the application of JD-R and Social Exchange Theory within high-risk, service-oriented sectors and underscore the importance of distinguishing between practices that are statistically associated with engagement and those that constitute necessary structural conditions.

LIMITATIONS AND FUTURE RESEARCH

This study presents several limitations that should be acknowledged. First, the use of non-probabilistic convenience sampling may constrain the external validity of the findings and introduce potential selection bias. Second, the reliance on self-reported, cross-sectional data increases the possibility of common method bias and limits the ability to draw causal inferences. Although procedural safeguards were implemented to reduce response bias, future research should consider longitudinal or mixed-method designs and probabilistic sampling strategies to strengthen causal interpretation and improve generalizability across sectors and regions.

Further studies may also explore contextual moderators such as organizational culture, leadership style, or safety climate, particularly in high-risk service environments. Comparative analyses across industries or countries could provide additional insight into whether the

observed relationships remain stable in different institutional settings. Expanding the model to incorporate complementary constructs—such as organizational justice or employee well-being—may also contribute to a more nuanced understanding of engagement dynamics.

THEORETICAL, PRACTICAL AND SOCIAL IMPLICATIONS

The findings strengthen the model's theoretical grounding by supporting Social Exchange Theory, the JD-R framework, and Meyer and Allen's (1991). Three Component Model, showing that fair, stable, and consistent HRM practices foster work engagement and, in turn, organizational commitment. The integration of PLS-SEM and NCA also illustrates the value of combining causal and necessary condition analyses. Practically, the results highlight the importance of job stability, rigorous selection, and soft skills training to improve job quality and reduce turnover. Socially, the implications align with the United Nations Sustainable Development Goals (SDGs) 8, 3, and 16, as higher engagement promotes productivity, well-being, public safety, and social trust. Stable employment and fair HRM practices contribute to decent work conditions (SDG 8), employee well-being (SDG 3), and more reliable security services that strengthen institutional trust (SDG 16). Overall, the study emphasizes that investing in people strengthens both organizational sustainability and broader societal impact.

CONCLUSIONS

This study sought to address three central research questions. Regarding **RQ1**, the findings indicate that selection and recruitment, job security, and performance appraisal are significantly associated with work engagement in private security companies, whereas training, rewards, and participation did not show significant relationships. Concerning **RQ2**, the results confirm that work engagement mediates the relationship between specific HRM practices and organizational commitment, functioning as the psychological mechanism through which management practices translate into stronger em-

ployee attachment. Finally, in response to **RQ3**, the Necessary Condition Analysis revealed that work engagement, job security, employee participation, and performance appraisal constitute necessary conditions for achieving high levels of organizational commitment, meaning that without these elements, elevated commitment is unlikely to occur.

The proposed model demonstrates strong reliability, convergent validity, and substantial explanatory power, accounting for 55.7% of work engagement and 57.6% of organizational commitment, thus providing solid empirical and predictive consistency. The findings show that work engagement is the critical mechanism linking HRM practices to organizational commitment, revealing that employees must first develop an emotional and psychological bond with their work before fully identifying with their organization. The most influential drivers of engagement are job security (31%), recruitment and selection (28%), and performance evaluation (12%), which together explain more than two-thirds of the total effect. NCA results complement the PLS-SEM findings by confirming that engagement is the strongest necessary condition for high organizational commitment, followed by smaller necessity effects for job security, employee participation, and performance appraisal. Practically, these insights highlight the strategic value of HRM policies centered on stability, transparent evaluation, and meaningful performance recognition, especially in high-turnover, high-risk industries. Overall, this study deepens the understanding of commitment as a psychologically mediated process and offers an integrative model that simultaneously addresses sufficiency (statistical effects) and necessity (structural conditions), aligning with contemporary approaches in organizational analysis.

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The authors declare that they have no conflicts of interest.

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Authors' contributions:

Conceptualization and Data Curation: DOC; Formal Analysis: RRT; Research, Methodology, Project Management, and Resources: DOC; Software, Supervision, and Validation: RRT; Visualization, Writing - Original Draft, and Writing - Review and Editing: DOC.

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