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The subliminal interactions of the dimensions of employee engagement with employee performance

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The Coronavirus pandemic has significantly altered work environments, necessitating high levels of employee engagement and adaptability to keep up with technological advancements and market demands. This study focuses on understanding how different engagement dimensions (physical, cognitive, emotional) influence employee performance dimensions (task, adaptive, contextual) within the South African Information Communication Technology sector. Using a quantitative methodology and Partial Least Squares Structural Equation Modeling, the study analyzed 478 responses from employees in the Information Communication Technology sector of South Africa, collected through an online survey. Findings indicate a statistically significant positive relationship between physical engagement and employee performance, and similarly between cognitive engagement and performance. Conversely, the relationship between emotional engagement and performance was found to be statistically insignificant. These findings suggest that managers should encourage physical activity, for example, by creating ergonomic workplaces for their employees, which can contribute to improved work performance. The generalizability of the findings is constrained through the utilization of a non-probability sampling technique. Nonetheless, this study contributes novel and empirical data and insights to the understanding of the multifaced nature of employee engagement and its relationship with employee performance, distinguishing the roles of physical, cognitive, and emotional engagement in the South African Information Communication Technology sector. It challenges existing models, provides data from a developing context, and offers practical managerial actions. This study pioneers the exploration of distinct employee engagement dimensions and how they relate with performance, advancing employee engagement literature, and offering a new perspective by conceptualizing employee performance as a unidimensional construct in the South African Information Communication Technology sector.

Introduction

In the tumultuous aftermath of the Coronavirus pandemic, fostering a deeply engaged and high-performing workforce has emerged as a critical imperative for organizations (Gupta and Arora, 2024; Maley et al., 2024). To enhance and sustain organizational performance, it is essential to foster active employee engagement by promoting motivation and ensuring job satisfaction (Riyanto et al., 2021). This is important because organizations continue to expect more from their employees, in order to remain sustainable in a competitive market (Jayaraman et al., 2023; Rožman et al., 2023). This is particularly salient within South Africa's pivotal Information Communication Technology sector, which has undergone seismic disruptions and transformations (Hlatshwayo, 2022). Employee engagement is essentially a concept that organizations cannot afford to ignore as it is a significant factor in organizational success (Song et al., 2022). Specifically, engaged employees have been linked to metrics of organizational interest, including employee performance (Jiatong et al., 2022). It may well be that understanding the intricate relationships among the dimensions of employee engagement and employee performance holds potential for yielding valuable insights to optimize workplace productivity and wellbeing.

Therefore, the main purpose of this paper is to explore the relationship between employee engagement dimensions namely physical engagement, cognitive engagement, emotional engagement and employee performance dimensions task performance, adaptive performance, and contextual performance. This study makes several contributions. Firstly, it contributes to the domains of business management, human resources, organizational management, and business strategy as it proposes and empirically tests relationships as well as enriching the understanding of the study constructs, despite the existence of literature predominated by western narratives. Secondly, it further develops the Job Demands-Resources model by empirically testing the multidimensional conceptualization of employee engagement and employee performance in the context of South Africa, a developing country.

This study is structured into several key parts. After introduction, a literature review is conducted and research hypotheses presented, followed by the research design, results and analysis, and discussion of findings. The study concludes with a discussion of theoretical developments, contributions, implications, recommendations, strengths of the study, and conclusions. In addition, limitations are stated, and further research ideas identified.

Literature review and research hypotheses

This study adopted the Job Demands-Resources (JD-R) model as a theoretical framework to examine the interrelationships between employee engagement (EmE) dimensions, namely physical engagement (PE), cognitive engagement (CE), emotional engagement (EE) and employee performance (EPe) dimensions: task performance (TP), adaptive performance (AP), and contextual performance (CP). According to Marimon et al. (2024), the JD-R model encapsulates work engagement, a positive, fulfilling psychological state that is characterized by vigor, dedication, and absorption.

Instructively, the JD-R model posits that job resources lead to positive work outcomes through work engagement (Katou et al., 2022). The JD-R model has been recognized as one of the leading frameworks to investigate the factors related to psychological wellbeing and optimal organizational functioning (Pansini et al., 2023). This is because when employees have sufficient job and personal resources, they are more likely to be engaged in their work, resulting in improved job performance (Naveed and Qamar Zia, 2024). Consequently, the JD-R model highlights the importance of managing both job demands and job resources to foster EmE and optimize EPe across various dimensions.

Employee engagement dimensions and employee performance dimensions

PE is thought to have some negative effects on employees, such as energy exhaustion, anxiety, and fatigue which lead to performance degradation and unprofessional behaviors (Yao et al., 2022). Idrus (2023) argues that excessive PE without adequate rest or recovery can lead to fatigue which affects employees' ability to deliver on tasks. Further, Sørlie et al. (2022) contend that PE does not lend itself to an improvement in TP. This may be because employees who are behaviorally disengaged withdraw their energies physically and leave the organization (Afrahi et al., 2022). Possibly encouraged by this assertion, Ten Brummelhuis et al. (2022) opine that PE may influence TP. A study by Goodyear et al. (2023) reports that PE can have a positive impact on employee wellbeing. According to Boccoli et al. (2023), employees who are physically engaged, observe, and learn from their colleagues' behaviors, and best practices.

Radu et al. (2023) observed that when employees do not feel psychologically safe to ask for help, take risks, or feel accepted in the organization, their CP is negatively impacted. Notably, employees who are physically engaged are often perceived as approachable and more inclined to assist others willingly (Javed, 2024), contributing to a culture of mutual support that could influence CP. Specifically in resource-constrained environments, CP is impacted negatively which disadvantages employees and affects the organization's ability to gain a competitive advantage (Faeq and Ismael, 2022). Owing to the diverse views in extant literature, accurately predicting the exact nature of the relationship between PE and CP becomes a difficult proposition.

According to Dubovi (2022), EE and CE unfolds and synergistically impacts achievements. Meanwhile Shen and Ren (2023) assert that disengaged employees show less cognitive and emotional connection with others which may result in incomplete tasks and poor performance. Further, according to Erickson et al. (2022), physical exercise does not seem to uniformly affect all cognitive processes and is unlikely to improve performance. Notably, disengaged individuals weaken their sustained attention and mental effort in attaining CE and TP (Ali Sulaiman and Singh Thakur, 2022). The relationship between CE and TP is evidently

susceptible to multiple influences, including task complexity, task demands, and the degree of autonomy afforded to employees in their respective roles (Sayali et al., 2023). Owing to this, accurately conjecturing the relationship between CE and TP in the studies context of the South African Information Communication Technology (ICT) sector becomes a complicated prospect.

While there may be some links between CE and AP (Shang, 2022), Reig-Botella et al. (2024) as well as Jiang and Peng (2023) report that CE has no direct relationship with AP. More so, because predictors that may help to determine the AP of employees remain undiscovered (Jundt and Shoss, 2023), which may affect the association to CE (Linnenbrink-Garcia et al., 2016). Employees who are highly engaged cognitively, have a better understanding of how and what must be done to identify their tasks, describe their jobs according to procedures, as well as achieve the targets so that their job performance increases (Fachrunnisa et al., 2022). The findings and arguments regarding CE and AP from previous studies inspire the present study to posit that as organizations demand more from their employees in a changing business environment, employees can leverage off their capabilities and invest in working on the tasks while adjusting to and understanding change in the workplace.

Instructively, one of the most well-known factors affecting individual AP is work engagement, although no significant effect of work engagement on AP has been observed in the context of organizational change (Nandini et al., 2022). Although employees are cognitively engaged, if the organizational culture does not reward such employee actions, it may be that they do not exhibit CP behaviors (Bhatti et al., 2022; Gil et al., 2024). It could be argued that employees with higher levels of CE are likely to leverage CP through their voluntary behaviors for organizational success. Curiously, according to Xiao and Hew (2024), CE does not directly contribute to EPe. Contrastingly, Li and Lajoie (2022) assert that a high level of CE contributes to performance. This assertion is in alignment with the findings of Ye et al. (2024) who report that an employee's mental health, is positively connected to CE, fuels the investment of energy and resources into innovative behavior, as well as work engagement, fostering productive work conditions and enhancing EPe.

A study by Lam et al. (2018) uncovered that EE job demands exhibit a negative correlation with TP. In some cases when employees experience burnout due to the work environment being hostile, EE is negatively affected by TP, and this leads to a diminished interpersonal trust (Bang and Reio Jr, 2017). It would seem that the lack of EE is associated with negative results of TP. In particular, when employees feel connected and invested in their job (Kronenwett and Rigotti, 2019), this enables TP (Ozyilmaz, 2020). According to Qiu (2022) emotionally engaged employees contribute to overall success. Further, Luo et al. (2021) posit that existing studies have not explicitly explained the relationship between EE and AP. Meanwhile, Park and Park (2019) argue that EE alone might not fully influence all aspects of AP due to the responsive work behaviors required to adapt to changing conditions and demands. Additionally, according to Thomas and Allen (2021), higher emotional intelligence is associated with EE, and it may be that this could aid AP.

Employees that feel valued and confident in their work are empowered to make decisions, which generates enthusiasm

(Chukwuma et al., 2019). According to Jena (2022), CP increases when employees are enthusiastic. This suggests that managers can facilitate EE when employees face high emotional demands due to their work (Kilroy et al., 2023; Martinez et al., 2020), leading to the achievement of organizational goals through CP (Pazetto et al., 2024). Notably, for performance to improve in the organization, leaders must focus on completing assigned tasks (Jufrizen et al., 2023), as EPe is shaped by specific job criteria that directly affects employees' contribution to the organization (Susanto et al., 2023). Owing to the diverse findings, it may be arduous to accurately infer what the exact nature of the relationship between EE and CP could be. With due consideration for prior findings in extant literature, this study elects to predict that EmE dimensions could be a vital heuristic for understanding EPe dimensions. Therefore, the following hypotheses are proposed:

$H_{1.1}$: There is a positive relationship between Physical Engagement and Task Performance.
$H_{1.2}$: There is a positive relationship between Physical Engagement and Adaptive Performance.
$H_{1.3}$: There is a positive relationship between Physical Engagement and Contextual Performance.
$H_{2.1}$: There is a positive relationship between Cognitive Engagement and Task Performance.
$H_{2.2}$: There is a positive relationship between Cognitive Engagement and Adaptive Performance.
$H_{2.3}$: There is a positive relationship between Cognitive Engagement and Contextual Performance.
$H_{3.1}$: There is a positive relationship between Emotional Engagement and Task Performance.
$H_{3.2}$: There is a positive relationship between Emotional Engagement and Adaptive Performance.
$H_{3.3}$: There is a positive relationship between Emotional Engagement and Contextual Performance.

The hypotheses developed in this study are presented within a conceptual framework, as depicted in Figure 1.

Research design

This study utilized a quantitative methodology to examine the relationship between dimensions of EmE and EPe. The study was guided by a positivist philosophy that emphasizes the objective and observable aspects of reality. Employing a deductive reasoning approach, hypotheses were formulated based on existing theoretical perspectives. A survey strategy was employed within a cross-sectional time horizon.

Sampling and data collection

The study's targeted population was the South African ICT sector employees. The respondents were selected through a combination of snowball, purposive, and self-selection sampling techniques. The survey was hosted on *Qualtrics* where respondents who received the anonymous link through social media platforms such as LinkedIn, Twitter, and WhatsApp could respond. All
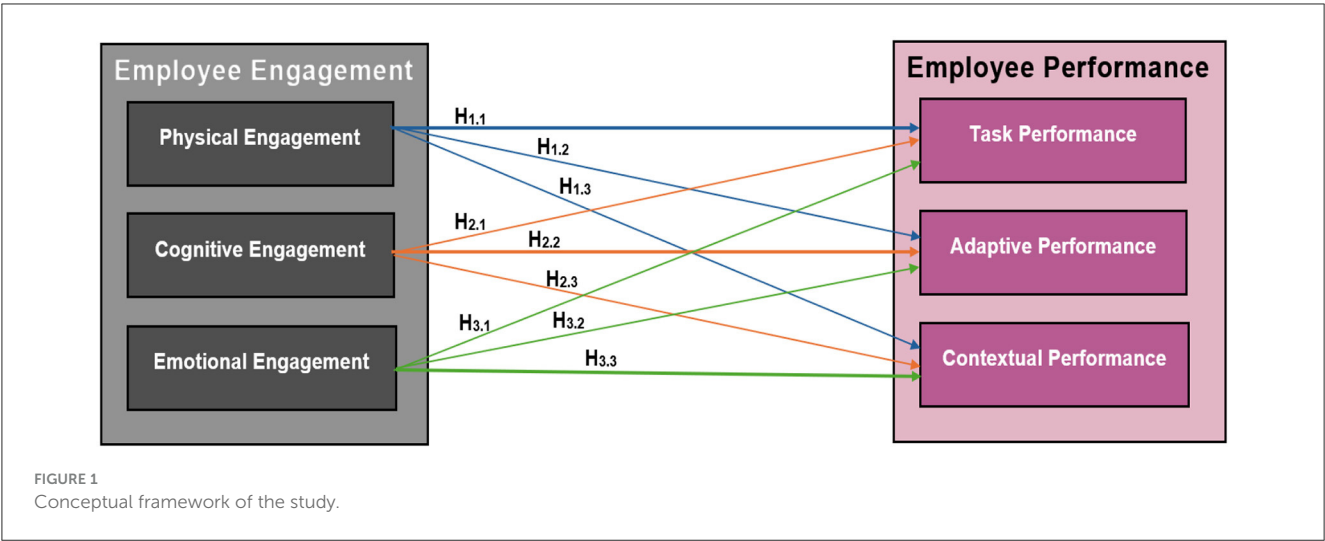
FIGURE 1
Conceptual framework of the study.

TABLE 1 Demographic profile of respondents (n = 478).

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	264	55.23
	Female	214	44.77
Age group (years)	<21	1	0.21
	21–30	43	9.00
	31–40	192	40.17
	41–50	199	41.63
	51–60	41	8.58
	>60	2	0.42
Education level	Tertiary degree	346	72.38
	Other qualifications	132	27.62
Enterprise size	Small enterprise	97	20.29
	Medium enterprise	113	23.64
	Large enterprise	268	56.07

invitation channels explicitly communicated the researchers' exclusive interest in the perspectives of employees working in hardware, software, telecommunications organizations within the South African ICT sector. The survey link was disseminated through the researchers' personal professional network, with a request for respondents to forward the survey link to other potential participants. Data was collected in the last two quarters of 2023. A total of 1,368 questionnaires were distributed online with 1,054 responses collected, of which 576 responses were unusable due to incomplete responses. Consequently, this study proceeded with 478 complete responses, reflecting a 45.35% response rate that was considered adequate for the intended descriptive and inferential statistical analysis.

As shown in Table 1, males constituted 55.23% (n = 264) of the total sample, while females accounted for 44.77% (n = 214). Regarding age distribution, most respondents were between 41 and 50 years old (41.63%, n = 199), followed closely by those aged 31–40 years (40.17%, n = 192). Respondents aged 21–30 years made up 9% (n = 43), those aged 51–60 years constituted 8.58% (n = 41), while respondents aged 61 and above represented 0.42% (n = 2). Only one respondent (0.21%) was under the age of 21. In terms of educational attainment, a significant portion (72.38%, n = 346) of the sample held tertiary qualifications, indicating a generally well-educated respondent pool. Furthermore, the majority of respondents were employed in large enterprises (56.07%), followed by those in medium-sized enterprises (23.64%) and small enterprises (20.29%).

Existing scales were used to assess the study's primary constructs. The respondent's perception of PE was assessed using a five-item scale, CE through a five-item scale, and EE using a six-item scale developed by Rich et al. (2010). The study used a scale developed by Pradhan and Jena (2017) to assess AP (seven items), CP (nine items), and TP (six items). Items in each of the scales comprised statements with 5-point Likert-type answer options on a continuum of strongly disagree to strongly agree.

Data analysis

To examine the hypothesized relationships in the study, the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was utilized in Smart PLS version 4. PLS-SEM is considered advantageous for its ability to analyse complex models, owing to its robustness in managing data with heterogenous characteristics, its flexibility in model evaluation, and its support for advanced analytical techniques (Batra, 2025). Further, PLS-SEM can manage small sample sizes as well as data that are not normally distributed (Hair et al., 2022). Notably, Hair Jr et al. (2020) assert that PLS-SEM is more effective than CB-SEM,

TABLE 2 Descriptive statistics for the study constructs.

Constructs	n	Minimum	Maximum	Mean	SD
PE	478	1	5	4.506	0.889
CE	478	1	5	4.298	0.965
EE	478	1	5	4.288	1.044
AP	478	1	5	4.008	0.910
CP	478	1	5	4.582	0.722
TP	478	1	5	4.458	0.827

TABLE 3 Collinearity and common method bias results.

Relationship	VIF	Decision	
		Collinearity	CMB
CE → AP	3.249	No collinearity problem	No concern for CMB
CE → CP	3.249	No collinearity problem	No concern for CMB
CE → TP	3.249	No collinearity problem	No concern for CMB
EE → AP	2.986	No collinearity problem	No concern for CMB
EE → CP	2.986	No collinearity problem	No concern for CMB
EE → TP	2.986	No collinearity problem	No concern for CMB
PE → AP	3.656	No collinearity problem	No concern for CMB
PE → CP	3.656	No collinearity problem	No concern for CMB
PE → TP	3.656	No collinearity problem	No concern for CMB

especially in determining the accurate model. Instructively PLS-SEM analysis focuses on evaluating both the measurement model and the structural model (Abbasi et al., 2024).

In the course of evaluating the measurement model, internal consistency reliability was assessed using the Cronbach alpha. In consonance with the guidelines of Salehi et al. (2020), values above 0.7 served as indicators of internal consistency reliability. Convergent validity was examined based on the average variance extracted (AVE) which according to Rizal et al. (2024) meets requirements if the AVE is above 0.5 and composite reliability scores are above 0.7. Discriminant validity was assessed using the heterotrait-monotrait (HTMT) ratio and guided by the prescript of Hair et al. (2022) that values below 0.90 ($HTMT_{0.90}$) signify attainment of discriminant validity between the constructs. PLS-SEM in Smart-PLS v4 was conducted to assess the measurement model followed by examination of the structural model.

Ethical considerations

The online survey included an informed consent statement detailing the study's objective and participation guidelines. Respondents were assured that their responses would remain confidential and anonymous, as individual identification was not possible from the data collected. No incentives were provided to encourage participation. This procedure ensured that ethical research standards were diligently followed. Additionally, ethical approval for the study was secured from the authors' affiliated university.

Results and analysis

Descriptive statistics for the study's primary constructs are presented in Table 2. The measures of central tendency and dispersion summarily express how the respondents, at an aggregate level, perceived engagement and performance.

Based on a five-point Likert scale, the descriptive statistics for the study's constructs indicate that respondents had a favorable perception of EmE and EPe across dimensions. Among the dimensions of EmE, PE achieved the highest mean score of 4.506 (SD = 0.889), reflecting noteworthy physical involvement in work tasks. CE and EE exhibited mean scores of 4.298 (SD = 0.965) and 4.288 (SD = 1.044), respectively, indicating that respondents demonstrate substantial mental and emotional investment in

their work. Across all the study constructs, CP exhibited the highest mean score of 4.582 (SD = 0.722), indicating supportive behaviors in the workplace. TP and AP exhibited mean scores of 4.458 (SD = 0.827) and 4.008 (SD = 0.910), respectively, suggesting that respondents typically excel in their primary job responsibilities and demonstrate adaptability to change. The study's results, as it concerns the descriptive statistics of constructs, show that employees favorably rated levels of EmE and EPe at their workplaces.

Furthermore, the assessment of the PLS-SEM structural model began with an examination of potential prediction collinearity issue that may adversely influence the findings as suggested by Hair et al. (2019). In the context of PLS-SEM, a variance inflation factor (VIF) value of 5 and above signals a collinearity problem and also serves as an indication that a model may be contaminated by common method bias (CMB) (Arifin et al., 2024; Kock, 2015). The VIF results obtained in relation to the respective combinations of constructs are summarized in Table 3.

As shown in Table 3, the VIF values range between 2.986 and 3.656 indicating no concerns relating to multicollinearity was detected and CMB was not regarded as a major concern as the VIF values were lower than the threshold of 5.

Assessment of the measurement model

In the initial stage of analysis, hypothesis testing was conducted through SmartPLS 4 with bootstrapping of 5,000 random subsamples and no sign change setting. A one-tailed test with a significance level of 0.05 was engaged. Based on the results of the PLS algorithm, indicator reliability, internal consistency reliability, convergent and validity of the constructs were evaluated. Figure 2 presents the measurement model for EmE dimensions and EPe examined in this study.

The item loadings depicted in Figure 2 ranged from 0.778 to 0.880 for PE, 0.872 to 0.933 for CE, and 0.869 to 0.928 for EE. Similarly, the item loadings obtained for AP ranged from 0.812 to 0.866 whilst those associated with CP were between 0.747 and 0.829, and 0.753 to 0.851 for TP. Consequently, the measurement
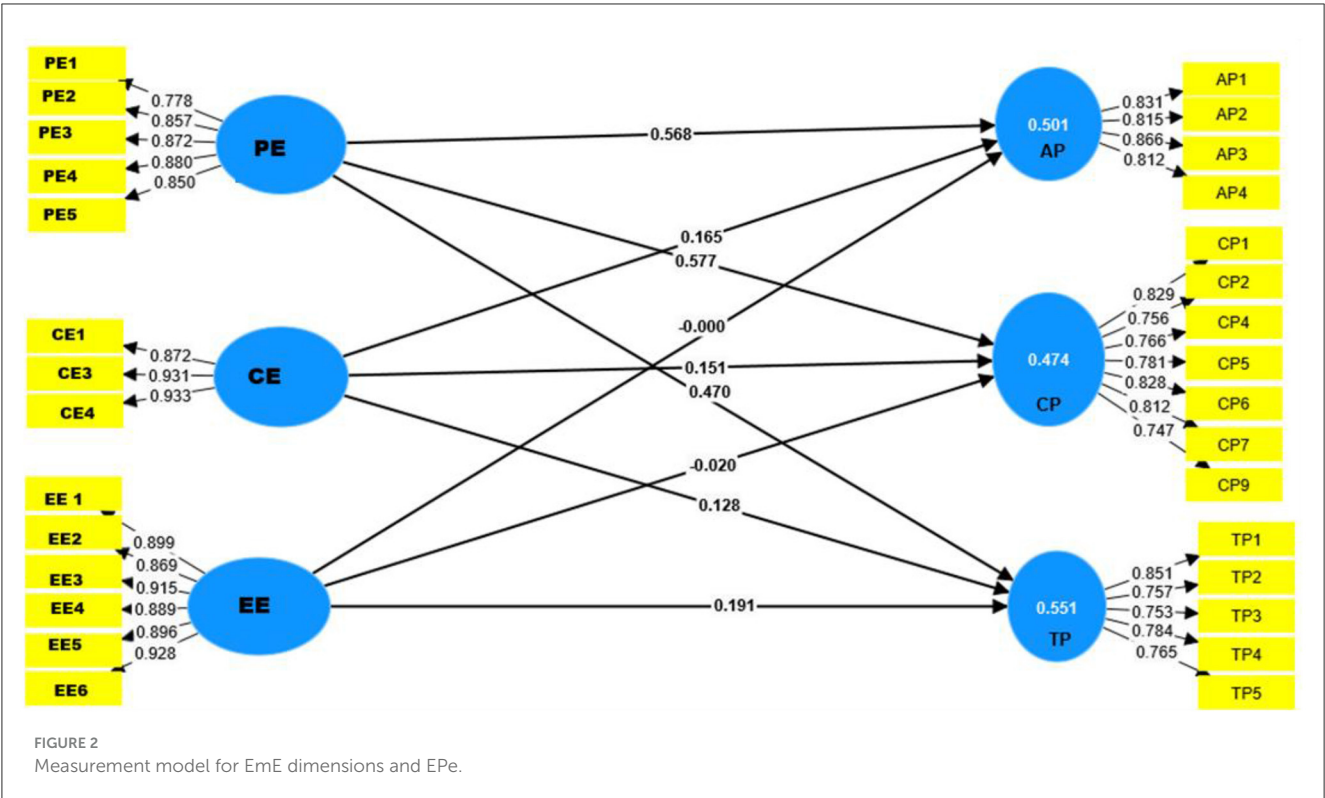
FIGURE 2
Measurement model for EmE dimensions and EPe.

TABLE 4 Internal consistency reliability, convergent and discriminant validity results.

Latent variable	α	rhoc	AVE	HTMT					
				AP	CE	CP	EE	PE	TP
AP	0.851	0.899	0.691	1.000					
CE	0.899	0.937	0.833	0.710	1.000				
CP	0.899	0.920	0.623	0.980	0.664	1.000			
EE	0.953	0.962	0.809	0.635	0.821	0.587	1.000		
PE	0.902	0.927	0.719	0.795	0.896	0.750	0.851	1.000	
TP	0.844	0.888	0.613	1.026	0.728	0.968	0.692	0.809	1.000

model depicted in Figure 2 achieved the requisite 0.708 threshold for item reliability in PLS-SEM, substantiating the model's indicator reliability. For each scale, items that had loadings below the 0.708 threshold were removed following the recommendations of Bazi et al. (2023). Additionally, internal consistency reliability, convergent and discriminant validity for PE, CE, EE, AP, CP, and TP were assessed, and the results are presented in Table 4.

Table 4 shows that all the Cronbach's alphas (α) ranged from 0.844 to 0.953 whilst composite reliability (rho$_c$) ranged between 0.888 to 0.962 which are larger than 0.70. This implies that the measurement model has a high degree of construct reliability. From the perspective of convergent validity, the magnitude of the respective AVE values is between 0.613 and 0.833. Since these values are above 0.50, they affirm that the measurement items converge to the relevant constructs and thus convergent validity is verified.

In relation to discriminant validity, while most HTMT values fell within acceptable limits, critical issues arose with the

constructs AP, CP, and TP. Specifically, the HTMT ratios for AP–TP (1.026), AP–CP (0.980), and CP–TP (0.968) exceeded the recommended threshold of 0.90, suggesting that these constructs, although conceptually distinct, were not empirically separable in the context of this dataset. These elevated values may reflect genuine conceptual interdependence. In high-performance work environments, such as the South African ICT sector examined in this study, adaptive, contextual, and task-related behaviors often occur concurrently and may not be easily disentangled by respondents. For example, an employee adapting quickly to technological change (AP) may also be fulfilling their formal tasks effectively (TP) and contributing to a positive team climate (CP).

Drawing on the research of Ringle et al. (2023) and Lim (2024), HTMT values approaching 1.0 should not be interpreted in isolation or rigidly, especially in domains where constructs are inherently linked. In such cases, elevated HTMT ratios may represent the complexity and interwoven nature of behavioral

constructs rather than measurement flaws. Further, Hair et al. (2022), assert that while an HTMT value of <0.90 is a useful rule of thumb, higher values may be justifiable for theoretically related constructs (such as in this study), particularly if backed by strong theoretical coherence and empirical fit.

To address the lack of discriminant validity among the three EPe dimensions, the study followed the recommendations of Rönkkö and Cho (2022), who suggest either removing problematic indicators or forming higher-order constructs when empirical overlap undermines model integrity. Given the conceptual closeness of AP, CP, and TP, a theoretically sound decision was made to consolidate these three dimensions into a higher-order construct, namely EPe. This restructuring was not only empirically necessary but also aligned with the broader literature that advocates model re-specification as a legitimate strategy for resolving issues of discriminant validity (Arwen et al., 2025; Sari et al., 2024).

Contrastingly, the EmE constructs namely, PE, CE, and EE exhibited HTMT values that remained within acceptable bounds, albeit moderately high (e.g., PE–CE = 0.896, PE–EE = 0.851, CE–EE = 0.821). These results support the empirical distinctiveness of the three types of EmE while acknowledging their expected conceptual overlap. EmE, as defined by Kahn (1990), is a multidimensional construct encompassing physical energy, cognitive focus, and emotional investment. Therefore, some correlation between these dimensions is both anticipated and acceptable. As Ng et al. (2024) and Rosli et al. (2024) suggest, HTMT values close to but below 0.90 may reflect the real-world interconnectivity of psychological experiences rather than deficiencies in measurement design.

In sum, while the EPe dimensions initially violated discriminant validity expectations, this issue was addressed by thoughtfully merging them into a unified higher-order construct, enhancing the model's empirical robustness without compromising theoretical clarity. The EmE constructs, although related, maintained sufficient distinctiveness to support their independent roles within the model. This approach underscores the importance of interpreting HTMT values within the context of theoretical coherence and empirical fit, rather than applying rigid cutoffs without consideration of the model's conceptual foundation.

Table 5 presents the consolidation of the study's nine hypothesis into three hypotheses as dictated by the discriminant validity results obtained in the study.

Examination of the PLS-SEM structural model

Following the analysis of the measurement model, to examine the proposed restated relationships in the studied model, structural model analyses was conducted. For the validation of the restated hypotheses, a bootstrapping procedure with 5,000 iterations was applied. Further, the model fit statistics of PLS-SEM are regarded at the development stages (Masianoga and Chakauya, 2023). According to Shah et al. (2023), Standardized Root Mean Square Residual (SRMR) values of <0.08 and Normed Fit Index (NFI) values of >0.9 show that the model is best fit. Consequently, SRMR and NFI thresholds were used to determine the model fit of the

TABLE 5 Initial and restated hypotheses related to the study's constructs.

Initial hypothesis		Restated hypothesis	
	Statement		Statement
H$_{1.1}$	There is a positive relationship between Physical Engagement and Task Performance	H$_1$	There is a positive relationship between Physical Engagement and Employee Performance
H$_{1.2}$	There is a positive relationship between Physical Engagement and Adaptive Performance		
H$_{1.3}$	There is a positive relationship between Physical Engagement and Contextual Performance		
H$_{2.1}$	There is a positive relationship between Cognitive Engagement and Task Performance	H$_2$	There is a positive relationship between Cognitive Engagement and Employee Performance
H$_{2.2}$	There is a positive relationship between Cognitive Engagement and Adaptive Performance		
H$_{2.3}$	There is a positive relationship between Cognitive Engagement and Contextual Performance		
H$_{3.1}$	There is a positive relationship between Emotional Engagement and Task Performance	H$_3$	There is a positive relationship between Emotional Engagement and Employee Performance
H$_{3.2}$	There is a positive relationship between Emotional Engagement and Adaptive Performance		
H$_{3.3}$	There is a positive relationship between Emotional Engagement and Contextual Performance		

TABLE 6 PLS-SEM structural model fit.

Model fit indices	Acceptable threshold	Current study threshold	Decision
SRMR	<0.08	0.659	Acceptable
NFI	>0.90	0.915	Acceptable

PLS-SEM structural model. The model fit results (SRMR: 0.659 < 0.08, NFI: 0.915 > 0.9) presented in Table 6 confirm an acceptable model fit.

The structural path model results presented in Figure 3, highlight that the path coefficient for the direct relationship between PE and EPe is 0.581 whereas CE and EPe had a path coefficient of 0.160 whilst it is 0.023 for EE and EPe.

Furthermore, the structural path analysis model revealed that 54.1% ($R^2 = 0.541$) of the variance in EPe is explained by PE, CE, and EE for the study's cohort of employees in the ICT sector of South Africa. Following the validation of the path analysis model,
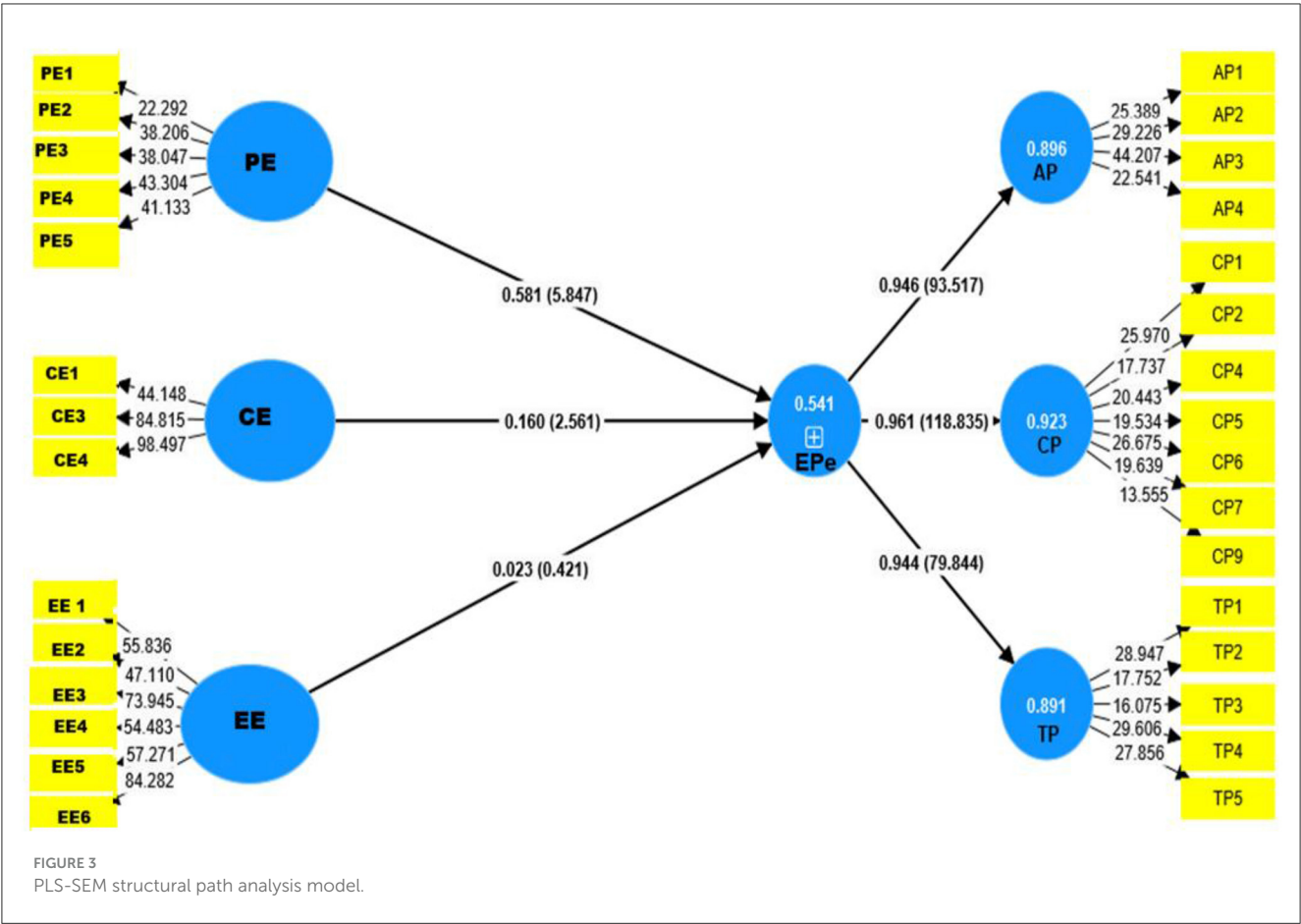
FIGURE 3
PLS-SEM structural path analysis model.

TABLE 7 PLS-SEM direct relationship results.

Structural path	Path Coeff	t-stat	p-value	f^2	95% CI		Decision
					LLCI	ULCI	
PE → EPe (H$_1$)	0.581	5.847	0.000	0.202	0.416	0.744	Supported
CE → EPe (H$_2$)	0.160	2.561	0.005	0.017	0.059	0.266	Supported
EE → EPe (H$_3$)	0.023	0.421	0.337	0.000	−0.067	0.117	Not supported
R-squared	0.541						
Q-squared	0.527						

the effects size (f^2) was calculated. The results presented in Table 7 highlight that PE had f^2 of 0.202 which is substantial, whilst CE (f^2 = 0.017) and EE (f^2 = 0.000) had negligible effect sizes. The study also calculated predictive relevance (Q^2), and the results indicated a Q^2 value of 0.527 for all the endogenous constructs which is more than zero, inferring significant predictive relevance.

The study findings highlighted that PE had a positive and statistically significant relationship with EPe (β = 0.581, t = 5.847, $p < 0.001$). The results indicate that an increase in PE is associated with an increase in EPe, inferring that PE strengthens EPe. The positive relationship between PE and EPe suggests that engaging in physical activity promotes better physical health, reducing absenteeism, and boosting employee energy levels. In addition, PE enhances mental health by reducing stress and improving

the mood. This could emanate from face-to-face interactions with colleagues that eliminates the burdens associated with social isolation. Consequently, encouraging PE among employees leads to a healthier and more collaborative workforce, ultimately improving organizational performance. The results reinforce the pivotal role of PE in fostering a productive workforce. Conclusively, **H$_1$** which states that there is a positive relationship between PE and EPe in the South African ICT sector was statistically supported. This finding aligns with the conclusions drawn by Nagarajan et al. (2023) who discovered that PE increases job performance. The study results counteract the findings by Yao et al. (2022) that indicates the negative impact that PE has on employees, such as energy exhaustion, anxiety, and fatigue which lead to EPe degradation and unprofessional behaviors.

The results with respect to the relationship between CE and EPe indicate a positive and statistically significant relationship ($\beta = 0.160$, $t = 2.561$, $p = 0.005$). The positive relationship between CE and EPe suggests that as employees become more mentally invested and engaged in their work, their performance improves. CE involves the degree to which employees focus, concentrate, and apply mental effort to their tasks. When employees are cognitively engaged, they are more likely to be proactive, make thoughtful decisions and solve problems efficiently, which leads to better performance. When employees are mentally immersed in their work, they are more likely to experience higher levels of intrinsic motivation, job satisfaction and a sense of accomplishment. Engaged employees tend to take ownership of their tasks, which enhances both the quality and quantity of their output. The positive feedback loop between CE and EPe can further motivate employees to maintain or increase their levels of cognitive involvement, resulting in more improved performance. Consequently, organizations that foster an environment conducive to CE can expect to see enhanced employee productivity and overall organizational success. In essence, H_2 which proposed that there is a positive relationship between CE and EPe, was statistically supported. Notably, the findings of the current study contradict those of Ho et al. (2011) that revealed that attention, which is partly an expression of CE, did not significantly relate with work performance even though it was later highlighted that this specific finding was unexpected.

The relationship between EE and EPe was positive and insignificant ($\beta = 0.023$, $t = 0.421$, $p = 0.337$). The finding that EE has no statistically significant positive relationship with EPe for the cohort of employees in the South African ICT sector indicates that employees' feelings of enthusiasm, connections, and emotional attachment to their work do not necessarily translate into improved performance. This suggests that while employees might be emotionally invested and find their work meaningful, their EE does not automatically enhance their productivity. The absence of a statistically significant relationship, in this case, could be due to several factors such as insufficient resources, ineffective management practices, or a mismatch between employees' emotional investment and their actual job roles, which may impede the potential benefits of their EE. Furthermore, this finding highlights the possibility that EE may influence other aspects of employee experience such as job satisfaction or organizational loyalty, rather than directly affecting performance. EE alone may not address other critical performance drivers, such as, skill sets, workload management, or external challenges. Therefore, organizations need to consider a broader set of factors and interventions beyond EE to foster improved EPe. This insight underscores the importance of a multifaceted approach to performance management, integrating EE with practical support and development opportunities to achieve desired performance outcomes. Therefore, H_3 which proposed that there is a positive relationship between EE and EPe, was not statistically supported. In essence, the results confirms that in the cohort of studied employees working in the South African ICT sector, EE has no relationship with EPe, though Sagayadevan and Jeyaraj (2012) claim that evidence for the role of EE in predicting performance is inconclusive.

Discussion

The study findings highlight that in the studied cohort of employees in the ICT sector of South Africa, PE strengthens EPe. The positive relationship between PE and EPe corroborates the reasoning by Mahindru et al. (2023) as well as Filgueira et al. (2021), that engaging in physical activity promotes better physical health. Further, physical activity has been found to reduce absenteeism (Marin-Farrona et al., 2023), boosts employee energy levels, decreases occupational stress and burnout symptoms (Santos and Miragaia, 2023). Likewise, Bhana and Suknunan (2021) found that high levels of disengagement led to increased employee stress and high job turnover. Contrastingly, the findings of this study oppose those of Yao et al. (2022) which indicate that PE has a negative effect on EPe since it results in energy exhaustion, anxiety and fatigue. This study's finding is in harmony with the assertion of Kahn (1990) that employees can be engaged on one dimension and not the other. Likewise, Suliman et al. (2023) report that employees' EE, CE, and PE with their work do not indicate engagement. Consequently, encouraging PE among employees would lend itself to better performance. This is rational since employees who are exposed to PE tend to demonstrate higher levels of energy, resilience, and focus. This finding reinforces the pivotal role of PE in fostering a productive workforce. Recognition of the positive relationship between PE and EPe may be the cornerstone for fostering a thriving organizational performance culture. This outcome is noteworthy since it counteracts the findings by Yao et al. (2022) which indicates the negative effects that PE has on employees, such energy exhaustion, anxiety, and fatigue that work in concert to deflate EPe.

As for the relationship between CE and EPe, the study's results indicate a positive and statistically significant relationship suggesting that cognitively engaged employees tend to perform better. This is so because employees who are cognitively engaged tend to have positive thoughts and attitude toward their work (Paul and Sharma, 2022). This finding is in harmony with the research conducted by Corbeanu and Iliescu (2023) as well as Abdelwahed and Doghan (2023) who found that EmE dimensions (physical, cognitive, and emotional), significantly predict EPe components of TP and CP. Consequently, it is necessary for organizations to prioritize interventions aimed at enhancing CE as a direct means to improve EPe.

No statistical support was found for the hypothesized relationship between EE and EPe. This is despite extant literature highlighting the potential benefits of EE in organizational settings. In the context of the South African ICT sector, EE may not be as significant in influencing EPe as other forms of engagement, such as PE and CE. The statistically insignificant relationship between EE and EPe may be attributed to various factors. Firstly, ICT work typically involves less interpersonal interaction and emotional involvement and so this diminishes the relevance of EE in influencing EPe. Secondly, in ICT-related roles, performance tends to be more-driven by CE and task related competencies rather than emotional involvement, which may limit the influence of EE on EPe. Lastly, cultural dynamics may play a role particularly in contexts where emotional expression is either restrained or not directly linked to professional expectations. Further, in fast-paced

and highly dynamic work environments like those in the ICT sector, employees might prioritize physical and cognitive aspects of their work, such as problem-solving, task completion, and skill development, over emotional connections to their roles.

The findings of the study support Park and Park (2019) that EE alone might not fully influence the aspects of EPe due to the responsive work behaviors required to adapt to changing conditions and demands in work environments. In contrast to the study findings, Nguyen et al. (2021) found that EE has a significant positive relationship with job performance. Similarly, Qiu (2022) asserts that emotionally engaged employees contribute to overall success. Conclusively, the study findings suggest that other factors may play a more pivotal role in driving and sustaining high levels of performance among employees. While EmE may contribute to overall wellbeing and job satisfaction, it may not be as central to performance in environments that prioritize task complexity and rapid innovation. These findings prompt a reconsideration of the presumed effect of EE on EPe and emphasize the importance of exploring additional variables that could contribute meaningfully to enhancing employee effectiveness and productivity.

Theoretical developments

The JD-R model, which emphasizes the balance between job demands and available resources, is broadly applicable across various organizational contexts, including the South African ICT sector. However, the empirical findings of this study challenge certain assumptions within the JD-R framework, particularly the emphasis on a positive psychological state characterized by vigor, dedication, and absorption. The study indicates that certain dimensions of EmE, such as PE and CE, have distinct associations with EPe, whereas EE does not demonstrate a statistically significant relationship with EPe.

This finding indicates that the traditional understanding of engagement within the JD-R model may not fully encompass the complexity of EPe dynamics in South African ICT organizations. Unique socio-economic factors, such as limited resources and a high demand for innovation, likely influence how employees engage with their work and contribute to organizational outcomes. Consequently, the study advocates for a more nuanced adaptation of the JD-R model that takes these specific contextual elements into account, acknowledging that EmE does not always manifest uniformly and that various forms of EmE may have different associations with EPe.

In the context of the South African ICT sector, characterized by rapid technological advancement and economic growth, the study reveals that employees perceive performance as an integrated construct. This perception includes elements such as task execution, quality, and adaptability, rather than viewing them as separate components like AP, CP, and TP. This finding highlights the contextual nuances that may influence the interpretation of the EPe construct since each EPe dimension may be perceived differently based on individual roles, experiences, and organizational context, leading to subjective assessments. So, employees have therefore, been conditioned by this, to view EPe as a mono-construct for all intents and purposes.

Contributions

The study makes valuable contributions to the field of EmE and EPe, particularly within the context of the South African ICT sector. Firstly, it provides empirical evidence on the distinct relationships of different EmE dimensions (PE, CE, and EE) with EPe. By doing so, the study challenges and extends existing theoretical frameworks, such as the JD-R model, demonstrating that EmE is not a monolithic concept and that its components can influence performance in varied ways. This nuanced understanding helps refine the conceptualization of EmE, offering a more detailed perspective on how specific forms of EmE contribute to EPe outcomes.

The study contributes to the JD-R model by revealing how performance is perceived in a more monolithic way, influenced by the unique challenges and opportunities within the South African ICT industry. In this context, the ability to adapt to changing technological environments and the drive for career advancement may overshadow the nuanced categorization of performance criteria, suggesting that organizations should adopt a flexible approach in measuring and enhancing performance. Moreover, by providing empirical evidence from a developing country context, the study highlights the importance of considering local realities and the diversity of employee experiences in shaping performance outcomes, calling for a reassessment of how EmE and EPe should be understood in emerging economies like South Africa.

Secondly, the study contributes novel empirical data from a developing country context, which is often underrepresented in global research. By focusing on the South African ICT sector, the research highlights the unique dynamics of engagement and performance in a rapidly growing industry within a developing economy, despite the prevalence of Western narratives. This contribution is significant as it provides insights that are directly relevant to similar contexts, where technological advancement and economic development are closely intertwined. Thirdly, this study suggests that the AP, CP, and TP dimensions of EPe are homogenous, and the studied employees in the ICT sector in South Africa cannot differentiate them. Despite literature suggesting heterogeneity of the concepts, ICT sector employees tend to prioritize executing tasks holistically and achieving desired performance for career growth, rather than focusing on literary-propelled concepts of AP, CP, and TP. The unidimensional perspective revealed in the study may be unique to the ICT context, highlighting the importance of acknowledging the unique features of any studied cohort of respondents.

In essence, the study triggers a reconsideration of how organizations define, and approach EPe based on the observed unidimensional nature of EPe in this context. Finally, this study offers practical implications for managers and organizations, particularly in the ICT sector. By identifying the significant positive relationships between PE and EPe as well as CE and EPe, the study suggests actionable interventions for enhancing employee outcomes, such as promoting ergonomic workspaces and fostering CE. These insights are valuable for organizational leaders seeking to optimize performance and adaptability in a fast-paced and evolving work environment, making the study not only theoretically significant but also relevant to practitioners.

Practical implications

This study's findings offer practical implications for organizational management. Organizations can use this nuanced understanding of EmE dimensions to tailor interventions and strategies aimed at improving EPe. For instance, understanding that PE (e.g., active involvement in tasks, physical presence) and CE (e.g., mental absorption in work, creative problem-solving) positively corelates with EPe suggests that initiatives aimed at promoting these types of EmE can yield tangible performance improvements. Further, organizations may implement targeted programs to enhance PE and CE, such as providing ergonomic work environments, fostering a culture of autonomy and decision-making, and offering opportunities for skill development and learning. Interestingly, this study's findings suggest that organizations may need to reconsider the emphasis placed on emotional aspects in EmE initiatives. Instead of solely focusing on EE, organizations can redirect efforts toward fostering PE and CE, which have demonstrated direct links to EPe. This insight enables more efficient allocation of resources and efforts toward.

Recommendations

This study recommends that organizations adopt a tailored approach to EmE interventions. This involves conducting thorough assessments to identify which dimensions of EmE are most consequential within their specific context and aligning interventions accordingly. For instance, organizations can prioritize initiatives that enhance PE and CE by providing skill development opportunities, promoting autonomy in tasks, and creating environments conducive to active participation and mental absorption in work activities. Additionally, given the study's revelation that EE may not significantly relate to performance, organizations should reassess the allocation of resources toward emotional aspects in EmE interventions and redirect efforts toward fostering PE and CE, which have demonstrated stronger links to performance outcomes. Markedly, this study recommends that continuous monitoring and adaptation of PE and CE initiatives are crucial in the work environment due to their relationships with EPe. By consistently monitoring and adapting, organizations can gain insights into how EmE dynamics evolve over time, influenced by organizational changes and external factors. This can be achieved through regular feedback mechanisms and employee surveys, to provide valuable insights that may inform adjustments and improvements in EmE strategies.

Strengths of the study

This study has several strengths that contribute to its significance in the field of EmE and EPe. One key strength is its focus on the South African ICT sector, providing valuable insights into a rapidly evolving industry within a developing country context. By examining how different dimensions of EmE (PE, CE, EE) influence EPe, the study offers a nuanced understanding of the factors that drive performance in a sector that is critical to technological advancement and economic growth. Further,

this study's strength lies in its methodological rigor. The use of a quantitative methodology and PLS-SEM allows for a robust analysis of the relationships between EmE and EPe dimensions. The sample size of 478 responses further enhances the reliability of the findings, enabling the study to draw statistically significant conclusions about the relationships between PE, CE, and EPe. This rigorous approach adds credibility to the study and provides a solid foundation for future research in the field. Additionally, the study challenges existing theories, such as the JD-R model, by demonstrating that different dimensions of EmE have varied relationships with EPe. This contribution is particularly valuable as it advances the understanding of EmE-EPe dynamics, offering a fresh perspective that views EPe as a unidimensional construct. By highlighting the differential effects of PE, CE, and EE, the study opens new avenues for research and provides practical insights for organizations aiming to enhance employee outcomes in the ICT sector.

Limitations and future research directions

This study has some limitations that should be recognized to inform future research. This study was conducted in South Africa, and its findings may not apply to other countries. Consequently, the relationship between EmE and EPe should be tested in different cultural contexts. This notwithstanding, a major limitation of this study is the use of a non-probability sampling technique. As a result, the findings may not fully capture the diversity of the broader population within the South African ICT sector. This limitation suggests caution when attempting to generalize the study's results to other contexts or industries. Future research can employ a stratified sampling technique to ensure that subgroups within the population are adequately represented. In addition, the unique characteristics of the ICT sector, especially during the Coronavirus pandemic, may have influenced the dynamics of EmE and EPe in ways that differ from other sectors. Consequently, the applicability of these findings outside the ICT sector or in a post-pandemic environment may be limited.

The implications for future research concerning discriminant validity are noteworthy, especially in contexts where constructs demonstrate high intercorrelations, as observed in the current study with the AP, CP, and TP dimensions of EPe. The elevated HTMT ratios (exceeding the 0.90 threshold) between these constructs indicate that, although conceptually distinct, they were empirically indistinguishable by the cohort of South African ICT sector employees that responded to the study. This observation prompts critical questions regarding the suitability of employing these constructs as separate dimensions in other contexts. Future research could investigate why these dimensions are highly correlated in certain contexts, exploring industry-specific factors, socio-cultural influences, or methodological considerations.

Conclusion

This study is a pioneering effort that explores how physical engagement, cognitive engagement, and emotional engagement influence employee performance within the South African Information Communication Technology sector. While employee

engagement has been widely studied, few have examined its association with employee performance using distinct engagement dimensions. Therefore, this study not only advances the literature on employee engagement but also offers practical strategies for enhancing employee performance in dynamic work environments. While emotional wellbeing remains essential for overall employee satisfaction, organizations may benefit from redirecting resources toward fostering physical engagement and cognitive engagement, which have been shown to have a more direct link with performance outcomes within this sector.

Overall, the study encourages a tailored and evidence-based approach to employee engagement in the South African Information Communication Technology sector, emphasizing an investment in organizational culture and leadership development to optimize employee wellbeing and drive organizational success in this evolving industry. Finally, given that the sector is characterized by rapid technological advancements and evolving work practices, the increasing reliance on remote collaboration, digital platforms, and agile methodologies necessitates a re-evaluation of traditional employee engagement approaches to align with the demands of this dynamic environment. By embracing the transforming workplace and leveraging employee engagement interventions that cater to the unique needs of Information Communication Technology professionals in this context, organizations can effectively navigate challenges and capitalize on opportunities to drive sustained performance and competitiveness in the digital era.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Committee for Research Ethics, University of Pretoria. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

HR: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. CE-E: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Funding

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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