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Overview of HR Development and Performance of Health Workers during the Covid-19 Pandemic: Studies on Health Workers in Indonesia

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Abstract

The COVID-19 pandemic has exposed significant weaknesses in public health systems, particularly in terms of workforce preparedness and responsiveness. Among the many interventions to improve service quality, training remains a core element of human resource development; however, its direct impact on health worker performance remains controversial. Building on Human Capital Theory, this study investigates how training effectiveness contributes to health workers' performance through the mediating roles of knowledge management and employee capacity.

A quantitative survey was conducted among 202 health professionals in South Sulawesi, Indonesia, and data were analyzed using structural equation modeling (SEM; AMOS). The results indicate that effective training is positively associated with performance both directly and indirectly. Knowledge management and employee capacity served as complementary mediators, with the latter perceived as being more critical by respondents. Significant causal pathways were identified among training, knowledge management, capacity building, and overall performance.

These findings underscore the importance of integrating knowledge-sharing mechanisms and capacity development into training frameworks, particularly in post-crisis recovery. This study offers insights into the strategic value of intangible assets for workforce resilience in developing countries' health systems and provides evidence to support more adaptive and learning-oriented HR policies in healthcare.

Introduction

Human resources are considered fundamental to the achievement of organizational effectiveness through any form of operation, especially in service delivery, including healthcare. Among human resource management practices, training has elicited a strategic response as an intervention that enhances competencies at the individual level, among other common practices (Aryee et al., 2024; Giovanelli et al., 2024; Lehyani, Zouari, Ghorbel, & Tollenaere, 2023). In its sensitivity to health systems, good training has been defined as an enabler to improve service delivery and responsiveness and meet the demands of complex patients (Chakma et al., 2024; Conti et al., 2024).

The connection between training and employee performance is still debated, both theoretically and empirically. Some studies have shown a strong positive relationship, while others find little to no effect (Amare et al., 2023; Ngusie et al., 2023; Rogers et al., 2023). This raises critical questions regarding the contextual effectiveness and design of workplace learning programs (Perrotta et al., 2023). Such mixed results lead one to posit that training outcomes are contingent upon underlying mechanisms and organizational conditions.

This study responds to these inconsistencies by proposing an explanatory framework in which training effectiveness influences health workers' performance indirectly through two critical mediators: knowledge management and employee capacity. It is argued that the success of training programs depends not only on content delivery, but also on their ability to foster knowledge sharing, promote organizational learning, and build individual capabilities (Afshari et al., 2023; Al-Husseini, 2023; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023).

The model is based on Human Capital Theory (HCT), which suggests that the money spent on education and training adds to output gains through the increase and use of knowledge and skills (El-Jardali et al., 2023; Obeng et al., 2024). Viewing human capital as a knowledge-based but critical asset, modern views stress its sustainability when used through processes based on knowledge and supporting institutions (Abbate et al., 2023; Shaikh et al., 2023).

Though often criticized for its failure to address structural inequalities and institutional environments (Auerbach & Green, 2024), Health Compliant Theory is one of the available tools for analyzing employee development in environments affected by a crisis. The COVID-19 pandemic provides an excellent empirical opportunity to understand how health organizations may improve workforce resilience and responsiveness in service delivery through training, particularly underpinned by knowledge and capacity building (Deussom et al., 2022; Mwansisya et al., 2022). This study aims to understand how

training-based human resource development supports health system performance during periods of disquiescence and unpredictability.

Literature Review: Theoretical background and hypothesis development

Training effectiveness

Human resource training is a major player in ensuring the success of any organization in this era of rapid technological adaptation in a data-driven environment (Abbate et al., 2023; Giovanelli et al., 2024; Lehyani, Zouari, Ghorbel, & Tollenaere, 2023). The same investment in HR training should boost adaptability among employees, as well as communication and technological competence (Aryee et al., 2024; Hughes, 2021), which then leads to improved task execution, customer service, and leadership potential (Amare et al., 2023; Rogers et al., 2023).

Effective training not only builds workers' motivation, creativity, and productivity (Chen et al., 2024; Kengia et al., 2023), but informal and formal education also provides sustained talent growth (Smythe et al., 2024). Individual- or group-based training is specific to improving service quality and maintaining ethical standards (Chakma et al., 2024; Conti et al., 2024).

Effective training alone resulted in meaningful outcomes. As mentioned by some scholars, it enhances knowledge management by building self-efficacy and IT-based programs (Alharbi & Aloud, 2024; El-Jardali et al., 2023). It also bridges individual capacity and confidence (Afshari et al., 2023; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023). This improved self-efficacy contributes to proactive and sustained performance.

In addition, training shapes competencies (Upadhyay et al., 2023), facilitates knowledge management (Al-Husseini, 2023; Obeng et al., 2024), and is linked with higher performance (Alolayyan & Alyahya, 2023; Sheffel et al., 2024). Motivational learning theory, from which effective training is determined, reengineers behavior toward incremental change (Cavalcante de Oliveira et al., 2023; Shaikh et al., 2023).

Therefore, the following hypothesis is posited:

H1: Training effectiveness has a positive influence on knowledge management.

H2: Training effectiveness positively influences employee competency.

H3: The effectiveness of training can have a positive impact on the performance of health workers.

Knowledge Management

Knowledge consists of relevant information, skills, and values that spur innovation and guide action (Alharbi & Aloud, 2024; Karsikas et al., 2023). It is available as tacit and explicit knowledge (El-Jardali et al., 2023; Obeng et al., 2024), with the combination of both contributing to organizational value (Afshari et al., 2023; Lehyani, Zouari, Ghorbel, & Tollenaere, 2023; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023).

Knowledge management (KM) is a structured process for creating, storing, sharing, and applying knowledge to enable learning and adaptation to the environment to enhance performance and ultimately build competitive advantage. It supports the flow of knowledge, organizational learning, and strategic decisions (Abbate et al., 2023; Al-Husseini, 2023; Shaikh et al., 2023) while improving individual productivity and organizational outcomes (Alolayyan & Alyahya, 2023; Chen et al., 2024; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023).

KM builds an individual’s self-efficacy by increasing their confidence and motivation (Chakma et al., 2024; Sheffel et al., 2024; Smythe et al., 2024). It helps to share knowledge and create new knowledge (Abbate et al., 2023; Lehyani, Zouari,

Ghorbel, Tollenaere, et al., 2023), which later turns into capacity building (Rogers et al., 2023; Upadhyay et al., 2023).

Recent studies have validated the strategic relevance of KM. In health care, KM has a positive impact on infection control (Ahsan et al., 2021), sustainability performance, and quality of care (Alboliteeh et al., 2023; Karsikas et al., 2023). It supports green innovation through manufacturing concerns (Shahzad et al., 2021) and improves employee effectiveness in SMEs (Lehyani, Zouari, Ghorbel, & Tollenaere, 2023). Knowledge management can dramatically enhance organizational performance when combined with training and soft TQM (Aziz et al., 2022; Ong & Tan, 2022).

Based on the Resource-Based View (Al-Husseini, 2023; Giovanelli et al., 2024), KM is considered an important internal resource that relates to resilience, through which an organization can gain competitive and innovative outcomes. As viewed in terms of human capital, KM is viewed as the enabler of skill development, particularly in complicated and dynamic environments (Abbate et al., 2023; Memon et al., 2022).

Therefore, KM is crucial for improving the knowledge asset, human capability, and sustainable performance of an employee's KM framework. A subsequent hypothesis to be tested based on this framework is as follows:

H4: Knowledge management enhances employees' capacity.

Employee Capacity

Employee capacity refers to the development of individual competencies, knowledge, and resources that enhance organizational adaptability and long-term performance (Giovanelli et al., 2024; Sheffel et al., 2024). It goes beyond maintaining skills to building capabilities through continuous learning and institutional support (Kengia et al., 2023; Upadhyay et al., 2023).

Capacity building, viewed through Human Capital Theory and the Resource-Based View, should be directed towards organizational effectiveness and innovation (Al-Husseini, 2023; Auerbach & Green, 2024; Gerhart & Feng, 2021). It improves work conditions, reduces turnover, increases engagement, and fosters an enabling environment (Cavalcante de Oliveira et al., 2023). Formal education, soft skills and on-the-job training fill critical competency gaps and ensure sustained performance (Aryee et al., 2024; Mwansisya et al., 2022; Wu et al., 2023).

Capacity should be viewed as the ability to make timely ad hoc decisions and identify priorities in complex tasks. This is related to creativity, retention, and team effectiveness. A study by Riyanto and Adhitama (2020) proved that improving capacity improves compassion in the delivery system. In another study, Ullah et al. (2021) proved that this also helps reduce delays. In another study, Hou et al. (2021) found that capacity significantly increased the efficiency of the delivery system.

H5: The capacity of an employee introduces significant positive efficiency to health worker performance.

Health Workers Performance

Indonesia has experienced disparities in the delivery of health services caused by urban-rural imbalance and unequal allocation and use of resources (Sheffel et al., 2024). Shortages of staff in crucial areas (Jalal et al., 2023) have elicited some fairly new government rives, such as that of HRH2030, implemented with funds from USAID and PEPFAR, which focus on checking policies, boosting capacity, and getting different stakeholders to work toward meeting a country's health targets.

Health workers' performance is a major outcome of human capital investment. Individual performance is defined as the degree to which training outcomes are implemented at the workplace (Aryee et al., 2024). It is usually measured in terms of post-training enhancement of competency, efficiency, and effectiveness (Ngusie et al., 2023; Wu et al., 2023), and may be appraised through self-reports or supervisor evaluations (Rogers et al., 2023).

Effective training improves knowledge application (Giovanelli et al., 2024), develops capacity for work (Kugler et al., 2024), and enhances individual and team performance (Amare et al., 2023; Carboni et al., 2024; Smythe et al., 2024). Such effects improve with a good structure in knowledge management and capacity building (Conti et al., 2024).

Recent evidence has indicated that competency-based training and supervision is accompanied by significant improvements in health service delivery (Deussom et al., 2022; Mwansisya et al., 2022). Soft skills, such as empathy and communication, are considered key, though critical; they remain underdeveloped (Al Badi et al., 2023; Sancho-Cantus et al., 2023). "Knowledge sharing and learning systems are tantamount to making the ability of employees more effective for the sustainability of performance" (Alboliteeh et al., 2023; Cometto et al., 2022).

Aligned with the Resource-Based View (Gerhart & Feng, 2021), internal capabilities significantly shape health workers' performance, which comprises the components of knowledge management and human capital development (Al-Husseini, 2023; Karsikas et al., 2023). Training, KM, and capacity development integrative approaches have proven worth in positively improving workforce outcomes in different sectors (Abbate et al., 2023; Ahsan et al., 2021; Vyas, 2024).

H6: Training effectiveness mainly enhances the performance of a health worker through knowledge management and employee capacity.

H7: Knowledge management mainly enhances the performance of health workers through the capacity of employees.

Methodology

Sample Criteria and Justification

This study involved 202 health workers from South Sulawesi, Indonesia (Table 1), who were selected through random sampling. Although data collection was conducted after the peak of the COVID-19 pandemic, this study retrospectively examined perceptions of training and performance during the crisis period. The sample size falls within the widely accepted range of 30–500 for behavioral research (Howell, 2011), and is considered sufficient for structural equation modeling when model complexity is moderate and measurement reliability is high (MacCallum et al., 1999; Wolf et al., 2013).

Table 1
Demographic Characteristics of Respondents (N = 202)

Respondent Criteria	Sub-Criteria	Frequency	Percentage (%)
Professional Role	Medical Doctor	13	6.43
	Nurse	47	23.27
	Midwife	35	17.33
	Physiotherapist	11	5.45
	Dental Technician	16	7.92
	Laboratory Analyst	13	6.43
	Environmental Health Officer	7	3.47
	Nutritionist	5	2.47
	Radiographer	10	4.95
	Medical Records Officer	10	4.95
	Public Health Graduate	33	16.34
	Electromedical Technician	2	0.99
Job Position	Echelon II	3	1.48
	Echelon III	23	11.39
	Echelon IV	25	12.38
	Non-Echelon Staff	151	74.75
Educational Background	Diploma (D1–D3)	81	40.10
	Bachelor's Degree (S1)	98	48.51
	Master's Degree (S2)	23	11.39
Gender	Male	89	44.06
	Female	113	55.94
Age Group	20–30 years	29	14.36
	31–40 years	67	33.17
	41–50 years	87	43.07
	51–60 years	19	9.40

Given the use of validated constructs, complete response rates, and acceptable model fit, the sample was deemed both statistically and contextually appropriate to support the study's analytical framework.

[Insert Table . Demographic Characteristics of Respondents]

The sample (Table 1) reflects diverse professional backgrounds, covering 12 medical occupations, with nurses being the most represented and biomedical engineers the least. Respondents also varied across employment levels, from non-managerial staff to senior executives (Echelon II). Most participants held a diploma or undergraduate degree, with female

health workers dominating the sample. The majority were aged 31–50. Data collection faced limitations due to COVID-19, which restricted access to a larger respondent pool.

Measurement

A quantitative design using Structural Equation Modeling (SEM-Amos) was employed (Alshetewi, 2016; Ferdinand, 2014; Ghozali, 2017). The study population consisted of 18,240 health workers across South Sulawesi. A random sampling approach was used (Sugiyono, 2018), targeting at least 100 complete responses via an online survey. This approach aligns with recommended sample sizes for SEM, where 100–200 respondents enhance model accuracy (Ferdinand, 2006; Ghozali, 2017), and adheres to Roscoe's rule of thumb, which suggests 30–500 as a suitable range for survey studies (Sekaran & Bougie, 2016; Sugiyono, 2018).

By the end of the 8-week collection period, 202 valid responses were obtained. The instrument measured:

1. Training Effectiveness (TE) via three indicators: additional knowledge, ability to remember, and ability to practice (Perdue et al., 2002; Wilson et al., 2002); see (Tamsah et al., 2021; Tamsah, Yusriadi, et al., 2023; Umar et al., 2020) for public sector applications);
2. Knowledge Management (KM) using use, sharing, reflection, and identification of knowledge (Davidson & Voss, 2003);
3. Employee Capacity (EC) through cooperation, commitment, involvement, and capacity-building initiatives (Kimutai et al., 2013);
4. Health Worker Performance (HWP) through responsiveness, availability, productivity, and use of competence (Dieleman & Harnmeijer, 2006; Kimutai et al., 2013; Lutwama et al., 2012).

Further information regarding the measurement of the variables is presented in Table 2.

Table 2. Operationalization of Variables and Measurement Items

Variable	Indicator	References	Item
Training Effectiveness (TE)	Additional knowledge (TE1)	(Perdue et al., 2002; Tamsah et al., 2021, 2023; Umar et al., 2020; Wilson et al., 2002)	• I gained additional knowledge after completing the training sessions. • I acquired new work-related skills after each training session.
	Ability to remember (TE2)		• I am able to recall activities conducted during the training. • I understand the training activities and their relevance.
	Ability to practice (TE3)		• I can apply the training outcomes to my current work. • I am able to implement practical lessons from the training in my job.
Knowledge Management (KM)	Use of knowledge (KM1)	(Davidson & Voss, 2003)	• I am capable of managing and utilizing knowledge to discover new approaches or innovations in my work.
	Sharing knowledge (KM2)		• I am able to create, share, and apply knowledge effectively to disseminate useful information.
	Reflection of knowledge (KM3)		• I can transform raw data into meaningful insights as a reflection of my existing knowledge.
	Identification of knowledge (KM4)		• I am able to identify new ideas that may serve as a foundation for organizational knowledge development.
Employee Capacity (EC)	Employee cooperation (EC1)	(Kimutai et al., 2013)	• I am able to collaborate effectively with colleagues to enhance work capacity.
	Employee commitment (EC2)		• I demonstrate strong commitment to my job and to the development of work capacity.
	Employee involvement (EC3)		• I consistently promote employee engagement in efforts to improve capacity.
	Employee capacity building initiatives (EC4)		• I actively initiate activities aimed at enhancing employee capacity.
Health Worker Performance (HWP)	Responsiveness (HWP1)	(Dieleman & Harnmeijer, 2006; Kimutai et al., 2013; Lutwama et al., 2012)	• I maintain a high level of responsiveness in job-related tasks, even during the COVID-19 pandemic.

	Availability (HWP2)	• I ensure consistent presence and time availability for work tasks, including during the pandemic.
	Productivity (HWP3)	• I maintain work productivity as a key priority for performance improvement, even during the COVID-19 period.
	Use of competence (HWP4)	• I strive to utilize my full capabilities to improve job performance, even under pandemic-related constraints.

Source: Authors' own work.

[**Insert** Table 2. **Operationalization of Variables and Measurement Items**]

The questionnaire method was chosen for its efficiency in large-scale data collection. Ensuring data validity and reliability required rigorous instrument development (Dörnyei & Taguchi, 2009). A total of 19 items were included, each rated on a 7-point Likert scale (1 = strongly disagree, 4 = neutral, 7 = strongly agree). This design supports generalizability and statistical reliability in HR research (Iacobucci & Churchill, 2018).

Aligned with Human Capital Theory, the variables in this study reflect critical intangible assets—knowledge, skills, and capabilities—that collectively determine workforce productivity and organizational value (Bontis et al., 2000; Mayo, 2000).

Results

The model was conducted in two sequential stages. The first stage involved Confirmatory Factor Analysis (CFA) to examine the reliability and validity of the measurement model, including convergent and discriminant validity tests. The second stage employed structural path analysis to assess the overall model fit, test hypothesized relationships among constructs, and evaluate the mediation effects.

Reliability Assessment

Internal consistency was established through Cronbach's alpha, with all constructs exceeding the commonly accepted threshold of 0.70 (Lance et al., 2006), indicating the high reliability of the measurement items (Table 3).

Table 3
Summary of Reliability and Validity Assessments

Variables	Indicators	Standardized Estimate	Estimate	Standard Error	Critical Ratio	P - Value	Construct Reliability	Average Variance Extracted
Training Effectiveness (TE)	Additional knowledge (TE1)	0.84	0.97	0.06	15.12	***	0.92	0.84
	Ability to remember (TE2)	0.85	0.97	0.06	15.35	***		
	Ability to practice (TE3)	0.87	1.00					
Knowledge Management (KM)	Use of knowledge (KM1)	0.84	1.00				0.97	0.95
	Sharing knowledge (KM2)	0.89	1.12	0.07	15.74	***		
	Reflection of knowledge (KM3)	0.86	1.08	0.07	14.99	***		
	Identification of knowledge (KM4)	deleted item						
Employee Capacity (EC)	Employee cooperation (EC1)	0.82	1.00				0.98	0.95
	Employee commitment (EC2)	0.87	1.13	0.08	14.93	***		
	Employee involvement (EC3)	0.73	0.97	0.09	11.23	***		
	Employee capacity building initiatives (EC4)	0.78	1.15	0.09	12.35	***		
Health Workers Performance (HWP)	Responsiveness (HWP1)	deleted item					0.97	0.95
	Availability (HWP2)	0.76	1.00					
	Productivity (HWP3)	0.87	1.08	0.09	12.64	***		
	Use of competence (HWP4)	0.83	1.03	0.09	11.97	***		
Model Fit Testing		**Cut of Value**				**Result**		**Remark**
1. Absolute Fit Indices:								
Note: *** (Significant at Level p < 0.01)								

Variables	Indicators	Standardized Estimate	Estimate	Standard Error	Critical Ratio	P - Value	Construct Reliability	Average Variance Extracted
Chi-Square		df = 60; X^2 = 79.08				117.60		Marginal
Significance		≥ 0.05 (Laar and Braeken, 2021)				0.00		Marginal
CMIN/df		≤ 3.00 (even < 5.00) (Dash and Paul, 2021)				1.98		Fit
GFI		≥ 0.90 (Hair *et al.*, 2010)				0.92		Fit
RMSEA		0.03–0.08 (Arbuckle, 2009)				0.07		Fit
2. Incremental Fit Indices:								
AGFI		≥ 0.90 (Hair *et al.*, 2010)				0.88		Marginal
TLI		≥ 0.90 (Arbuckle, 2009)				0.96		Fit
NFI		≥ 0.90 (Dash and Paul, 2021)				0.94		Fit
CFI		≥ 0.90 (Laar and Braeken, 2021)				0.97		Fit
3. Parsimony Fit Indices:								
PNFI		> 0.50 (Dash and Paul, 2021)				0.73		Fit
PGFI		> 0.50 (Dash and Paul, 2021)				0.61		Fit
Note: *** (Significant at Level p < 0.01)								

[Insert Table 3. Summary of Reliability and Validity Assessments]

Validity Assessment

Construct validity was examined to determine the degree to which the items accurately represented their respective theoretical constructs (Bernard, 2013; Hair et al., 2017). All factor loadings ranged between 0.73 and 0.89, surpassing the 0.50 benchmark (Ferdinand, 2014; Hair et al., 2017), thereby confirming convergent validity. The significance of each item was supported by Critical Ratios (CR > 2) and p-values below 0.05. Construct Reliability (CR ≥ 0.70) and Average Variance Extracted (AVE ≥ 0.50) further indicate the robustness of the latent constructs (Sekaran & Bougie, 2016).

Measurement Model Summary

1. Training Effectiveness (TE): Comprised of additional knowledge (0.84), memory retention (0.85), and practical application (0.87). CR = 0.94; AVE = 0.84.
2. Knowledge Management (KM): Assessed through knowledge use (0.84), knowledge sharing (0.89), and reflection (0.86). One item (identification) was excluded from analysis. CR = 0.97; AVE = 0.95.
3. Employee Capacity (EC): Represented by cooperation (0.82), commitment (0.87), involvement (0.73), and Capacity building (0.78). CR = 0.98; AVE = 0.95.
4. Health Worker Performance (HWP): measured via availability (0.76), productivity (0.86), and use of competence (0.83). One item (Responsiveness) was excluded from the analysis. CR = 0.97; AVE = 0.95.

Model Fit and Structural Validation

CFA and structural model assessment demonstrated a strong fit with the observed data (Fig. 1 and Table 3). The fit indices reported were CMIN/DF = 1.96, GFI = 0.92, RMSEA = 0.07, TLI = 0.96, NFI = 0.94, CFI = 0.97, PNFI = 0.73, and PGFI = 0.61 indicating an acceptable and well-fitting model (Ferdinand, 2014; Hair et al., 2014).

[Insert Fig. 1. Structural Equation Model]

Hypothesis Testing

All the proposed hypotheses (H1–H7) were supported. Standardized regression weights were significant (t-values > 1.96), and p-values were below 0.05, confirming the statistical significance across all direct paths (Table 4).

Table 4. Structural Model Results and Hypothesis Testing

Hypothesis	Standardized estimate	Estimate	Standard Error	Critical Ratio	P Value	Result
H1: Training Effectiveness → Knowledge Management	0.76	0.41	0.04	10.62	***	Supported
H2: Training Effectiveness → Employee Capacity	0.30	0.13	0.04	3.32	***	Supported
H3: Training Effectiveness → Health Worker Performance	0.32	0.13	0.04	3.67	***	Supported
H4: Knowledge Management à Employee Capacity	0.61	0.49	0.08	6.46	***	Supported
H5: Employee Capacity → Health Worker Performance	0.65	0.63	0.09	6.89	***	Supported
H6: Training Effectiveness → Knowledge Management → Employee Capacity → Health Worker Performance	0.40	estimates/bootstrap (two tailed significance-BC)			0.00	Supported
H7: Knowledge Management → Employee Capacity → Health Worker Performance	0.54	estimates/bootstrap (two tailed significance-BC)			0.01	Supported

Note: *** (Significant at Level p< 0.01)

Source: Authors' own work, based on survey data (2024).

[Insert Table 4. Structural Model Results and Hypothesis Testing]

Mediation Analysis

Bootstrapping procedures were applied to test the mediating mechanisms, which is a robust technique suitable for moderate sample sizes and non-normal data distributions (Mattila, 2001; Preacher & Hayes, 2004).

1. H6: Training Effectiveness positively influences Health Worker Performance through the sequential mediation of Knowledge Management and Employee Capacity (p = 0.003).
2. H7: Knowledge Management influences Health Worker Performance through Employee Capacity (p = 0.011).

These mediation results affirm the principles of Human Capital Theory (Bontis et al., 2000; Mayo, 2000), emphasizing that training impacts performance most effectively when cultivating knowledge application and organizational capacity. Moreover, in the post-pandemic context, these findings underscore the strategic role of intangible assets such as knowledge management systems and employee development processes in sustaining public sector performance during and after periods of crisis (Ahsan et al., 2021; Gerhart & Feng, 2021).

Discussion

Training Effectiveness and Knowledge Management (H1)

This study demonstrates that training effectiveness significantly enhances knowledge management ($\beta = 0.76$; $p < 0.001$). Among KM indicators, knowledge sharing (0.89), reflection (0.86), and knowledge use (0.84) emerged as the strongest dimensions, highlighting the role of training in cultivating not only knowledge acquisition but also its integration and dissemination.

From the lens of Human Capital Theory (HCT), training is a key investment that builds employees' cognitive and behavioral capacities, aligning with organizational goals (Auerbach & Green, 2024; Bontis et al., 2000). As supported by Tamsah, Ilyas, et al., (2023), effective training enhances employees' ability to remember, apply, and expand knowledge—three foundational elements for strong KM systems.

This finding aligns with Giovanelli et al. (2024), who emphasize that training strengthens both knowledge and ability. Specifically, the ability to practice, as emphasized by Aryee et al. (2024), is particularly relevant for health professionals operating in dynamic service environments. However, not all knowledge dimensions contribute equally—this study excluded knowledge identification due to weak measurement loading, which corroborates (Chakma et al., 2024), who argue that knowledge must be actionable to influence performance.

Recent literature reinforces these results. KM-based training has improved clinical behavior (Ahsan et al., 2021), academic performance (Vyas, 2024), and healthcare sustainability (Alboliteeh et al., 2023). Across industries, KM and training are interdependent levers for enhancing organizational capability (Alharbi & Aloud, 2024; Lehyani, Zouari, Ghorbel, & Tollenaere, 2023; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023), further validating the strategic role of training in developing human capital through knowledge optimization.

Training Effectiveness and Employee Capacity (H2)

The analysis confirms a significant positive effect of training effectiveness on employee capacity ($\beta = 0.30$; $p < 0.001$). Among capacity indicators, employee commitment (0.87), cooperation (0.82), capacity-building initiative (0.78), and involvement (0.73) emerged as core dimensions. These reflect the human capital components developed through effective training.

Aligned with Human Capital Theory, training enhances not only skills but also psychological readiness and workplace engagement (Auerbach & Green, 2024; Leoni, 2023). Effective training enables practical skill application, reinforces memory, and introduces new knowledge, which collectively foster employees' initiative, participation, and teamwork (Aryee et al., 2024; Giovanelli et al., 2024).

As prior studies suggest, training contributes to higher commitment and collaboration by increasing self-confidence and morale, particularly in dynamic environments requiring adaptability (Chen et al., 2024; Kengia et al., 2023). This supports the argument that training is not merely a tool for knowledge transfer, but a strategic lever for strengthening employee capacity as a key organizational resource (Gerhart & Feng, 2021; Tamsah, Ilyas, et al., 2023).

Furthermore, competency-based training fosters workforce flexibility and readiness, which are vital for enhancing individual and collective performance, especially in healthcare and public service sectors (Cometto et al., 2022; Conti et al., 2024). Therefore, employee capacity can be seen as the manifestation of accumulated human capital shaped by strategic learning interventions.

Training Effectiveness and Health Worker Performance (H3)

The findings indicate a significant and positive relationship between training effectiveness and health worker performance (β = 0.32; p < 0.001). The strongest contributors to training effectiveness were ability to practice (0.87), ability to remember (0.85), and acquisition of new knowledge (0.84). For health worker performance, productivity was the most dominant indicator (0.86), followed by competence utilization (0.83), and availability (0.76). These results affirm that effective training enhances readiness and productivity—key attributes of high-performing health systems (Mwansisya et al., 2022; Sheffel et al., 2024).

Grounded in Human Capital Theory, training develops workers' competencies that drive performance in dynamic service contexts (Auerbach & Green, 2024; Giovanelli et al., 2024). As human capital is enhanced through practical skills and knowledge application, employees become more productive, and confident to organizational needs (Adhvaryu et al., 2023; Chen et al., 2024). Effective training also fosters adaptive capacity, allowing staff to adjust to changing demands, thus boosting overall health service delivery (Alolayyan & Alyahya, 2023; Kengia et al., 2023).

Moreover, learning outcomes from structured training—such as motivation, engagement, and behavioral reinforcement—are essential mechanisms for sustaining high performance (Aryee et al., 2024). This suggests that beyond technical instruction, training serves as a motivational engine for behavior change and performance enhancement within healthcare systems (Cometto et al., 2022; Conti et al., 2024).

Knowledge Management and Employee Capacity (H4)

This study confirms that knowledge management (KM) has a positive and significant effect on employee capacity (β = 0.61; p < 0.001). Among KM dimensions, knowledge sharing, reflection, and application substantially contribute to strengthening employee commitment, cooperation, involvement, and capacity-building initiatives. These findings are consistent with prior studies demonstrating that KM improves employee competence and engagement (Al-Husseini, 2023; Lehyani, Zouari, Ghorbel, & Tollenaere, 2023).

Under the lens of Human Capital Theory, KM functions as a strategic mechanism to accumulate, organize, and apply knowledge, thereby enhancing individual and organizational value (Gerhart & Feng, 2021; Karsikas et al., 2023). Employees who actively utilize and share knowledge are more likely to demonstrate proactive behaviors, including higher involvement and initiative, as knowledge becomes embedded in daily tasks (Afshari et al., 2023; El-Jardali et al., 2023). This supports the premise that effective KM contributes directly to the development of organizational human capital and improves workforce adaptability in dynamic environments (Abbate et al., 2023; Alharbi & Aloud, 2024).

In line with HCT, KM-driven learning processes strengthen individual readiness and self-development—key components of capacity enhancement in modern, knowledge-based institutions (Obeng et al., 2024; Shaikh et al., 2023).

Employee Capacity and Health Worker Performance (H5)

The findings reveal a significant positive relationship between employee capacity and health worker performance (β = 0.65; p < 0.001). Employees with higher levels of commitment, cooperation, involvement, and capacity-building initiatives tend to demonstrate greater productivity, competence utilization, and work readiness. This supports prior evidence that employee capacity is a critical determinant of performance outcomes (Chen et al., 2024; Karsikas et al., 2023).

From a Human Capital Theory perspective, employee capacity represents the embodiment of accumulated skills, motivation, and knowledge, which translate into improved task execution and adaptability (Gerhart & Feng, 2021; Leoni, 2023). Enhanced commitment and cooperation foster higher engagement and collaboration, while initiative and involvement support problem-solving and responsiveness—key to healthcare delivery effectiveness (Conti et al., 2024; Deussom et al., 2022). These findings align with research indicating that capacity development facilitates performance improvisation and helps employees prioritize tasks in complex environments (Afshari et al., 2023; Alolayyan & Alyahya, 2023).

As organizations face dynamic challenges, fostering human capital through capacity strengthening becomes imperative to ensure sustainable improvements in health worker productivity and system responsiveness (Karsikas et al., 2023; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023).

Training Effectiveness and Health Worker Performance through Knowledge Management and Employee Capacity (H6)

The study confirms that knowledge management and employee capacity significantly mediate the effect of training effectiveness on health worker performance (β = 0.40; p = 0.003). This indicates that training outcomes translate into performance improvements when newly acquired knowledge is effectively applied (Alharbi & Aloud, 2024; Aryee et al., 2024; Ngusie et al., 2023).

Drawing from Human Capital Theory, effective training enhances individual skills and knowledge, while KM structures provide the mechanisms for retention, reflection, and application—thus reinforcing behavior change and performance (Gerhart & Feng, 2021; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023). Knowledge management acts as a guidance system that enables knowledge to be embedded into practice, aligning with the learning motivation process theory, where reinforcement and application are essential for behavioral improvement (Afshari et al., 2023).

The mediating role of KM is further supported by self-efficacy theory, which highlights the importance of context-specific reinforcement. Health workers with strong self-efficacy, shaped by structured KM and capacity-building initiatives, are more resilient and goal-oriented (Chen et al., 2024; Smythe et al., 2024). This aligns with recent evidence that organizational learning structures improve health system responsiveness (Cometto et al., 2022; Karsikas et al., 2023).

While training directly contributes to performance (Giovanelli et al., 2024), its impact is significantly strengthened when mediated by KM and employee capacity. This addresses prior concerns that training alone may not improve performance (Al Badi et al., 2023; Cavalcante de Oliveira et al., 2023), emphasizing the strategic importance of knowledge-driven human capital development.

Knowledge Management and Health Worker Performance through Employee Capacity (H7)

The findings demonstrate that employee capacity significantly mediates the relationship between knowledge management and health worker performance, with an indirect effect of 0.54 (p = 0.011). This indicates that knowledge management has a stronger impact on performance when channeled through enhanced employee capacity.

This result confirms that the contribution of employee capacity as a lever between KM and performance exceeds that of direct training effects. Employees may not immediately exhibit improved performance after training; instead, training often first builds capacity—through increased commitment, cooperation, initiative, and involvement—which then leads to sustainable performance gains, especially when supported by effective KM systems (Al-Husseini, 2023; Karsikas et al., 2023; Lehyani, Zouari, Ghorbel, Tollenaere, et al., 2023).

Aligned with Human Capital Theory, this relationship affirms that investments in knowledge resources enhance intangible assets, such as employee capacity, which subsequently strengthen organizational performance (Bontis et al., 2000; Gerhart & Feng, 2021; Mayo, 2000). These findings also support the idea that performance improvement, particularly in healthcare settings, depends on how well knowledge is internalized, shared, and applied across roles (Abbate et al., 2023; Ahsan et al., 2021; El-Jardali et al., 2023).

Thus, optimizing KM is not only about managing information but also about strategically developing human capital to amplify capacity and performance—particularly relevant during disruptive periods like the pandemic.

Theoretical and Managerial Implications

This study confirms that human resource development (HRD) plays a pivotal role in enhancing organizational resilience, particularly during crisis periods such as the COVID-19 pandemic. Effective training improves employee capacity, which in turn strengthens performance under uncertainty (Adhvaryu et al., 2023; Vyas, 2024).

From a theoretical standpoint, the findings reinforce Human Capital Theory (HCT) by demonstrating that training not only enhances individual productivity but also builds intangible assets such as knowledge management capabilities and employee capacity (Bontis et al., 2000; Gerhart & Feng, 2021). These assets serve as mediators that drive sustainable performance improvements across organizational levels (Memon et al., 2022; Shahzad et al., 2021).

Managerially, this study highlights the necessity of training programs that go beyond knowledge transmission. Training must foster retention, application, and reflective practice to improve both knowledge management processes and employee capacity (Ahsan et al., 2021; Akther & Rahman, 2021). Health organizations, in particular, should prioritize structured and competency-based training models to equip employees with adaptive capabilities needed in dynamic healthcare environments (Alt et al., 2023; Mwansisya et al., 2022).

In sum, effective training serves as a foundational mechanism for building human capital that translates into higher organizational performance—especially when supported by strong knowledge management systems and employee development strategies.

Conclusion

This study has provided empirical evidence that structured training human resource development is instrumental in improving health worker performance, especially in times of crisis, such as during the COVID-19 pandemic. The results indicate that training effectiveness has both direct and indirect effects, the latter channeling through improved knowledge management and employee capacity. In this study, the mediating mechanisms were found to have a more pronounced contribution than the direct influence of training.

This finding therefore suggests that training interventions should not be perceived as a stand-alone solution; rather, their effective output is a greater percentage when enforced with organizational systems that enhance knowledge sharing and capacity development. This pathway suggests that improvements in performance often come protractedly. First, there is an enhancement of knowledge processes, capacity building, and later manifest behavior and performance outcomes.

From a larger perspective, these insights demand a more strategic approach to workforce development in public health institutions. The study suggests that the design of training programs aligned with knowledge utilization goals and capacity priorities could offer a more sustainable route to achieving long-term resilience in the health system. Therefore, this study is expected to add value to the understanding of how interventions based on training intersect with organizational learning and capacity dynamics to enhance the delivery of public services.

Declarations

Author Declarations

Availability of Data and Materials: The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

Funding: This research received no external funding.

Ethics Approval and Consent to Participate: This study was reviewed and approved by the Institutional Review Board of the Research and Community Service Center (PPPM), STIE Amkop Makassar, Indonesia (Ethical Clearance No. 112/KomTik-PPPM/STIEAMKOP/IX/2024; approval date: 23 September 2024; certificate issued: 24 February 2025). The data were collected while the corresponding author was affiliated with STIE Amkop Makassar; therefore, ethical oversight for this

project was provided by that institution. All procedures complied with relevant guidelines and regulations and adhered to ethical principles for research involving human participants. Although data collection occurred in March–May 2024, the protocol later approved by the IRB is identical to the procedures applied during data collection and therefore covers the dataset gathered in that period.[1]

Informed consent. All participants received an information sheet describing the study's objectives, procedures, risks/benefits, confidentiality, and their rights as respondents. Written informed consent was obtained prior to participation during the data collection period (March–May 2024). Participation was voluntary; no identifying information was recorded; confidentiality and anonymity were assured; and participants could withdraw at any time without consequence.

Competing Interests: The authors declare no competing interests.

AI Use Declaration: The authors used generative AI tools (ChatGPT by OpenAI) exclusively for language enhancement and editing purposes. All conceptual content, interpretations, and final revisions are entirely based on the authors' intellectual contributions and have been verified for accuracy and originality.

Consent for Publication: Not applicable.

[1] Institutional policy reference for research ethics and governance (PPPM STIE Amkop Makassar): https://ppm.stieamkop.ac.id/zg-content/uploads/19._standar_peneliti_penelitian.pdf

References

Abbate, S., Centobelli, P., Cerchione, R., Oropallo, E., & Riccio, E. (2023). Investigating Healthcare 4.0 Transition Through a Knowledge Management Perspective. *IEEE Transactions on Engineering Management*, *70*(9), 3297–3310. https://doi.org/10.1109/tem.2022.3200889

Adhvaryu, A. R., Kala, N., & Nyshadham, A. (2023). Returns to On-the-Job Soft Skills Training. *Journal of Political Economy*, *131*(8), 2165–2208. https://doi.org/10.1086/724320

Afshari, L., Ahmad, M. S., & Mansoor, T. (2023). How to lead responsibly toward enhanced knowledge sharing behavior and performance: implications for human resource management. *Personnel Review*, *53*(4), 944–964. https://doi.org/10.1108/pr-12-2022-0869

Ahsan, A., Dewi, E. S., Suharsono, T., Setyoadi, S., Soplanit, V. G., Ekowati, S. I., Syahniar, N. P., Sirfefa, R. S., Kartika, A. W., Ningrum, E. H., Noviyanti, L. W., & Laili, N. (2021). Knowledge Management-Based Nursing Care Educational Training: A Key Strategy to Improve Healthcare Associated Infection Prevention Behavior. *SAGE Open Nursing*, *7*, 1–16. https://doi.org/10.1177/23779608211044601

Akther, S., & Rahman, M. S. (2021). Investigating training effectiveness of public and private banks employees in this digital age: an empirical study. *International Journal of Manpower, Vol. Ahead-of-Print No. Ahead-of-Print*. https://doi.org/https://doi.org/10.1108/IJM-04-2021-0240

Al-Husseini, S. (2023). Examining the impact of top management support on employee creativity through the mediating role of knowledge management and absorptive capa city. *International Journal of Innovation Science*, *16*(4), 658–682. https://doi.org/10.1108/ijis-01-2023-0017

Al Badi, F. M., Cherian, J., Farouk, S., & Al Nahyan, M. (2023). Work engagement and job performance among nurses in the public healthc are sector in the United Arab Emirates. *Journal of Asia Business Studies*, *17*(5), 1019–1041. https://doi.org/10.1108/jabs-06-2022-0216

Alboliteeh, M., Alrashidi, M. S., Alrashedi, N., Gonzales, A., Mostoles, R. J., Pasay-an, E., & Dator, W. L. (2023). Knowledge Management and Sustainability Performance of Hospital Organisations: The Healthcare Managers' Perspective. *Sustainability (Switzerland)*, *15*(1), 1–11. https://doi.org/10.3390/su15010203

Alharbi, G. L., & Aloud, M. E. (2024). The effects of knowledge management processes on service sector perfor mance: evidence from Saudi Arabia. *Humanities and Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-02876-y

Alolayyan, M. N., & Alyahya, M. S. (2023). Operational flexibility impact on hospital performance through the rol es of employee engagement and management capability. *BMC Health Services Research*, *23*(1). https://doi.org/10.1186/s12913-023-09029-y

Alshetewi, S. (2016). A Structural Equation Model (SEM) of Governing Factors Influencing the Implementation of t-Government. *Journal of Entrepreneurship & Organization Management*. https://doi.org/10.4172/2169-026x.1000170

Alt, D., Naamati-Schneider, L., & Weishut, D. J. N. (2023). Competency-based learning and formative assessment feedback as precursors of college students' soft skills acquisition. In *Studies in Higher Education* (Vol. 48, Issue 12, pp. 1901–1917). https://doi.org/10.1080/03075079.2023.2217203

Amare, D., Getahun, F. A., Mengesha, E. W., Dessie, G., Shiferaw, M. B., Dires, T. A., & Alene, K. A. (2023). Effectiveness of healthcare workers and volunteers training on improvi ng tuberculosis case detection: A systematic review and meta-analysis. *PLOS ONE*, *18*(3), e0271825. https://doi.org/10.1371/journal.pone.0271825

Aryee, G. F. Ben, Amoadu, M., Obeng, P., Sarkwah, H. N., Malcalm, E., Abraham, S. A., Baah, J. A., Agyare, D. F., Banafo, N. E., & Ogaji, D. (2024). Effectiveness of eLearning programme for capacity building of healthca re professionals: a systematic review. *Human Resources for Health*, *22*(1). https://doi.org/10.1186/s12960-024-00924-x

Auerbach, P., & Green, F. (2024). Reformulating the Critique of Human Capital Theory. *Journal of Economic Surveys*, 1–13. https://doi.org/10.1111/joes.12675

Aziz, I., Shafiq, M., & Fatima, I. (2022). Investigation of knowledge management and firm competitiveness: core competence as a mediator. *F1000Research*, *11*, 1114. https://doi.org/10.12688/f1000research.124459.1

Bernard, H. R. (2013). *Social Research Methods: Qualitative and Quantitative Approaches (2nd Edition)*. Sage Publications Sage CA: Los Angeles, CA.

Bontis, N., William Chua Chong, K., & Richardson, S. (2000). Intellectual capital and business performance in Malaysian industries. *Journal of Intellectual Capital*, *1*(1), 85–100. https://doi.org/10.1108/14691930010324188

Carboni, C., Maroto, I. J., Galindo, M., Plessis, L., Lambert, Y., Bardon, T., Vreden, S., Suárez-Mutis, M., Bordalo, J. M., Douine, M., & Sanna, A. (2024). Training-of-trainers program for community health workers involved in an innovative and community-based intervention against malaria among g oldminers in the Guiana shield: a quality and effectiveness evaluation . *Frontiers in Public Health*, *11*. https://doi.org/10.3389/fpubh.2023.1306432

Cavalcante de Oliveira, A. P., Galante, M. L., Maia, L. S., Craveiro, I., da Silva, A. P., Fronteira, I., Chança, R., Cometto, G., Ferrinho, P., & Dal Poz, M. (2023). Implementation of policy and management interventions to improve healt h and care workforce capacity to address the COVID-19 pandemic respons e: a systematic review. *Human Resources for Health*, *21*(1). https://doi.org/10.1186/s12960-023-00856-y

Chakma, S. K., Hossen, S., Rakib, T. M., Hoque, S., Islam, R., Biswas, T., Islam, Z., & Islam, M. M. (2024). Effectiveness of a hand hygiene training intervention in improving kno wledge and compliance rate among healthcare workers in a respiratory d isease hospital. *Heliyon*, *10*(5), e27286. https://doi.org/10.1016/j.heliyon.2024.e27286

Chen, H., Kewou, N. Y. N., Atingabili, S., Sogbo, A. D. Z., & Tcheudjeu, A. T. (2024). The impact of psychological capital on nurses' job performance: a chai n mediation analysis of problem-focused coping and job engagement. *BMC Nursing*, *23*(1). https://doi.org/10.1186/s12912-024-01802-6

Cometto, G., Assegid, S., Abiyu, G., Kifle, M., Tunçalp, Ö., Syed, S., Kleine Bingham, M., Nyoni, J., & Ajuebor, O. K. (2022). Health workforce governance for compassionate and respectful care: a framework for research, policy and practice. *BMJ Global Health*, *7*(3). https://doi.org/10.1136/bmjgh-2021-008007

Conti, A., Viottini, E., Comoretto, R. I., Piovan, C., Martin, B., Albanesi, B., Clari, M., Dimonte, V., & Campagna, S. (2024). The Effectiveness of Educational Interventions in Improving Waste Mana gement Knowledge, Attitudes, and Practices among Healthcare Workers: A Systematic Review and Meta-Analysis. *Sustainability*, *16*(9), 3513. https://doi.org/10.3390/su16093513

Davidson, C., & Voss, P. (2003). *Knowledge Management: An Introduction to Creating Competitive Advantage from Intellectual Capital*. Vision Book. New Delhi.

Deussom, R., Mwarey, D., Bayu, M., Abdullah, S. S., & Marcus, R. (2022). Systematic review of performance-enhancing health worker supervision approaches in low- and middle-income countries. *Human Resources for Health*, *20*(1), 1–12. https://doi.org/10.1186/s12960-021-00692-y

Dieleman, M., & Harnmeijer, J. W. (2006). *Improving health worker performance: in search of promising practices* (Issue September). https://www.kit.nl/wp-content/uploads/2018/08/1174_Improving-health-worker-performance_Dieleman_Harnmeijer.pdf

Dörnyei, Z., & Taguchi, T. (2009). *Questionnaires in Second Language Research: Construction, Administration, and Processing (2nd Edition)*. Routledge, New York. https://doi.org/10.4324/9780203864739

El-Jardali, F., Bou-Karroum, L., Hilal, N., Hammoud, M., Hemadi, N., Assal, M., Kalach, N., Harb, A., Azzopardi-Muscat, N., Sy, T. R., & Novillo-Ortiz, D. (2023). Knowledge management tools and mechanisms for evidence-informed decisi on-making in the WHO European Region: a scoping review. *Health Research Policy and Systems*, *21*(1). https://doi.org/10.1186/s12961-023-01058-7

Ferdinand, A. (2006). Metode Penelitian Manajemen Pedoman Penelitian untuk Penulisan Skripsi Tesis dan disertai Ilmu Manajemen. In *Semarang: Universitas Diponegoro*.

Ferdinand, A. (2014). *Structural Equation Modelling: dalam Penelitian Manajemen, Aplikasi Model-Model Rumit dalam Penelitian untuk Skripsi, Tesis, dan Disertasi Doktor* (5th ed.). BP Undip - Undip Press.

Gerhart, Barry, & Feng, Jie. (2021). The Resource-Based View of the Firm, Human Resources, and Human Capital: Progress and Prospects. *Journal of Management*, *47*(7), 1796–1819. https://doi.org/10.1177/0149206320978799

Ghozali, I. (2017). *Model Persamaan Struktural Konsep dan Aplikasi Dengan Program AMOS 24 Update Bayesian SEM* (7th ed.). Badan Penerbit Universitas Diponegoro.

Giovanelli, L., Rotondo, F., & Fadda, N. (2024). Management training programs in healthcare: effectiveness factors, cha llenges and outcomes. *BMC Health Services Research*, *24*(1). https://doi.org/10.1186/s12913-024-11229-z

Hair, J. F., Babin, B. J., & Krey, N. (2017). Covariance-Based Structural Equation Modeling in the Journal of Advertising: Review and Recommendations. *Journal of Advertising*, *46*(1), 163–177. https://doi.org/10.1080/00913367.2017.1281777

Hair, J. F., Gabriel, M. L. D. S., & Patel, V. K. (2014). Amos Covariance-Based Structural Equation Modeling (CB-SEM): Guidelines On Its Application as a Marketing Research Tool. *Brazilian Journal of Marketing*, *13*(2), 44–55.

https://doi.org/10.5585/remark.v13i2.2718

Howell, D. C. (2011). Fundamental Statistic for the Behavioral Sciences 7e. In *Wadsworth, Cengage Learning ALL*.

Hughes, C. (2021). The Changing Learning Technological Landscape for Trainers in the Wake of COVID-19. *Advances in Developing Human Resources*, *23*(1), 66–74. https://doi.org/10.1177/1523422320972108

Iacobucci, D., & Churchill, G. A. (2018). *Marketing Research: Methodological Foundations, 12th Edition*. Dawn Iacobucci and Gilbert Churchill Nashville, TN: Earlie Lite Books, Inc. https://www.researchgate.net/publication/327387821_Marketing_Research_Methodological_Foundations_12th_edition

Jalal, A., Iwamoto, K., Gedik, G., Ravaghi, H., & Kodama, C. (2023). Health workforce capacity of intensive care units in the Eastern Medit erranean Region. *PLOS ONE*, *18*(6), e0286980. https://doi.org/10.1371/journal.pone.0286980

Karsikas, E., Koivunen, K., Meriläinen, M., & Kanste, O. (2023). Health and social care managers' perceptions of factors affecting the competence of managers in knowledge management: A qualitative study. *Journal of Advanced Nursing*, *80*(6), 2487–2499. https://doi.org/10.1111/jan.15990

Kengia, J. T., Kalolo, A., Barash, D., Chwa, C., Hayirli, T. C., Kapologwe, N. A., Kinyaga, A., Meara, J. G., Staffa, S. J., Zanial, N., & Alidina, S. (2023). Research capacity, motivators and barriers to conducting research amon g healthcare providers in Tanzania's public health system: a mixed met hods study. *Human Resources for Health*, *21*(1). https://doi.org/10.1186/s12960-023-00858-w

Kimutai, G., Gachunga, H., Wanjau, K., & Gichuhi, A. W. (2013). Influence of employee capacity on health workforce performance in Kenya's Public Health Sector: A tale of ISO 9001:2008 certified hospitals. *European Journal of Business and Social Sciences*, *2*(9), 134–152. http://library.kisiiuniversity.ac.ke:8080/xmlui/bitstream/handle/123456789/818/Influence of Employee Capacity on Health Workforce.pdf?sequence=1&isAllowed=y

Kugler, H. L., Taylor, N. F., & Brusco, N. K. (2024). Patient handling training interventions and musculoskeletal injuries i n healthcare workers: Systematic review and meta-analysis. *Heliyon*, *10*(3), e24937. https://doi.org/10.1016/j.heliyon.2024.e24937

Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The Sources of Four Commonly Reported Cutoff Criteria: What Did They Really Say? *Organizational Research Methods*, *9*(2), 202–220. https://doi.org/10.1177/1094428105284919

Lehyani, F., Zouari, A., Ghorbel, A., & Tollenaere, M. (2023). Do KM and TQM have an impact on employee effectiveness and supply chai n performance? *International Journal of Lean Six Sigma*, *15*(4), 733–762. https://doi.org/10.1108/ijlss-12-2022-0254

Lehyani, F., Zouari, A., Ghorbel, A., Tollenaere, M., & Sá, J. C. (2023). Knowledge Management and Total Quality Management Impact on Employee E ffectiveness in Emerging Industries: Case of Tunisian Small and Medium Enterprises. *Sustainability*, *15*(5), 3872. https://doi.org/10.3390/su15053872

Leoni, S. (2023). A Historical Review of the Role of Education: From Human Capital to Human Capabilities. *Review of Political Economy*. https://doi.org/10.1080/09538259.2023.2245233

Lutwama, G. W., Roos, J. H., & Dolamo, B. L. (2012). A descriptive study on health workforce performance after decentralisation of health services in Uganda. *Human Resources for Health*, *10*(1), 1–10. https://doi.org/10.1186/1478-4491-10-41

MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, *4*(1), 84–99. https://doi.org/10.1037/1082-989X.4.1.84

Mattila, A. S. (2001). The effectiveness of service recovery in a multi-industry setting. *Journal of Services Marketing*, *15*(7), 583–596. https://doi.org/10.1108/08876040110407509

Mayo, A. (2000). The role of employee development in the growth of intellectual capital. *Personnel Review*, *29*(4), 521–533. https://doi.org/10.1108/00483480010296311

Memon, K. R., Ghani, B., Hyder, S. I., Han, H., Zada, M., Ariza-Montes, A., & Arraño-Muñoz, M. (2022). Management of knowledge and competence through human resource information system—A structured review. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.944276

Mwansisya, T., Mbekenga, C., Isangula, K., Mwasha, L., Mbelwa, S., Lyimo, M., Kisaka, L., Mathias, V., Pallangyo, E., Edwards, G., Mantel, M., Konteh, S., Rutachunzibwa, T., Mrema, S., Kidanto, H., & Temmerman, M. (2022). The impact of training on self-reported performance in reproductive, maternal, and newborn health service delivery among healthcare workers in Tanzania: a baseline- and endline-survey. *Reproductive Health*, *19*(1), 1–12. https://doi.org/10.1186/s12978-022-01452-4

Ngusie, H. S., Ahmed, M. H., Mengiste, S. A., Kebede, M. M., Shemsu, S., Kanfie, S. G., Kassie, S. Y., Kalayou, M. H., & Gullslett, M. K. (2023). The effect of capacity building evidence-based medicine training on it s implementation among healthcare professionals in Southwest Ethiopia: a controlled quasi-experimental outcome evaluation. *BMC Medical Informatics and Decision Making*, *23*(1). https://doi.org/10.1186/s12911-023-02272-7

Obeng, H. A., Arhinful, R., Mensah, L., & Owusu-Sarfo, J. S. (2024). Assessing the Influence of the Knowledge Management Cycle on Job Satis faction and Organizational Culture Considering the Interplay of Employ ee Engagement. *Sustainability*, *16*(20), 8728. https://doi.org/10.3390/su16208728

Ong, E. C., & Tan, C. L. (2022). Soft TQM, agility, and knowledge management deliver organizational performance: A study of Malaysian manufacturing organizations in the electrical and electronics sector. *Global Business and Organizational Excellence*, *41*(4), 28–47. https://doi.org/10.1002/joe.22155

Perdue, J., Ninemeier, J. D., & Woods, R. H. (2002). Training methods for specific objectives: Preferences of managers in private clubs. *International Journal of Contemporary Hospitality Management*, *14*(3), 114–119. https://doi.org/10.1108/09596110210424402

Perrotta, C., Downey, V., Elabbasy, D., Ingram, C., Lo, C., Naseer, A., Thorson, A., & Brizuela, V. (2023). Remote training for strengthening capacity in sexual and reproductive health and rights research: a systematic review. *BMC Public Health*, *23*(1). https://doi.org/10.1186/s12889-023-16851-w

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods Instruments & Computers*, *36*(4), 717–731. https://doi.org/10.3758/bf03206553

Riyanto, S., & Adhitama, J. (2020). Maintaining Employee Engagement and Employee Performance during Covid-19 Pandemic at PT Koexim Mandiri Finance. *Quest Journals Journal of Research in Business and Management*, *8*(3), 6–10. www.questjournals.org

Rogers, A., Goore, L. L., Wamae, J., Starnes, J. R., Okong'o, S. O., Okoth, V., & Mudhune, S. (2023). Training and experience outperform literacy and formal education as pr edictors of community health worker knowledge and performance, results from Rongo sub-county, Kenya. *Frontiers in Public Health*, *11*. https://doi.org/10.3389/fpubh.2023.1120922

Sancho-Cantus, D., Cubero-Plazas, L., Botella Navas, M., Castellano-Rioja, E., & Cañabate Ros, M. (2023). Importance of Soft Skills in Health Sciences Students and Their Repercussion after the COVID-19 Epidemic: Scoping Review. *International Journal of Environmental Research and Public Health*, *20*(6). https://doi.org/10.3390/ijerph20064901

Sekaran, U., & Bougie, R. (2016). *Research Methods for Business: A Skill-Building Approach (7nd Edition)*. John Wiley & Sons Ltd.

Shahzad, A., Hassan, R., Aremu, A. Y., Hussain, A., & Lodhi, R. N. (2021). Effects of COVID-19 in E-learning on higher education institution students: the group comparison between male and female. *Quality and Quantity*, *55*(3), 805–826. https://doi.org/10.1007/s11135-020-01028-z

Shaikh, F., Afshan, G., Anwar, R. S., Abbas, Z., & Chana, K. A. (2023). Analyzing the impact of artificial intelligence on employee productivi ty: the mediating effect of knowledge sharing and well-being. *Asia Pacific Journal of Human Resources*, *61*(4), 794–820. https://doi.org/10.1111/1744-7941.12385

Sheffel, A., Andrews, K. G., Conner, R., Di Giorgio, L., Evans, D. K., Gatti, R., Lindelow, M., Sharma, J., Svensson, J., Wane, W., & Welander Tärneberg, A. (2024). Human resource challenges in health systems: evidence from 10 African countries. *Health Policy and Planning*, *39*(7), 693–709. https://doi.org/10.1093/heapol/czae034

Smythe, T., Ssemata, A. S., Slivesteri, S., Mbazzi, F. B., & Kuper, H. (2024). Co-development of a training programme on disability for healthcare wo rkers in Uganda. *BMC Health Services Research*, *24*(1). https://doi.org/10.1186/s12913-024-10918-z

Sugiyono. (2018). Metode Penelitian Kuantitatif, Kualitatif, dan R&D. In *ke-26*. Bandung: Alfabeta.

Tamsah, H., Ilyas, G. B., Nurung, J., Jusuf, E., & Rahmi, S. (2023). Soft skill competency and employees' capacity as the intervening factors between training effectiveness and health workers' performance. *Cogent Business and Management*, *10*(1). https://doi.org/10.1080/23311975.2023.2199493

Tamsah, H., Ilyas, J. B., & Yusriadi, Y. (2021). Create teaching creativity through training management, effectiveness training, and teacher quality in the covid-19 pandemic. *Journal of Ethnic and Cultural Studies*, *8*(4), 18–35. https://doi.org/10.29333/ejecs/800

Tamsah, H., Yusriadi, Y., Hasbi, H., Haris, A., & Ajanil, B. (2023). Training Management on Training Effectiveness and Teaching Creativity in The Covid-19 Pandemic. *Hindawi - Education Research International*, *2023*, 15. https://doi.org/10.1155/2023/6588234

Ullah, Z., Ahmad, N., Scholz, M., Ahmed, B., Ahmad, I., & Usman, M. (2021). Perceived accuracy of electronic performance appraisal systems: The case of a non-for-profit organization from an emerging economy. *Sustainability (Switzerland)*, *13*(4), 1–16. https://doi.org/10.3390/su13042109

Umar, A., Tamsah, H., Mattalatta, M., Baharuddin, B., & Latief R, A. (2020). Training–Effectiveness and Team-Performance in Public Organization. *Journal of Asian Finance, Economics and Business*, *7*(11), 1021–1031. https://doi.org/10.13106/jafeb.2020.vol7.no11.1021

Upadhyay, K., Goel, S., & John, P. (2023). Developing a capacity building training model for public health manage rs of low and middle income countries. *PLOS ONE*, *18*(4), e0272793. https://doi.org/10.1371/journal.pone.0272793

Vyas, P. (2024). Knowledge management and higher education institute: Review & topic analysis. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(3), 100349. https://doi.org/10.1016/j.joitmc.2024.100349

Wilson, P. H., Strutton, D., & Farris, M. T. (2002). Investigating the perceptual aspect of sales training. *Journal of Personal Selling and Sales Management*, *22*(2), 77–86. https://doi.org/10.1080/08853134.2002.10754296

Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety. *Educational and Psychological Measurement*, *73*(6), 913–934.

https://doi.org/10.1177/0013164413495237

Wu, Wei, Zhou, E, Zhu, Xu, Chen, Shang, Guo, Li, Yang, & Li. (2023). The effectiveness of continuing education programmes for health worker s in rural and remote areas: a systematic review and meta-analysis. *Rural and Remote Health*. https://doi.org/10.22605/rrh8275

Figures

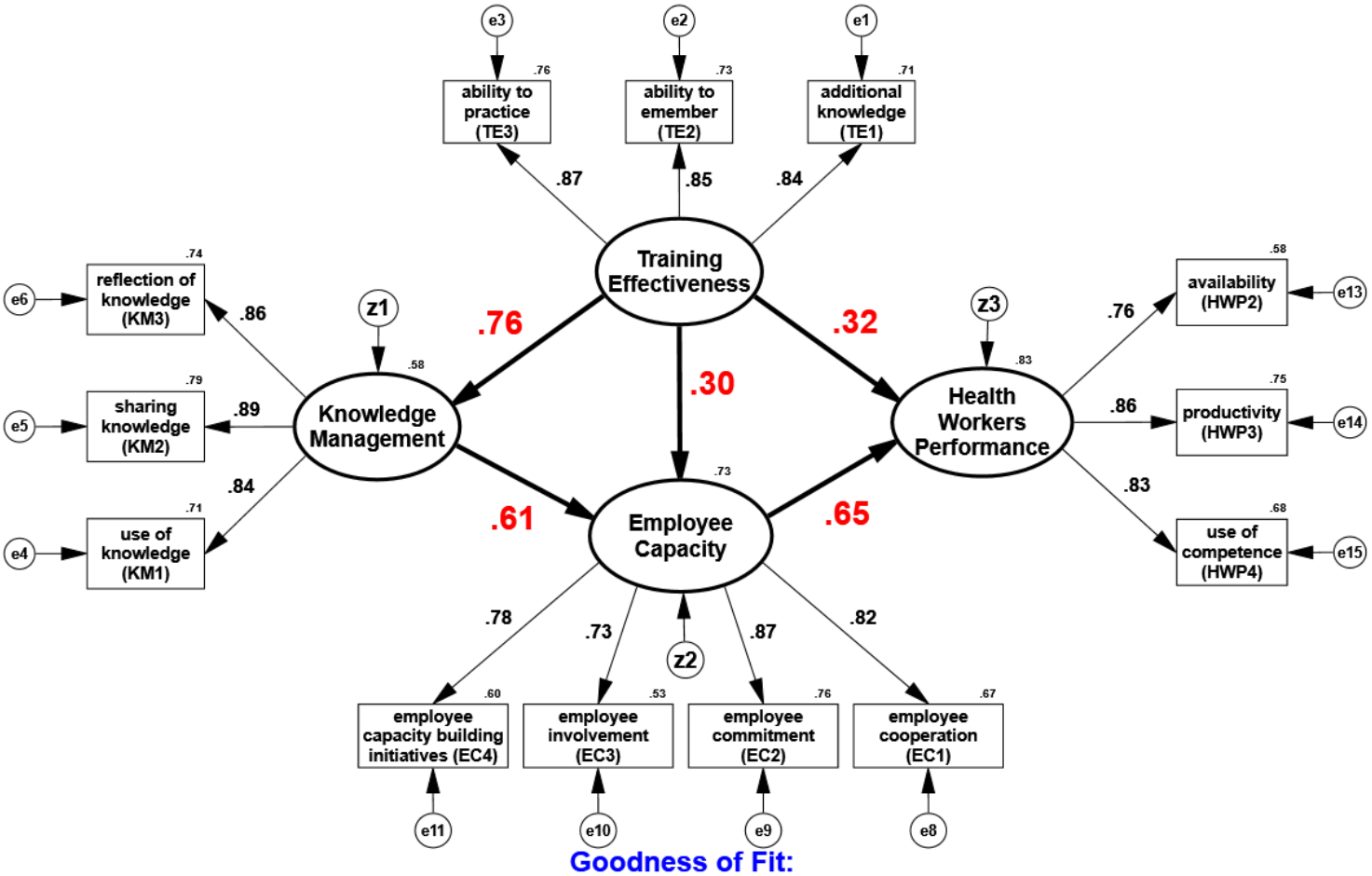


Figure 1

Structural equation model showing the direct and indirect paths between training effectiveness, knowledge management, employee capacity, and health worker performance.

Source: Authors' own work, based on survey data (2024).