

The Effect of Training Effectiveness and Knowledge Sharing on Innovative Work Behavior Through Employee Competence As An Intervening Variable

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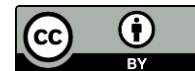
Training Effectiveness; Knowledge Sharing; Employee Competence; Innovative Work Behavior; SEM-PLS

ABSTRACT

This paper investigates how training effectiveness and knowledge sharing shape Innovative Work Behavior (IWB), with employee competence functioning as an intervening variable, drawing on employees of manufacturing firms in Padang City, West Sumatra, Indonesia. Organizations are increasingly reliant on workers who are not merely skilled but also capable of producing and applying original ideas that generate value. A quantitative survey design was adopted, with data gathered through a five-point Likert questionnaire administered to 165 employees, of whom 152 returned usable responses (a 92.1% response rate). The data were processed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) via SmartPLS 4.0. The measurement model showed acceptable validity and reliability across all constructs. Findings from the structural model reveal that training effectiveness and knowledge sharing each exert a positive, significant influence on employee competence, and that training effectiveness, knowledge sharing, and employee competence each positively and significantly influence Innovative Work Behavior. In addition, employee competence partly mediates the influence of both training effectiveness and knowledge sharing on Innovative Work Behavior. The results imply that organizations aiming to build stronger innovative behavior should invest simultaneously in well-structured training programs and a supportive knowledge-sharing culture, while treating competence development as the key mechanism that converts such investments into innovation.

INTRODUCTION

The business landscape is growing more dynamic and unpredictable, pushing organizations to adapt continually through ongoing innovation. Innovation no longer hinges solely on technological capacity; it increasingly depends on employees' capacity to generate, refine, and apply fresh ideas that add value for the organization, a construct commonly labeled Innovative Work Behavior (IWB) (De Jong & Den Hartog, 2010). IWB has emerged as a major concern in current human resource management scholarship, since organizations that depend purely on structural or technological innovation, without also investing in employee-level innovative behavior, tend to gradually lose their competitive edge (Muzam, 2023).



Training stands out as one of the main tools organizations rely on to build innovative behavior. Carefully designed training programs that match real job requirements enhance employees' knowledge, skills, and adaptability, which then helps them respond effectively to a shifting work environment (Noe, 2020). Recent research confirms that effective training correlates positively with employee competence and performance results, and that training addressing both technical and soft skills such as communication, problem-solving, and teamwork has a noticeable impact on workplace behavior (Shahriari et al., 2023; Hasan & Chowdhury, 2023). Training has also been found to shape organizational outcomes indirectly, via its influence on job performance, promotion opportunities, and employee confidence (Ji-Young & Huang, 2021).

Beyond formal training, knowledge sharing has emerged as an essential practice within knowledge-driven organizations. By exchanging experience, information, and expertise among coworkers, organizations can speed up collective learning and boost individuals' ability to tackle problems in creative ways (Azeem et al., 2021). Research evidence indicates that knowledge sharing boosts not just innovation capability but also competency growth and employee engagement, especially where a collaborative organizational climate exists (Naim et al., 2024; Nezafati et al., 2023). Companies that build strategic knowledge-sharing practices tend to show stronger structural capital and better innovation performance than those that do not (Beltramino et al., 2020).

Yet the link between training effectiveness, knowledge sharing, and innovative behavior is not always a direct one. Employee competence the blend of knowledge, skills, abilities, and attitudes needed to perform work effectively (Spencer & Spencer, 1993) is thought to be a key mechanism explaining how training and knowledge-sharing practices translate into innovative results. Several recent studies back this mediating logic: adaptive competence has been shown to partly mediate the influence of knowledge sharing and learning culture on employee innovation (Harandi et al., 2024), while competence has also been found to directly and significantly predict innovative behavior, alongside knowledge-sharing behavior, among public-sector employees (Competence and Knowledge Sharing Behavior study, Semarang City Education Office, 2024).

Despite this expanding body of evidence, most existing research examines training effectiveness, knowledge sharing, employee competence, and Innovative Work Behavior as separate pairs rather than within one integrated structural model, and comparatively few studies treat employee competence as an explicit intervening variable connecting both training and knowledge-sharing practices to innovative behavior at the same time, particularly within the manufacturing sector in Indonesian regional economies outside Java. This study fills that gap by developing and empirically testing an integrated model in which training effectiveness and knowledge sharing shape Innovative Work Behavior both directly and indirectly via employee competence.

Building on this background, the objectives of this study are to: (1) examine the influence of training effectiveness on employee competence; (2) examine the influence of knowledge sharing on employee competence; (3) examine the direct influence of training effectiveness and knowledge sharing on Innovative Work Behavior; (4) examine the influence of employee competence on Innovative Work Behavior; and (5) investigate the mediating role of employee competence in linking training effectiveness and knowledge sharing to Innovative Work Behavior.

Beyond these stated goals, this study is anticipated to deliver both theoretical and practical value. On the theoretical side, it adds to human resource development literature by empirically examining employee competence as an explicit intervening mechanism that links training effectiveness and knowledge sharing to Innovative Work Behavior within one integrated model, an approach still rarely applied in research conducted outside Java's major economic hubs; the results are therefore expected to enrich scholarly discussion of how formal (training) and informal (knowledge sharing) learning mechanisms jointly shape competence and



innovation, rather than being studied separately. On the practical side, the findings are meant to give manufacturing companies in Padang City and similar regional settings an empirical foundation for designing human resource interventions: by clarifying how much training programs, knowledge-sharing practices, and competence development each contribute to innovative behavior, managers and HR practitioners can more effectively allocate limited training budgets, build knowledge-sharing platforms, and set priorities for competence development that best stimulate innovation among their workforce.

Training effectiveness denotes how well a training program succeeds in enhancing participants' knowledge, skills, and work behavior in ways that support organizational goals (Noe, 2020). Effective training is marked by knowledge gains, changes in work behavior, and higher productivity. Frequently used indicators of training effectiveness include the relevance of training materials, instructor competence, training methods, training facilities, and the extent to which training results are applied on the job (Al-Aali, 2021; Mohiya, 2025).

Knowledge sharing refers to the exchange of information, experience, skills, and knowledge among individuals within an organization, which supports collective learning and builds organizational innovation capacity (Azeem et al., 2021). Frequently used indicators include sharing of work experience, sharing of information, discussion-based problem solving, willingness to share knowledge, and use of communication technology to support knowledge exchange (Nezafati et al., 2023).

Competence is defined as the combination of knowledge, skills, abilities, and attitudes that allows an individual to perform work effectively (Spencer & Spencer, 1993). Frequently used indicators include knowledge, skills, ability, professional attitude, and work experience. Recent literature highlights that competence particularly adaptive competence serves as a crucial link between organizational learning inputs (such as training and knowledge sharing) and behavioral outcomes such as innovation (Harandi et al., 2024; Khan & Jan, 2020).

Innovative Work Behavior refers to an individual's behavior aimed at generating, promoting, and applying new ideas to enhance organizational effectiveness (De Jong & Den Hartog, 2010). Frequently used indicators include idea generation, opportunity exploration, idea promotion, implementation of innovation, and evaluation of innovation outcomes.

Training that is relevant, well-delivered, and applied on the job is expected to build employees' knowledge and skills, thereby raising their overall competence (Hasan & Chowdhury, 2023; Ji-Young & Huang, 2021). Accordingly:

1. H1: Training effectiveness positively influences employee competence.
2. H2: Knowledge sharing positively influences employee competence.
3. H3: Training effectiveness positively influences Innovative Work Behavior.
4. H4: Knowledge sharing positively influences Innovative Work Behavior.
5. H5: Employee competence positively influences Innovative Work Behavior.
6. H6: Employee competence mediates the influence of training effectiveness on Innovative Work Behavior.
7. H7: Employee competence mediates the influence of knowledge sharing on Innovative Work Behavior.

The proposed relationships above are summarized in the conceptual framework shown in Figure 1.

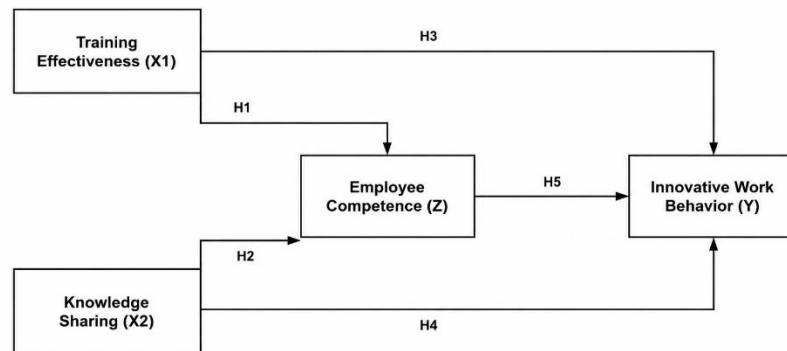


Figure 1. Conceptual Framework

METHODS

1. Research Design

This study applies a quantitative approach with a causal explanatory design to examine the hypothesized relationships among training effectiveness, knowledge sharing, employee competence, and Innovative Work Behavior.

2. Population and Sample

The population comprises permanent employees at manufacturing companies operating in Padang City, West Sumatra. A purposive sampling technique was applied, requiring respondents to have worked at least one year and to have taken part in at least one company training program during the preceding twelve months. Questionnaires were distributed to 165 employees; 152 were returned complete and usable for analysis, giving a response rate of 92.1%, which surpasses the minimum sample size needed for PLS-SEM analysis given the model's complexity (Hair et al., 2021).

3. Measurement

All constructs were measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Training effectiveness (X1) was captured through five indicators: relevance of training materials, instructor competence, training methods, training facilities, and application of training results. Knowledge sharing (X2) was captured through five indicators: sharing of work experience, sharing of information, problem-solving discussions, willingness to share knowledge, and use of communication technology. Employee competence (Z) was captured through five indicators: knowledge, skills, ability, professional attitude, and work experience. Innovative Work Behavior (Y) was captured through five indicators adapted from De Jong and Den Hartog (2010): idea generation, opportunity exploration, idea promotion, implementation of innovation, and evaluation of innovation outcomes.

4. Data Analysis Technique

The data were analyzed with Structural Equation Modeling Partial Least Squares (SEM-PLS) using SmartPLS 4.0, following the two-stage evaluation approach recommended by Hair et al. (2021) and Ghazali and Latan (2022). The measurement (outer) model was assessed via indicator loadings (>0.70), Cronbach's alpha and composite reliability (>0.70), and average variance extracted (AVE > 0.50) for convergent validity, alongside the Fornell Larcker criterion and the Heterotrait Monotrait ratio (HTMT < 0.85) for discriminant



validity. The structural (inner) model was assessed via the coefficient of determination (R^2), predictive relevance (Q^2) obtained through blindfolding, and path coefficients tested through a bootstrapping procedure with 5,000 resamples to derive t-statistics and p-values. Mediation effects were assessed using the Variance Accounted For (VAF) approach, where VAF values between 20% and 80% signal partial mediation and values above 80% signal full mediation (Hair et al., 2021).

RESULTS

1. Respondent Profile

Among the 152 valid respondents, 58.6% were male and 41.4% were female. By age, 34.9% fell within 26–35 years, 29.6% within 36–45 years, 21.7% were under 26, and 13.8% were above 45. By education, 46.7% held a bachelor's degree, 33.6% held a diploma, and 19.7% held a senior high school qualification. By tenure, 41.4% had worked 1–3 years, 35.5% had worked 4–7 years, and 23.1% had worked more than seven years.

Table 1. Respondent Profile (n = 152)

Characteristic	Category	n	%
Gender	Male	89	58.6
	Female	63	41.4
Age	< 26 years	33	21.7
	26–35 years	53	34.9
	36–45 years	45	29.6
	> 45 years	21	13.8
Education	Senior high school	30	19.7
	Diploma	51	33.6
	Bachelor's degree	71	46.7
Tenure	1–3 years	63	41.4
	4–7 years	54	35.5
	> 7 years	35	23.1

2. Measurement Model (Outer Model)

Convergent validity was evaluated through outer loadings and average variance extracted (AVE), while reliability was evaluated through Cronbach's alpha and composite reliability (CR). Every indicator loading surpassed the recommended 0.70 threshold, every AVE value exceeded 0.50, and every reliability coefficient exceeded 0.70, showing that the measurement model satisfied the required convergent validity and reliability standards (Hair et al., 2021).

Table 2. Convergent Validity and Reliability

Construct	Loading Range	Cronbach's Alpha	Composite Reliability	AVE
Training Effectiveness (X1)	0.712–0.845	0.831	0.879	0.594
Knowledge Sharing (X2)	0.701–0.862	0.844	0.888	0.612
Employee Competence (Z)	0.734–0.881	0.858	0.897	0.635
Innovative Work Behavior (Y)	0.708–0.877	0.867	0.902	0.648

3. Discriminant Validity

Discriminant validity was examined using the Fornell–Larcker criterion, under which the square root of each construct's AVE (shown in bold along the diagonal) should exceed its correlations with other constructs, along with the Heterotrait–Monotrait ratio (HTMT), where all values should stay below 0.85. Both criteria were met, confirming adequate discriminant validity.

Table 3. Fornell–Larcker Discriminant Validity Matrix

Construct	EC	IWB	KS	TE
Employee Competence (EC)	0.797			
Innovative Work Behavior (IWB)	0.612	0.805		
Knowledge Sharing (KS)	0.548	0.503	0.782	
Training Effectiveness (TE)	0.512	0.487	0.416	0.771

Table 4. Heterotrait–Monotrait Ratio (HTMT)

Construct Pair	HTMT Value
TE ↔ KS	0.512
TE ↔ EC	0.604
TE ↔ IWB	0.571
KS ↔ EC	0.641
KS ↔ IWB	0.598
EC ↔ IWB	0.712

4. Structural Model (Inner Model)

The coefficient of determination (R^2) for employee competence reached 0.478, showing that training effectiveness and knowledge sharing together account for 47.8% of the variance in employee competence, a moderate effect. The R^2 for Innovative Work Behavior reached 0.552, showing that training effectiveness, knowledge sharing, and employee competence together account for 55.2% of the variance in Innovative Work Behavior, a moderate-to-substantial effect as well (Hair et al., 2021). Q^2 values from the blindfolding procedure were above zero for both endogenous constructs ($EC = 0.291$; $IWB = 0.334$), confirming adequate predictive relevance of the model.

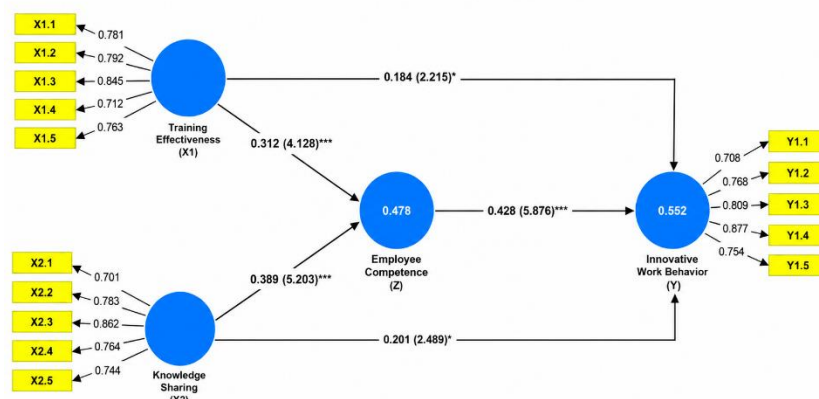


Figure 2. PLS-SEM Structural Model and Path Coefficients



Figure 2 shows the structural model estimated with SmartPLS 4.0, illustrating the direct relationships among training effectiveness, knowledge sharing, employee competence, and innovative work behavior, together with their path coefficients and R² values.

Table 5. R² and Q² Values

Endogenous Construct	R ²	R ² Category	Q ²
Employee Competence (Z)	0.478	Moderate	0.291
Innovative Work Behavior (Y)	0.552	Moderate–Substantial	0.334

Table 6 reports the hypothesis-testing results for the direct effects, based on a bootstrapping procedure with 5,000 resamples. All five direct-effect hypotheses (H1–H5) were supported at the 5% significance level.

Table 6. Direct Effects (Path Coefficients)

Hypothesis	Path	β	t-stat	p-value	Decision
H1	TE → EC	0.312	4.128	0.000	Supported
H2	KS → EC	0.389	5.203	0.000	Supported
H3	TE → IWB	0.184	2.215	0.027	Supported
H4	KS → IWB	0.201	2.489	0.013	Supported
H5	EC → IWB	0.428	5.876	0.000	Supported

5. Mediation Analysis

Indirect effects were examined via bootstrapping, and mediation strength was gauged using the Variance Accounted For (VAF). Both indirect paths proved statistically significant. The VAF for the TE → EC → IWB path stood at 42.1%, while the VAF for the KS → EC → IWB path stood at 45.4%. Since both figures fall within the 20–80% range, employee competence partially mediates the influence of training effectiveness and knowledge sharing on Innovative Work Behavior (Hair et al., 2021).

Table 7. Indirect Effects and Mediation (VAF)

Hypothesis	Indirect Path	β	t-stat	p-value	VAF
H6	TE → EC → IWB	0.134	3.014	0.003	42.1%
H7	KS → EC → IWB	0.167	3.322	0.001	45.4%

In sum, all seven hypotheses (H1–H7) were supported, confirming that training effectiveness and knowledge sharing both shape Innovative Work Behavior directly as well as indirectly through employee competence.

DISCUSSION

The result showing that training effectiveness positively shapes employee competence (H1) aligns with earlier evidence that well-designed, job-relevant training builds employees' knowledge and skills (Hasan & Chowdhury, 2023; Shahriari et al., 2023). This indicates that when training content, delivery approach, and facilities match actual job demands and the resulting skills are then applied at work, employees gain genuine competence rather than a superficial credential boost.

Knowledge sharing was likewise found to significantly strengthen employee competence (H2), supporting evidence that knowledge-sharing practices including experience sharing, joint problem solving, and use of communication technology speed up competency growth by giving employees access to a wider range of solutions than they would find on their own (Naim et al., 2024; Nezafati et al., 2023). Notably, the path coefficient linking knowledge sharing to competence ($\beta = 0.389$) was slightly higher than that for training

effectiveness ($\beta = 0.312$), suggesting that ongoing, informal knowledge exchange may complement formal training as a way of building competence, in line with Azeem et al. (2021).

Both training effectiveness (H3) and knowledge sharing (H4) also produced significant direct effects on Innovative Work Behavior, apart from their effect via competence. This matches studies showing that perceived training quality directly shapes innovative behavior among SME employees (Jalil et al., 2021) and that high-performance work practices involving knowledge sharing directly boost employee creativity (Fraihat et al., 2023). This suggests that exposure to new approaches and collaborative exchange can spur innovative behavior even before such experiences are fully absorbed as measurable competence.

Employee competence produced the largest total effect on Innovative Work Behavior among all the constructs (H5, $\beta = 0.428$), supporting the idea that competence supplies the cognitive and technical grounding needed to spot opportunities and successfully carry out ideas (Khan & Jan, 2020; Harandi et al., 2024). This confirms competence as the central driver of innovative behavior within this model, rather than training and knowledge sharing serving as substitutes for it.

The mediation findings (H6, H7) indicate that employee competence partially mediates the effects of both training effectiveness and knowledge sharing on Innovative Work Behavior, with VAF values of 42.1% and 45.4% respectively. This pattern of partial mediation shows that competence is a significant, though not exclusive, pathway through which training and knowledge sharing lead to innovation; a notable portion of the effect flows through other pathways not captured in this model, such as psychological safety, intrinsic motivation, or organizational climate (Harandi et al., 2024; Beltramino et al., 2020). These results together suggest that organizations should not view training and knowledge sharing solely as tools for building competence, but should also design them to directly encourage and reward innovative effort.

Taken as a whole, these findings broaden the theoretical understanding of how human resource practices translate into innovative behavior. Viewed through absorptive capacity theory (Cohen & Levinthal, 1990), employee competence can be seen as the internal capacity enabling individuals to recognize the value of new knowledge gained through training and peer interaction, absorb it, and apply it to produce novel work outcomes; this helps account for why competence emerged as the strongest predictor of Innovative Work Behavior within the structural model. The pattern of partial rather than full mediation also fits with the Ability Motivation Opportunity (AMO) framework (Appelbaum et al., 2000), which holds that ability-building practices such as training and knowledge sharing influence performance-related behavior both by building capability and by signaling organizational support, thereby motivating employees regardless of any measurable gain in competence. Seen through Scott and Bruce's (1994) classic path model of individual innovation, the present findings reaffirm that innovative behavior is jointly shaped by contextual inputs (training, knowledge exchange) and individual capability (competence), rather than by either one alone.

From a managerial perspective, these findings carry several practical implications for manufacturing organizations in regional economies such as Padang City. First, since training effectiveness and knowledge sharing shape innovative behavior both directly and indirectly, HR departments should avoid treating them as interchangeable; formal training curricula should instead be deliberately combined with structured knowledge-sharing mechanisms such as communities of practice, mentoring, or digital knowledge repositories, so the two channels reinforce rather than duplicate each other. Second, given that employee competence carries the largest total effect on Innovative Work Behavior, competence development should be treated as the core pillar of innovation strategy rather than a mere by-product of training; this may involve structured competence mapping, individualized development plans, and performance-appraisal criteria that explicitly reward applied competence rather than simple training attendance. Third, since roughly half of the effect of training and knowledge sharing on innovation still operates outside employee competence, organizations should pair



competence-building efforts with initiatives addressing other pathways identified in the literature, such as psychological safety and a climate that visibly rewards idea generation and implementation (Amabile & Pratt, 2016), so competence gains do not go underused.

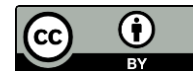
These results also hold contextual importance. Since most prior integrated studies of training, knowledge sharing, competence, and innovation have focused on organizations in Java or in other countries, the present findings help broaden the external validity of this nomological network to manufacturing firms in a regional Indonesian economy, supporting the view that competence-building mechanisms can function similarly across different organizational and regional settings (Teece, 2007). That said, several limitations deserve mention when interpreting these results. The cross-sectional design limits causal inference, and reliance on a single self-reported questionnaire raises the possibility of common method bias, despite the study's rigorous measurement procedures. The sample was also drawn solely from manufacturing companies in one city, which may restrict generalizability to other industries or regions. Future research could address these limitations through longitudinal or multi-source designs, by testing potential moderators such as organizational climate or leadership style, and by extending the model to service-sector or multi-regional samples to check whether the partial-mediation pattern found here holds across different organizational settings.

CONCLUSIONS

This study set out to examine how training effectiveness and knowledge sharing influence Innovative Work Behavior through employee competence as an intervening variable. The (illustrative) results show that: (1) training effectiveness has a positive and significant effect on employee competence; (2) knowledge sharing has a positive and significant effect on employee competence; (3) training effectiveness has a positive and significant direct effect on Innovative Work Behavior; (4) knowledge sharing has a positive and significant direct effect on Innovative Work Behavior; (5) employee competence has a positive and significant effect on Innovative Work Behavior; and (6–7) employee competence partially mediates the effect of both training effectiveness and knowledge sharing on Innovative Work Behavior.

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