International Journal of Economic, Business, Accounting, Agriculture Management and Sharia Administration (IJEBAS)

International Journal of Economics, Business, Accounting, Agriculture Management and Sharia Administration (IJEBAS Journal) | ISSN(e): 2808-4713
Volume 6 No. 3 (2026)

COLLABORATIVE WORK ENVIRONMENT AND INNOVATIVE WORK BEHAVIOR: THE ROLES OF PSYCHOLOGICAL SAFETY AND KNOWLEDGE SHARING

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Received	: 10 March 2026	Accepted	: 30 April 2026
Revised	: 15 March 2026	Published	: 18 May 2026

Abstract

Innovative work behavior is increasingly positioned as a source of excellence for public sector organizations amid service complexity and increasing demands for adaptation. However, the global literature does not fully explain the mechanisms by which collaborative work environments translate into employee innovation in formal, hierarchical technical bureaucracies. This study aims to analyze the influence of collaborative work environments on innovative work behavior through psychological safety and knowledge sharing among employees of the Public Works Department of the Kutai Kartanegara Regency. The study used a quantitative approach with an explanatory survey design on 174 respondents selected through proportionate stratified random sampling and analyzed using PLS-SEM. The findings indicate that collaborative work environments enhance innovative work behavior both directly and through two parallel mediation pathways: psychological safety and knowledge sharing. The theoretical contribution of this study lies in the integration of social exchange theory, psychological safety theory, and the knowledge-based view in explaining employee innovation in technical public organizations, while its practical implications emphasize the importance of cross-disciplinary work design, a culture of safe voice, and knowledge-sharing systems. The main novelty of this study lies in the parallel mediation model that simultaneously tests the psychological and epistemic pathways in the context of public sector technical bureaucracies.

Keywords: Collaborative Work Environment, Innovative Work Behavior, Psychological Safety, Knowledge Sharing, Technical Public Organizations

INTRODUCTION

Innovative work behavior is increasingly positioned as the foundation of organizational adaptability in the face of environmental complexity, digital transformation, and increasing pressure on public services. In the international literature over the past three years, innovative work behavior has been understood not simply as an expression of individual creativity, but as a micro-mechanism linking organizational capacity to process renewal, decision quality, and performance sustainability in an uncertain work environment (Liu et al., 2023; Jin & Peng, 2024; Zargar et al., 2025). In the public sector, this urgency is heightened as organizations are required to generate innovations without compromising accountability, procedural compliance, and service quality. Recent studies have shown that employee innovation in public organizations is strongly influenced by the design of the social work environment, which enables cross-functional interaction, knowledge exchange, and courage to convey new ideas (Lee & Kim, 2024; Pham et al., 2024). This position emphasizes that the key scientific issue at the global level is no longer the importance of employee innovation but rather the organizational conditions that consistently transform social interactions into sustainable innovative behavior.

From a theoretical perspective, the literature still demonstrates an inadequate explanatory mechanism for how collaborative work environments translate into innovative behavior. Recent studies have predominantly identified ethical leadership, inclusive leadership, and individual characteristics as the primary antecedents of innovative work behavior (Liu et al., 2023; Riani & Harsono, 2024; Zargar et al., 2025). Consequently, the collaborative work environment's position as an organizational social resource has not received adequate causal elaboration, particularly when organizations require cross-unit coordination and knowledge-based problem-solving. This gap is further exacerbated by the inconsistency of recent empirical findings in explaining whether

innovation is born primarily through interpersonal security or knowledge flows across employees (Kyambade et al., 2024; Jin & Peng, 2024). This inconsistency suggests that the theory still requires a more integrated model to simultaneously explain both psychological and knowledge pathways so that the relationship between collaboration and innovation extends beyond a superficial, direct association.

A more substantive gap lies in the untested boundary conditions of the theory in technical public organizations. The literature in the past three years has largely examined innovative work behavior in the context of higher education, service organizations, and knowledge-based business organizations (Liu et al., 2023; Kyambade et al., 2024; Zargar et al., 2025). Evidence in technical public organizations with high levels of formalization, bureaucratic structures, and complex operational innovation needs remains limited. In this context, the Public Works Department (PWD) is a relevant arena for testing the boundaries of theory because its work processes demand cross-sector coordination, rapid resolution of field issues, and continuous exchange of technical knowledge. This situation raises a deeper theoretical question: Is a collaborative work environment capable of generating innovative work behavior through psychological safety and knowledge-sharing mechanisms in a relatively formal and high-risk technical bureaucratic setting? This question encourages research to move beyond simple correlational testing to a more rigorous explanation of the causal mechanisms.

Based on this gap, this study formulates a core question: How does a collaborative work environment shape innovative work behavior through psychological safety and knowledge-sharing mechanisms in public technical organizations? This question necessitates theoretical answers at three levels. The first level positions the collaborative work environment as a social resource that strengthens the quality of work interaction. Second, it positions psychological safety as an interpersonal mechanism that explains employees' courage in taking risks with ideas. The third-level positions knowledge sharing as a pathway based on a knowledge-based view that explains the transformation of coordination into innovation (Jin & Peng, 2024; Xu & Wei, 2023). Thus, this model does not replicate old patterns but integrates the logic of social exchange theory, psychological safety theory, and the knowledge-based view into a single dual mediation mechanism that better explains the process of innovative behavior.

The contributions of this study are structured into three explicit layers. The primary theoretical contribution lies in the development of a causal model that positions the collaborative work environment as an organizational antecedent with two distinct but complementary mechanistic pathways: psychological safety and knowledge sharing. The methodological contribution lies in the examination of parallel mediation within a single structural model that allows for the simultaneous evaluation of the relative strengths of the psychological and knowledge pathways. The contextual contribution lies in the examination of the model in an Indonesian public technical organization, which has been relatively underexplored in the global literature on innovative work behavior. Conceptually, this study positions collaboration as a social resource that generates innovation through interpersonal safety and knowledge exchange.

LITERATURE REVIEW

Theoretical basis and position of the construct

Innovative work behavior must be understood as the result of interactions between social resources, psychological states, and knowledge flows, rather than as a stand-alone expression of individual creativity. Recent literature suggests that innovative work behavior develops when organizations provide a work context that allows employees to recognize problems, generate ideas, propose improvements, and implement new solutions continuously (Jin & Peng, 2024; Lee & Kim, 2024; Liu & Sun, 2025). This position demands a theoretical framework that can explain why certain work interactions lead to innovation while others result only in routine coordination. This study integrates social exchange theory, psychological safety theory, and the knowledge-based view, as these three perspectives provide complementary explanations of how collaborative work environments translate into innovative work behavior through measurable psychological and cognitive mechanisms (Cropanzano & Mitchell, 2005; Edmondson & Bransby, 2023; Xu & Wei, 2023). This integration constitutes the article's initial theoretical contribution because it shifts the explanatory focus from a single-antecedent model to a multiple mediation model that better captures the complexity of innovation in public technical organizations. According to social exchange theory, the quality of work relationships characterized by support, trust, and openness creates norms of reciprocity that encourage employees to contribute beyond their formal roles, including through innovative behavior (Cropanzano & Mitchell, 2005). This theory is relevant to explaining why a collaborative work environment not only facilitates coordination but also creates a social obligation to respond to a supportive environment with behaviors that are valuable to the organization.

Simultaneously, psychological safety theory explains that innovation requires a sense of security in taking interpersonal risks, as new ideas always carry the possibility of being rejected, questioned, or perceived as deviating from established work practices (Edmondson & Bransby, 2023). Meanwhile, the knowledge-based view asserts that new knowledge only acquires strategic value when it moves across individuals, is combined, and is transformed into applicable work solutions, making knowledge sharing a core mechanism linking work interactions to innovation formation (Grant, 1996; Xu & Wei, 2023). Thus, a collaborative work environment provides the social context, psychological safety provides the affective conditions, and knowledge sharing provides the cognitive content for the emergence of innovative work behavior.

The collaborative work environment construct in this study is positioned as a working condition characterized by open communication, professional support, cross-functional coordination, participation in problem-solving, and work trust that enables effective task integration. Recent literature shows that a collaborative atmosphere improves the quality of idea exchange and creates more fertile conditions for innovative behavior, particularly when work demands high interdependence and cross-unit learning (Liu & Sun, 2025; Shamout et al., 2025). The construct of psychological safety is understood as the belief that the work environment is safe to ask questions, express ideas, correct processes, and admit mistakes without fear of adverse relational repercussions. Therefore, this construct is a psychological mechanism that transforms social support into courage to act (Edmondson & Peng, 2024; Edmondson & Bransby, 2023). The construct of knowledge sharing is understood as the exchange of information, experience, expertise, and insights that expands an organization's capacity to combine dispersed knowledge into new solutions, thus becoming a cognitive mechanism that channels collaboration toward innovation (Xu & Wei, 2023; Shamout et al., 2025). This formulation demonstrates that the conceptual novelty of this study lies in the simultaneous explanation of two distinct yet complementary mediating pathways.

Collaborative work environment and innovative work behavior

Collaborative work environments theoretically influence innovative work behavior because innovation requires access to diverse information, perspectives, and work experiences that are unlikely to emerge in fragmented work contexts. According to social exchange theory, an open and supportive environment fosters mutual trust and reciprocal obligations, encouraging employees to reciprocate this support through contributions that go beyond routine tasks, including proposing and implementing work innovations (Cropanzano & Mitchell, 2005). At the operational level, collaboration brings together diverse experiences and expertise, making it easier for employees to identify process gaps, formulate alternative solutions and assess the feasibility of implementing new ideas. Therefore, the relationship between collaboration and innovation is not simply a general social relationship but a productive one that expands cognitive and motivational resources for innovative behavior.

Empirical findings from the past three years reinforce this reasoning. A study of educational institutions in Northern China showed that a collaborative atmosphere positively influences innovative work behavior and strengthens the learning process that supports work innovation (Liu & Sun, 2025). Another study showed that collaboration technology and a knowledge-sharing climate increase both productivity and innovative behavior, indicating that the quality of work interactions and an organization's social infrastructure are direct antecedents of employee innovation (Shamout et al., 2025). In public organizations, innovative behavior has also been shown to thrive in contexts that provide an innovative culture and relational conditions that support employee engagement in change (Lee & Kim, 2024). These theoretical arguments and empirical evidence suggest that a collaborative work environment should be positioned as a direct antecedent of innovative work behavior. Therefore, the first hypothesis is as follows:

H1: A collaborative work environment positively influences innovative work behavior.

Collaborative work environment and psychological safety

A collaborative work environment influences psychological safety because effective collaboration requires two-way communication, respect for input, and the legitimacy of members' participation in the work process. In psychological safety theory, a sense of interpersonal safety arises when individuals perceive that the work context does not penalize questions, disagreements, or admitting mistakes, so that active participation is not perceived as a threat to social standing (Edmondson & Bransby, 2023). A collaborative work environment creates these conditions because employees work in interaction patterns that emphasize trust, coordination, and

professional support. Thus, collaboration not only expands work relationships but also lowers the psychological costs of speaking up, proposing ideas and openly evaluating processes.

Recent empirical findings support this conclusion. Jin and Peng's (2024) study showed that team psychological safety positively influences employee innovation through communication behavior, indicating that feeling safe to speak up is a crucial foundation for work innovation. Research in the banking sector also shows that high-quality work relationships positively influence psychological safety, which, in turn, is positively related to knowledge sharing and innovative behavior (Abbas et al., 2024). This evidence confirms that psychological safety is not a spontaneously emerging individual trait but is shaped by the quality of the social work environment. In the context of technical public organizations, this logic is particularly relevant because employees must feel safe raising issues, criticizing procedures, and offering alternative solutions. Based on these arguments, the second hypothesis is formulated as follows:

H2: A collaborative work environment positively affects psychological safety.

Collaborative work environment and knowledge sharing

A collaborative work environment influences knowledge sharing because, in the knowledge-based view, the strategic value of knowledge lies not in individual ownership but in the organization's ability to channel and integrate it into work processes. When the work environment is characterized by open communication, trust, and good coordination, relational barriers to sharing experiences, expertise, and information are lower (Grant, 1996; Xu & Wei, 2023). Collaboration also creates social incentives for mutual assistance, as task completion is not understood as an isolated individual effort but as the result of integrating cross-functional contributions. Therefore, a collaborative environment increases the frequency of interactions and opportunities for meaningful knowledge exchange.

Recent empirical evidence supports this. Liu and Sun (2025) demonstrated that a collaborative climate positively influences knowledge sharing and that this mechanism serves as an important bridge to innovative work behavior . Shamout et al. (2025) also demonstrated that collaborative technology creates a knowledge-sharing climate that contributes to innovative behavior and employee productivity. Transformational studies in higher education also demonstrate that knowledge sharing plays a crucial role in creating healthier and more innovative work environments (Saif et al., 2024). Thus, the relationship between a collaborative work environment and knowledge sharing has a strong theoretical and empirical basis, particularly in technical work contexts that require intensive coordination and the exchange of solutions. Therefore, the third hypothesis is formulated as:

H3: A collaborative work environment has a positive effect on knowledge sharing.

Psychological safety and innovative work behavior

Psychological safety influences innovative work behavior because innovation requires the courage to take interpersonal risks. Employees need to feel safe to express immature ideas, question established procedures, and admit the possibility of errors when trying new approaches. In psychological safety theory, this sense of safety broadens participation, enhances learning, and reduces defensive tendencies, making employees more willing to engage in activities that require exploration and experimentation (Edmondson & Bransby, 2023). Psychological safety functions as psychological energy that transforms thinking skills into the courage to act. Without this sense of safety, creativity tends to stall at the cognitive level and does not develop into actual innovation.

Empirical findings over the past three years have consistently supported this. Jin and Peng (2024) demonstrated that team psychological safety enhances employee innovative performance through communication behavior, demonstrating that feeling safe to speak up is a crucial mechanism for fostering innovation. Another study found that psychological safety is positively related to innovative work behavior and explained how socially responsible leadership translates into innovation in public universities (Kyambade et al., 2024). In other sectors, psychological safety has also been shown to be positively related to discretionary behaviors such as innovative work and knowledge-sharing behaviors (Abbas et al., 2024). This body of evidence confirms that psychological safety is an important antecedent of innovative work behavior. Based on these arguments, the fourth hypothesis is formulated as follows:

H4: Psychological safety has a positive effect on innovative work behavior.

Sharing knowledge and innovative work behavior

Knowledge sharing influences innovative work behavior because innovation relies on the ability to combine dispersed knowledge into new job-relevant solutions. In the knowledge-based view, value creation occurs when information, experience, and expertise move across individual boundaries and are transformed into higher-order problem-solving capacities (Grant, 1996; Xu & Wei, 2023). Knowledge sharing broadens the information base that employees use to identify opportunities, refine ideas, and assess the feasibility of implementation. Therefore, this mechanism increases the quantity of ideas and the quality and practical utility of the resulting innovations.

Recent empirical findings support this hypothesis. Liu and Sun (2025) demonstrated that knowledge sharing directly enhances innovative work behavior and serves as a crucial bridge between a collaborative climate and workplace innovation. A theoretical review by Xu and Wei (2023) confirmed that knowledge sharing and intellectual capital are essential foundations of employee innovative behavior. Findings from Vietnam's IT sector also indicate that knowledge sharing influences innovative work behavior, even when the relationship is tested in conjunction with more flexible work arrangements (Nguyen et al., 2024). In technical public organizations, the implications are even stronger because procedural and technical innovation relies heavily on the exchange of field experience and job-specific knowledge. Based on these arguments, the fifth hypothesis is formulated as follows:

H5: Knowledge sharing has a positively affects work work behavior.

The mediating role of psychological safety

The mediating role of psychological safety can be explained by the logic that a collaborative work environment does not automatically generate innovative behavior simply because employees work together. Collaboration only translates into innovation when employees perceive the context as a safe space to express ideas, correct processes, and experiment with new approaches. From this perspective, a collaborative work environment functions as a social resource, while psychological safety becomes the psychological mechanism that transforms these resources into the courage to act (Edmondson & Bransby, 2023). This pathway is conceptually important because it explains why seemingly supportive work environments sometimes result only in administrative coordination and not always in innovation. Innovation requires more than just interaction. Innovation requires interaction, which is translated into a sense of safety when taking interpersonal risks.

Recent empirical evidence suggests that psychological safety serves as a bridge between the social context of work and innovative behavior. Jin and Peng (2024) demonstrated that psychological safety enhances innovation through communication behavior. Kyambade et al. (2024) demonstrated that psychological safety also mediates the relationship between responsible leadership and innovative work behavior. Abbas et al. (2024) strengthen this argument by demonstrating that psychological safety fully mediates the relationship between the quality of work relationships and various discretionary behaviors, including innovation. When H2 and H4 are placed in a single causal pathway, it is reasonable to argue that the influence of a collaborative work environment on innovative work behavior will operates through increased psychological safety. Therefore, the sixth hypothesis is formulated as:

H6: Psychological safety mediates the influence of a collaborative work environment on innovative work behavior.

The role of knowledge sharing mediation

The mediating role of knowledge sharing can be explained by the argument that collaborative work environments generate innovation not solely because of the quality of social relationships but also because these relationships create knowledge flows that enrich employees' problem-solving capacity. From the knowledge-based perspective, collaboration provides the structural conditions for knowledge exchange, while knowledge sharing serves as a cognitive mechanism that transforms interactions into work innovation (Grant, 1996; Xu & Wei, 2023). This pathway demonstrates that the relationship between collaboration and innovation is epistemic. That is, collaborative work environments only become productive for innovation when they enable employees to share experiences, expertise, and ideas that can be combined into new solutions.

Empirical findings from the past three years support this mediation pathway. Liu and Sun (2025) demonstrated that knowledge sharing mediates the relationship between collaborative climate and innovative work behavior . Shamout et al. (2025) also demonstrated that a knowledge-sharing climate is an important channel that explains the influence of technology and collaborative contexts on innovative behavior. Xu and

Wei's (2023) review reinforces this position by asserting that knowledge sharing is a crucial condition for shaping employee innovative behavior. By combining H3 and H5, this study confirms that the influence of a collaborative work environment on innovative work behavior operates not only through psychological channels but also through knowledge channels that enhance the quality of ideas and the implementation of innovations. Therefore, the seventh hypothesis is formulated as follows:

H7: Knowledge sharing mediates the effect of collaborative work environment on innovative work behavior.

METHOD

Research design

This study uses a quantitative approach with an explanatory survey design to examine the causal relationships between collaborative work environment, psychological safety, knowledge sharing, and innovative work behavior. This design was chosen because the research model was built from directional hypotheses, involved reflective latent constructs, and required simultaneous testing of direct and indirect influences within a single analytical framework. Methodological literature from the past three to five years confirms that an explanatory quantitative design is highly appropriate when the research objective is to estimate the strength of relationships between constructs, test the consistency of theoretical models, and explain causal mechanisms based on standardized survey data (Hair & Alamer, 2022; Slater et al., 2025).

The theoretical justification for this design is further strengthened by the conceptual model of the study, which posits two parallel mediators: psychological safety and knowledge sharing. Therefore, an analytical strategy capable of simultaneously capturing causal mechanisms rather than simply associations is required. In the context of a prediction-oriented model and testing of mediation paths, partial least squares structural equation modeling is an appropriate choice because it can evaluate complex models, assess the explanatory power of endogenous constructs, and test the stability of path coefficients and indirect effects (Hair et al., 2024). This framework aligns with the research objective of explaining how a collaborative work environment translates into innovative work behavior through psychological and cognitive mechanisms.

Population, sampling techniques, and sample size

The study population consisted of 316 employees of the Public Works Department of Kutai Kartanegara Regency, spread across the Secretariat, Highways, Water Resources, Human Settlements, Construction, and Technical Implementation Units (UPT). This population structure indicates high heterogeneity in work functions; therefore, representation in each unit is important so that the empirical model truly reflects the dynamics of collaboration, psychological safety, knowledge sharing, and innovation in technical public organizations. Based on the research data, the final sample size was 174 respondents, determined proportionally based on the work units.

The sampling technique used was proportionate stratified random sampling. This technique is appropriate because the population consists of subgroups that differ in the number of personnel and task characteristics; therefore, each stratum must be represented proportionally. Recent methodological literature confirms that stratified random sampling improves estimation precision, maintains subpopulation representation, and reduces sampling bias in heterogeneous populations (Ahmed 2024). Thus, the sampling decisions in this study were not only technical but also strengthened the external validity of the results.

A sample size of 174 respondents is also sufficient for PLS-SEM analysis because this approach is designed to handle complex models with a predictive focus, including moderate sample sizes and data that are not always normally distributed. Recent methodological guidelines emphasize that sample adequacy in PLS-SEM is determined by model complexity, the number of paths to the endogenous construct, and the stability of the path coefficient estimates (Hair & Alamer, 2022; Hair et al., 2024). In this research model, 174 respondents were sufficient to stably estimate direct effects and parallel mediation.

Measurement instruments, scale sources, and adaptation processes

The research instrument was developed as a closed-ended questionnaire using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). All items addressed employee perceptions of the actual working conditions in the organization. Innovative work behavior, psychological safety, knowledge sharing, and collaborative work environment were measured using six, five, five, and six indicators, respectively.

The measurement in this study does not adopt a single scale in its entirety but uses a construct-domain specification approach. This means that indicators are compiled based on conceptual domains from several primary sources relevant to each construct and then adapted to the context of technical public organizations. The innovative work behavior construct refers to the domains of Lukes and Stephan, De Spiegelaere and Anderson. The psychological safety construct refers to the domains of feeling safe to express opinions, ask questions, admit mistakes, take interpersonal risks, and provide relational support. The knowledge-sharing construct refers to sharing information, experiences, expertise, ideas, and knowledge-based assistance. The collaborative work environment construct refers to open communication, co-worker support, task coordination, decision-making participation, work trust, and the use of collaborative technology.

The instrument adaptation process was carried out in three stages: construct domain mapping, item wording adjustments, and content suitability checks before distributing the questionnaire. Instrument adaptation literature confirms that cross-context measurement quality is largely determined by semantic equivalence, content relevance, and contextual intelligibility (Benlidayi, 2024; Cruchinho et al., 2024). Therefore, adapting items to the context of Public Works Department employees is a crucial step to ensure that each indicator remains true to the theoretical domain and is easily understood by respondents.

Validity and reliability test

The measurement model was evaluated using convergent validity, internal reliability, and discriminant validity tests. Recent PLS-SEM literature recommends that the reflective model be examined first through outer loadings, then composite reliability and average variance extracted, and then discriminant validity using the Fornell–Larcker criteria (Hair & Alamer, 2022; Hair et al., 2024). he results showed that all indicators had outer loadings above 0.70. For the innovative work behavior construct, the values ranged from 0.804 to 0.875. For psychological safety, the values ranged from 0.806 to 0.874. For knowledge sharing, the values ranged from 0.819 to 0.855. For the collaborative work environment, the values ranged from 0.780 to 0.862. These values indicate that all indicators adequately represent their respective constructs. Internal reliability also yielded excellent results. Cronbach's alpha values were 0.895 for psychological safety, 0.886 for knowledge sharing, 0.902 for collaborative work environment, and 0.912 for innovative work behavior, respectively. The composite reliability values were 0.923, 0.917, 0.925, and 0.932, respectively. According to the latest methodological guidelines, this pattern indicates strong internal consistency and a suitable scale for structural testing (Hair et al. 2024). Convergent validity was met because all average variance extracted values were above 0.50, namely 0.705 for psychological safety, 0.688 for knowledge sharing, 0.671 for collaborative work environment, and 0.694 for innovative work behavior. Discriminant validity using the Fornell–Larcker criterion is also met because the square root of the AVE on the main diagonal is higher than the correlation between constructs, such that each construct has adequate empirical uniqueness.

Evaluation of the structural model

Structural model evaluation was conducted after the measurement model met the psychometric requirements. This stage included checking for multicollinearity, estimating path coefficients, bootstrapping for t-values, assessing R-squared, and evaluating effect sizes. The PLS-SEM literature emphasizes that structural models should be assessed based on path significance, explanatory power, and predictive relevance (Hair and Alamer, 2022; Hair et al., 2024). The results of the study show that all VIF values are below 2.00, indicating that the model is free from multicollinearity. The path coefficient shows that the influence of the collaborative work environment on innovative work behavior is 0.334, with $t = 4.434$. The influence on psychological safety was 0.518, with $t = 9.666$. The influence on knowledge sharing is 0.561, with $t = 10.274$. The influence of psychological safety on innovative work behavior was 0.276 ($t = 4.268$). The influence of knowledge sharing on innovative work behavior is 0.239, with $t = 3.725$. All relationships were significant at $p < 0.001$.

In the indirect pathway, psychological safety mediates the relationship between a collaborative work environment and innovative work, with a coefficient of 0.143 and $t = 4.119$. Knowledge sharing also mediates the same relationship, with a coefficient of 0.134 and $t = 3.449$. These results confirm that the influence of a collaborative work environment on innovative work behavior operates through two parallel mechanisms: the psychological and knowledge pathways. The model's explanatory power was adequate. The R-squared value is 0.268 for psychological safety, 0.315 for knowledge sharing, and 0.475 for innovative work behavior. These values indicate that almost half of the variance in employee innovation can be explained by the collaborative work environment, psychological safety, and knowledge sharing simultaneously. The effect sizes also show a

large influence of the collaborative work environment on psychological safety (0.367) and knowledge sharing (0.460), as well as a small but significant influence on the pathway to innovative work behavior.

Data analysis procedures and software

Data analysis was performed using SmartPLS software. This software was chosen for the research objectives because SmartPLS is designed for variance-based SEM, supports complex model testing, and provides integrated procedures for evaluating measurement models, structural models, and bootstrapping (Hair et al., 2024). Procedurally, the analysis progresses from data coding, response quality checks, reflective model estimation, validity and reliability evaluation, and direct and mediation hypothesis testing. This sequence ensures that the interpretation of structural relationships occurs only after the measurement quality has been determined to be adequate. Thus, the research methodology demonstrates strong coherence between the design, sampling strategy, instrument construction, and analysis techniques, building the article's theoretical contributions on a sound empirical basis.

RESULTS AND DISCUSSION

Demographic profile of respondents

Respondent demographic profiles are presented to demonstrate the sample's basic characteristics and ensure that the model results are interpreted in the appropriate organizational context. In SEM-based quantitative research, respondent descriptions remain important because they provide a basis for reading the empirical context, especially when the constructs being tested relate to perceptions, work experiences, and relational dynamics within the organization (Hair et al., 2025; Hair et al., 2024). The composition of this study's sample shows a fairly diverse distribution of respondents in terms of gender, age, education, length of service, and work unit, so that the tested model has an adequate empirical basis to represent the conditions of employees of the Public Works Department of Kutai Kartanegara Regency.

Table 1. Demographic profile of respondents

Demographic variables	Category	Frequency	Percentage (%)
Gender	Man	130	74.7
	Woman	44	25.3
Age	< 30 years	23	13.2
	30–39 years	48	27.6
	40–49 years	64	36.8
	≥ 50 years	39	22.4
last education	High School	21	12.1
	D3	36	20.7
	S1	90	51.7
	S2	27	15.5
Years of service	< 5 years	30	17.2
	5–10 years	49	28.2
	11–15 years	42	24.1
	> 15 years	53	30.5
Work unit	Secretariat	40	23.0
	Highways	38	21.8
	Water Resources	34	19.5
	Creative Works	32	18.4
	Construction Development	24	13.8
	UPT	6	3.4

The composition of respondents showed a predominance of male employees, aged 40 to 49, bachelor's degree graduates, and employees with more than 15 years of service. This pattern indicates that the sample was dominated by employees in their career maturity phase with relatively strong organizational experience. In organizational behavior research, this is important because perceptions of collaboration, psychological safety, and knowledge sharing tend to be more stable when respondents have been involved in the organization's work routines and structures for a considerable period of time (Hair & Alamer, 2022; Slater et al., 2025). The

representation of all work units also strengthened the analytical scope because the relationships between variables were tested across various administrative and technical functions.

Evaluation of the measurement model

A measurement model evaluation was conducted to ensure that all indicators represent the latent constructs validly and reliably before interpreting the structural analysis. In the PLS-SEM approach, this evaluation includes outer loading, internal reliability, convergent validity, and discriminant validity, as measurement quality is a prerequisite for accurate causal inference (Hair & Alamer, 2022; Hair et al., 2024). Therefore, good measurement results indicate that the model is not only statistically significant but also psychometrically sound.

Table 2. Results of outer loading , reliability, and convergent validity

Construct	Indicator code	Outer loading	Cronbach's alpha	Composite reliability	AVE
Innovative work behavior	Y1	0.875	0.912	0.932	0.694
	Y2	0.816			
	Y3	0.814			
	Y4	0.830			
	Y5	0.857			
	Y6	0.804			
Psychological safety	M11	0.874	0.895	0.923	0.705
	M12	0.865			
	M13	0.817			
	M14	0.806			
	M15	0.834			
Sharing knowledge	M21	0.855	0.886	0.917	0.688
	M22	0.831			
	M23	0.821			
	M24	0.819			
	M25	0.820			
Collaborative work environment	X1	0.862	0.902	0.925	0.671
	X2	0.812			
	X3	0.780			
	X4	0.800			
	X5	0.852			
	X6	0.807			

All indicators had outer loadings above 0.70; therefore, all items were retained in the model. Recent methodological literature suggests that indicators with outer loadings above 0.70 demonstrate good reliability because the proportion of variance explained by the construct is greater than the measurement error (Hair & Alamer, 2022; Hair et al., 2024). In this study, the strongest indicator of innovative work behavior was the ability to recognize problems and opportunities, while the strongest indicator of a collaborative work environment was open communication. This pattern suggests that employee work innovation lies in sensitivity to the need for change, whereas collaboration lies in the quality of communication between employees.

The internal reliability of all constructs was also strong. All Cronbach's alpha values were above 0.80, and all composite reliability values were above 0.90. The AVE values for all constructs also exceeded the 0.50 threshold value. Within the PLS-SEM framework, these results indicate that each construct has high internal consistency and adequate convergent validity, indicating that the indicators within each construct truly capture the same conceptual domain (Hair et al., 2024). Thus, the measurement model met the criteria for further examination of discriminant validity and the structural model.

Table 3. Results of discriminant validity with the Fornell–Larcker Criterion

Construct	M1	M2	X	Y
M1 Psychological safety	0.840			
M2 Sharing knowledge	0.345	0.829		
X Collaborative work environment	0.518	0.561	0.819	
Y Innovative work behavior	0.531	0.521	0.611	0.833

Discriminant validity demonstrated adequate results, as all AVE values on the main diagonal were higher than the inter-construct correlations. According to the reflective model evaluation guidelines, this indicates that each construct has sufficient empirical uniqueness and does not overlap excessively with other constructs (Hair & Alamer, 2022; Hair et al., 2024). In other words, the collaborative work environment, psychological safety, knowledge sharing, and innovative work behavior represent distinct, albeit interrelated, concepts within the model.

Evaluation of the structural model

Structural model evaluation was conducted to assess the model's explanatory power, the strength of the influence between variables, and the quality of the resulting predictions. In the PLS-SEM approach, this evaluation is carried out using the R-squared value, effect size or f-squared, multicollinearity test, model fit index, and bootstrapping path coefficients (Hair & Alamer, 2022; Hair et al., 2024). This analysis is important because statistical significance is only meaningful when the model can also explain the phenomenon under study.

Table 4. R-squared results

Endogenous variables	R-squared	R-squared adjusted	Category
Psychological safety	0.268	0.264	Weak to moderate
Sharing knowledge	0.315	0.311	Moderate
Innovative work behavior	0.475	0.466	Moderate

The R-squared value indicates that the collaborative work environment explains 26.8 percent of the variation in psychological safety and 31.5 percent of the variation in knowledge sharing. When all three predictors were analyzed simultaneously, the model explained 47.5 percent of the variation in innovative work behavior. The PLS-SEM literature suggests that these values are adequate for organizational behavior research, especially when endogenous constructs are influenced by numerous, inherently complex social and psychological factors (Hair et al., 2024). Thus, the model has sufficient explanatory power to support the interpretation of the tested causal relationships.

Table 5. Effect size and multicollinearity results

Path of influence	f-squared	Effect categories	VIF	Information
X → M1	0.367	Big	1,000	There is no multicollinearity
X → M2	0.460	Big	1,000	There is no multicollinearity
X → Y	0.120	Small	1,768	There is no multicollinearity
M1 → Y	0.105	Small	1,375	There is no multicollinearity
M2 → Y	0.074	Small	1,468	There is no multicollinearity

Effect size analysis shows that the largest influence in the model comes from the collaborative work environment on psychological safety and knowledge sharing. This indicates that the quality of work collaboration plays a significant role in shaping employees' psychological well-being and knowledge flow. Conversely, the direct and indirect effects on innovative work behavior were small but substantial. In behavioral research, small effects remain significant when the construct being tested represents complex behavior and is influenced by many determinants (Hair et al., 2024). All VIF values were well below the threshold of 5.00, indicating that the model was free from multicollinearity issues.

Table 6. Model fit results

Fit indicator	Saturated model	Estimated model	Interpretation
SRMR	0.054	0.055	Good
d_ULS	0.725	0.752	Good
d_G	0.302	0.301	Good
Chi-square	299,474	297,591	Adequate
NFI	0.884	0.885	Very good

An SRMR value of 0.055 indicates that the model has a low residual value and a good fit with empirical data. An NFI value close to 1 indicates an excellent model fit. Within the PLS-SEM evaluation framework, this pattern indicates that the relationship structure constructed in the model is sufficiently representative to explain the covariance patterns between constructs (Hair et al., 2024). Thus, the structural model is suitable for testing the hypotheses.

4.4 Hypothesis testing

Hypothesis testing was conducted using a bootstrapping procedure to obtain the path coefficients, t-statistics, and p-values. In PLS-SEM, a relationship is considered significant if the t-value is greater than 1.96 and the p-value is less than 0.05 at the 5 percent significance level (Hair & Alamer, 2022; Hair et al., 2024). Based on these criteria, all hypotheses in this study were supported.

Table 7. Results of hypothesis testing

Hypothesis	Track	Coefficient	t-statistics	p-value	Decision
H1	X → Y	0.334	4,434	0,000	Accepted
H2	X → M1	0.518	9,666	0,000	Accepted
H3	X → M2	0.561	10,274	0,000	Accepted
H4	M1 → Y	0.276	4,268	0,000	Accepted
H5	M2 → Y	0.239	3,725	0,000	Accepted
H6	X → M1 → Y	0.143	4,119	0,000	Accepted
H7	X → M2 → Y	0.134	3,449	0.001	Accepted

The first hypothesis was accepted. A collaborative work environment has a positive and significant effect on innovative work behavior, with a coefficient of 0.334 and a t-value of 4.434. These results indicate that the better the open communication, coworker support, task coordination, decision-making participation, work trust, and use of collaborative technology, the higher the tendency of employees to recognize problems, generate new ideas, and implement work innovation. Methodologically, this relationship is strong enough to indicate that collaboration serves not only as a social context but also as a direct driver of innovation (Hair et al., 2024).

The second hypothesis was accepted as true. A collaborative work environment had a positive and significant effect on psychological safety, with a coefficient of 0.518 and a t-value of 9.666. This is one of the strongest paths in our model. These results indicate that when employees work in a communicative and supportive atmosphere, their sense of safety in expressing opinions, asking questions, and admitting mistakes increases significantly. This pattern demonstrates that work collaboration is a crucial foundation for establishing a healthy psychological environment in an organization.

The third hypothesis is accepted. A collaborative work environment has a positive and significant effect on knowledge sharing, with a coefficient of 0.561 and a t-value of 10.274. This path had the strongest influence on the model. These findings indicate that good collaboration encourages a more intensive exchange of information, experiences, technical expertise, and new ideas. In other words, a collaborative work environment strongly triggers knowledge flow within an organization.

The fourth hypothesis is accepted. Psychological safety has a positive and significant effect on innovative work behavior, with a coefficient of 0.276 and a t-value of 4.268. These results indicate that employees who feel safe speaking up and trying new approaches are more likely to engage in innovative behavior. Within the organizational behavior framework, psychological safety increases the likelihood of new ideas emerging and being implemented because of lower interpersonal barriers.

The fifth hypothesis is accepted. Knowledge sharing had a positive and significant effect on innovative work behavior, with a coefficient of 0.239 and a t-value of 3.725. These findings indicate that the exchange of information and work experience helps employees improve the quality of solutions and accelerates the implementation of new ideas. These results also demonstrate that employee innovation does not exist in isolation but is highly dependent on the knowledge that flows between the organizational members.

The sixth hypothesis was supported. Psychological safety mediated the effect of a collaborative work environment on innovative work behavior, with an indirect coefficient of 0.143 and a t-value of 4.119. These results indicate that collaboration partially influences innovation by increasing psychological safety. This means that collaboration not only directly impacts innovation but also creates a mental state that makes employees more willing to innovate.

The seventh hypothesis was accepted. Knowledge sharing mediates the effect of a collaborative work environment on innovative work behavior, with an indirect coefficient of 0.134 and a t-value of 3.449. These results indicate that some of the influence of collaboration on innovation also operates through knowledge exchange. Thus, the research model confirms the existence of two parallel mediation pathways, namely the psychological and knowledge pathways, which explain how a collaborative work environment translates into innovative work behavior.

DISCUSSION

The influence of collaborative work environment on innovative work behavior

Research findings indicate that a collaborative work environment directly enhances employees' IWB. These results confirm that work innovation does not arise solely from individual capacity but from the quality of social interactions that enable the exchange of perspectives, cross-functional coordination, and active involvement in problem-solving. Liu and Sun (2025) demonstrated that a collaborative atmosphere is positively related to innovative work behavior because such an environment expands opportunities for shared learning and the generation of new solutions. Shamout et al. (2025) also demonstrated that a technology-enhanced collaborative context supports employees' innovative behavior by streamlining work coordination and responsiveness. In the public sector, Lee and Kim (2024) asserted that innovative behavior grows stronger when employees work within an organizational culture perceived as supportive of innovation. Therefore, these findings strengthen the position of a collaborative work environment as a relevant organizational antecedent of employee innovation.

From a theoretical perspective, these results extend the explanation of social exchange theory from general reciprocity to a technical work context that demands cross-sectoral coordination. These findings suggest that employees do not simply reciprocate social support with prosocial behavior but with innovative behavior that has strategic value for the organization. In other words, reciprocity in technical public organizations can take the form of work process reform rather than just compliance or commitment. The managerial implications of this study are clear. Leaders must establish cross-sector forums, strengthen horizontal communication, and reduce bureaucratic barriers that cause employees to work in silos. In the context of the Public Works Department, this is crucial because road, drainage, building, and project oversight issues can rarely be resolved within a single work unit. These findings also demonstrate that the technical bureaucratic context does not negate the effectiveness of collaboration theory but rather challenges it in a more rigorous setting.

The role of a collaborative work environment in shaping psychological safety

The following findings indicate that a collaborative work environment significantly improves employees' psychological safety. These results align with the growing body of literature that positions psychological safety as an outcome of the quality of the social context of work, not simply individual disposition. Edmondson and Bransby (2023) assert that psychological safety increases when work interactions provide a safe space for voice, inquiry, and experimentation. Jin and Peng (2024) demonstrate that team safety is closely linked to communication behaviors that support innovation. Abbas et al. (2024) also demonstrate that the quality of work relationships enhances psychological safety while simultaneously strengthening employee discretionary behavior. These findings reinforce the theory that authentic collaboration fosters interpersonal safety, which serves as the foundation for adaptive behavior.

The theoretical contribution of these results lies in extending psychological safety theory to structurally more formal and hierarchical public technical organizations in China. Many previous studies have demonstrated the role of psychological safety in teams in business, education, and knowledge-based companies. However, these results demonstrate that similar mechanisms operate within regional bureaucracies. This means that a communicative, supportive, and participatory environment can foster a sense of psychological safety even in organizations with a high degree of formality. The managerial implication is that leaders must not only encourage collaboration but also structure the way interactions occur, particularly in technical meetings, project evaluations, and the delivery of feedback. A culture that punishes mistakes or shames employees hinders

psychological safety, whereas a culture that fosters feedback strengthens it. These results demonstrate that the research context challenges the limits of theory and shows that psychological safety can still be built within public technical organizations when collaboration is truly functional.

The role of a collaborative work environment in encouraging knowledge sharing

Research findings also indicate that collaborative work environments significantly enhance knowledge sharing. These results support the logic of the knowledge-based view, which positions knowledge as a strategic resource whose value emerges when it moves across individuals and work units. Liu and Sun (2025) demonstrated that a collaborative climate enhances knowledge sharing and that these relationships are crucial for the formation of innovative behavior. Shamout et al. (2025) also found that collaborative technology creates a knowledge-sharing climate that strengthens innovative behavior and employee productivity. Saif et al. (2024) demonstrated that knowledge sharing remains a crucial pathway for explaining how work context and leadership translate into innovation. These findings reinforce the view that collaboration is not merely a relational environment but also a social infrastructure for knowledge flow.

The theoretical contribution of these results lies in strengthening the relationship between collaboration and knowledge sharing in public technical organizations. Until now, this relationship has been more often demonstrated in the higher education sector, service companies, and more flexible private organizations. This study shows that even in technical bureaucracies, when employees experience open communication, work trust, and strong task coordination, knowledge tends to flow better. The policy implication is that organizations must establish technical documentation systems, project learning forums, and mechanisms for sharing best practices across disciplines. In public works organizations, unshared knowledge remains trapped within specific individuals or units, thereby missing out on innovative opportunities. These findings also expand the boundaries of theory by demonstrating that knowledge sharing does not depend solely on an organic culture but can also be fostered within bureaucratic structures if collaboration is effective and encouraged.

The influence of psychological safety on innovative work behavior

The research findings indicate that psychological safety enhances employees' innovative work behavior. This finding is highly consistent with the recent literature that places psychological safety as a prerequisite for innovation because new ideas always carry interpersonal risks. Jin and Peng (2024) demonstrated that team psychological safety enhances innovative performance through communication behavior. Kyambade et al. (2024) also found that psychological safety is positively related to innovative work behavior and is an important mechanism for explaining how leadership translates into innovation. Thus, the results of this study strengthen the theory that the courage to ask questions, express ideas, and admit mistakes is the actual foundation of work innovation.

Theoretically, these results not only strengthen the existing theory but also extend it to the setting of technical public organizations. In formal bureaucracies, innovation is often assumed to be primarily determined by rules and structural resources. The findings of this study suggest that psychological well-being remains central even when work is highly technical and regulatory. This means that innovation in the public sector cannot be explained solely by organizational design but also by employees' interpersonal courage to speak up and experiment. The managerial implication is that leaders need to foster a non-repressive evaluation climate, allow technical questions, and treat mistakes as learning opportunities. If organizations want innovation to thrive, employees must feel safe not always getting it right the first time. Therefore, the context of this study tests the limits of theory and demonstrates that psychological safety remains relevant in compliance-oriented technical organizations.

The influence of knowledge sharing on innovative work behavior

Research findings indicate that knowledge sharing enhances innovative work behavior. These results support the view that innovation results from knowledge integration, not isolated individual thinking. Xu and Wei (2023) emphasized that knowledge sharing and intellectual capital are essential foundations for employee innovative behavior. Liu and Sun (2025) demonstrated that knowledge sharing is not only a consequence of a collaborative climate but also a pathway that enhances innovative work behavior . Saif et al. (2024) also demonstrated that knowledge sharing is positively related to innovation in higher education. These findings reinforce the theory that mobile knowledge enriches the quality of ideas, accelerates problem-solving, and increases the chances of innovation implementation.

The theoretical contribution of these findings lies in strengthening the knowledge-based view in the context of technical public-sector organizations. This study shows that the value of knowledge in technical bureaucracies does not stop at documentation or individual expertise but becomes a source of innovation when it is actively shared. These findings expand the argument that knowledge sharing is not merely a supportive behavior but rather a core mechanism that bridges coordination and innovation. The policy implications of this study are concrete. Organizations need to develop knowledge repositories, after-action reviews, field case discussions, and inter-project learning. In the Public Works Department, knowledge about design, implementation, supervision, and problem-solving in the field must be transformed into organizational assets rather than stored as individual experiences. Thus, the results of this study confirm that technical innovation requires a stable and structured knowledge flow.

The mediating role of psychological safety in the relationship between collaborative work environment and innovative work behavior

Research findings indicate that psychological safety mediates the influence of a collaborative work environment on innovative behavior. This finding is significant because it suggests that collaboration does not automatically translate into innovation without first establishing a sense of interpersonal safety within the group. Edmondson and Bransby (2023) assert that psychological safety is a mechanism that enables social interactions to translate into learning, voices, and experimentation. Jin and Peng (2024) demonstrate that team safety fosters communication, which subsequently enhances innovation. Kyambade et al. (2024) also found that psychological safety is a crucial pathway between social antecedents and innovative behavior. These findings demonstrate that the relationship between collaboration and innovation operates partly through the transformation of social context into psychological courage.

The theoretical contribution of these findings is explicit. This study extends collaboration theory by demonstrating that the innovative value of collaborative work environments lies in their ability to create psychological safety. These findings also clarify a mechanism often left implicit in many studies: collaboration is not simply understood as working together but rather as creating safe conditions for voicing innovation. The managerial implication is that collaboration policies must be designed in conjunction with psychological safety ones. Cross-disciplinary forums without a culture of safety produce only formal coordination, not innovation. In the context of a technical public organization, these findings test the limits of theory by demonstrating that even in bureaucratic work environments, collaboration can generate innovation when accompanied by a sense of safety in speaking up and experimenting.

The mediating role of knowledge sharing in the relationship between collaborative work environment and innovative work behavior

The research findings indicate that knowledge sharing mediates the influence of a collaborative work environment on innovative work behavior. These results indicate that collaboration generates innovation not only because of good social relationships but also because these relationships create knowledge flows that enrich problem-solving. Liu and Sun (2025) found that knowledge sharing bridges the gap between a collaborative climate and innovative work behavior . Shamout et al. (2025) also demonstrated that a knowledge-sharing climate is an important mechanism for explaining the relationship between a collaborative context and innovative behavior. Therefore, the results of this study strengthen the knowledge-based view by demonstrating that the value of collaboration for innovation lies in its ability to mobilize knowledge to create new products.

In terms of theoretical contribution, these findings confirm that the relationship between collaboration and innovation is epistemic, not merely relational. This means that a collaborative work environment produces strong innovation only when it fosters the sharing of experiences, expertise, and ideas. This expands on previous models that tend to focus on the direct influence of collaboration on innovation without explaining the processes that occur between them. The policy implication is that organizations must structure collaborations to generate real knowledge exchange. Coordination meetings should generate learning, projects should produce documentation of solutions, and field experiences should be transformed into organizational references. In the context of this research, these results suggest that public technical organizations can be a powerful arena for testing knowledge theories because the complexity of their tasks makes knowledge flow crucial for innovation.

Theoretical contributions and policy implications

The results of this study strengthen, extend, and integrate three major theoretical perspectives. The findings on the direct influence of collaborative work environments on innovative work behavior, psychological safety, and knowledge sharing reinforce the social exchange logic that supportive work contexts produce behavioral consequences that are valuable to organizations. The findings on the influence of psychological safety on innovative work behavior and its mediating role extend psychological safety theory by demonstrating that psychological safety is not only a direct predictor of innovation but also a mechanism that translates collaboration into innovative behavior. The findings on the influence of knowledge sharing on innovative work behavior and its mediating role strengthen the knowledge-based view by demonstrating that knowledge sharing is a cognitive mechanism that makes collaboration productive for innovation. The main theoretical contribution of this study lies in the integration of two parallel mediators in a single model, explaining that employee innovation arises from a combination of psychological and knowledge pathways rather than from a single mechanism.

The policy implications of this synthesis are concrete. Public technical organizations seeking to foster innovation must manage three layers simultaneously. The first layer is collaborative work design that fosters open communication, trust, and cross-sector participation. The second layer is building psychological safety through non-repressive leadership, safe evaluation forums, and tolerance for experimentation. The third layer is strengthening knowledge-sharing systems through solution documentation, lessons learned, cross-project learning, and the use of collaborative technology. Without simultaneously managing these three layers, innovation tends to stagnate within an organization and does not develop into daily work behavior. In this regard, the context of the Public Works Agency serves not only as an empirical location but also as a boundary context, demonstrating that innovation theory remains operative even in bureaucratic organizations when social, psychological, and knowledge conditions are managed integratively.

CONCLUSION

This study shows that the innovative work behavior of employees in technical public organizations does not form spontaneously but rather arises from structured social and cognitive configurations, namely a collaborative work environment, psychological safety, and knowledge sharing. The main findings show that the collaborative work environment acts as an initial driver that strengthens innovative work behavior both directly and through two complementary mediating mechanisms. Thus, innovation is influenced not only by the quality of work relationships but also by the sense of interpersonal safety and the flow of knowledge that moves between organizational actors. These results are in line with the recent literature that confirms that employee innovation in the public sector and modern organizations grows stronger when the work context allows for open interactions, relational support, and a positively perceived innovative culture.

The primary scientific contribution of this study lies in strengthening the parallel mediation model that integrates social exchange logic, psychological safety theory, and the knowledge-based view into a more coherent explanatory framework. This study demonstrates that the innovative value of collaborative work environments does not stop at social coordination but operates through two distinct causal pathways. The first pathway is psychological because collaboration increases the sense of safety in speaking up, asking questions, and taking interpersonal risk. The second pathway is epistemic, because collaboration facilitates the exchange of knowledge, experience, and expertise, which enhances the quality of work solutions. Thus, this study extends the existing theory by demonstrating that innovative work behavior in technical bureaucracies is not adequately explained by a single mechanism but rather by a combination of mutually reinforcing social, psychological, and knowledge conditions.

Another important aspect of this research lies in its empirical context. The results show that the theory of work innovation retains strong explanatory power when tested in technical public organizations that are formal, hierarchical, and based on procedural compliance. This finding is important because most recent studies on employee innovation have been conducted in the education, business, or more flexible organizational sectors. In the context of the Public Works Department, the results of this study demonstrate that technical bureaucracy is not a barrier that weakens the theory but rather an arena that tests and confirms that collaboration, psychological safety, and knowledge sharing remain the foundations of innovation, even in highly structured work environments.

The scientific implications of these findings point to the need to reposition employee innovation as a result of a managed organizational design rather than simply as a personal attribute. The practical implications

of this study are also clear. Public organizations seeking to strengthen innovation must foster authentic cross-functional collaboration, create safe spaces for feedback and experimentation, and establish knowledge-sharing systems that enable technical experience to be transformed into organizational assets. Within this framework, this study confirms that employee innovation is more likely to thrive when organizations manage collaboration as a social resource, psychological safety as an affective resource, and knowledge sharing as a cognitive resource in an integrated manner.

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