Servant Leadership and Innovation: Dual Mediation through Psychological Safety and Technology Readiness

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ABSTRACT

The rapid growth of Indonesia's digital services sector has underscored the need for leadership styles that can enhance organizational resilience and foster innovation in a competitive environment. Startups in this sector often face high failure rates, making innovation a critical capability for survival and long-term growth. Against this backdrop, leadership practices that prioritize employee development and empowerment have become increasingly important. This study aims to examine the relationship between servant leadership and employee innovative behavior in Indonesia's digital services sector, with particular attention to the mediating roles of psychological safety and technology readiness. A quantitative approach was employed, involving 150 respondents from digital service companies. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test both direct and indirect effects among variables. The findings indicate that servant leadership exerts a significant positive influence on employee innovative behavior ($\beta = 0.545$, $p < 0.001$). Furthermore, psychological safety and technology readiness were found to function as significant mediators, with technology readiness demonstrating the stronger effect. These results highlight the importance of servant leadership in fostering innovation, particularly when combined with psychologically safe environments and proactive technological adoption.

***Keywords**: Digital Services, Innovative Behavior, Psychological Safety, Servant Leadership, Technology Readiness.*

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ABSTRAK

Pertumbuhan pesat sektor jasa digital Indonesia telah menggarisbawahi perlunya gaya kepemimpinan yang dapat meningkatkan ketahanan organisasi dan mendorong inovasi dalam lingkungan yang kompetitif. Perusahaan rintisan di sektor ini sering kali menghadapi tingkat kegagalan yang tinggi, menjadikan inovasi sebagai kemampuan krusial untuk bertahan dan pertumbuhan jangka panjang. Dengan latar belakang ini, praktik kepemimpinan yang memprioritaskan pengembangan dan pemberdayaan karyawan menjadi semakin penting. Studi ini bertujuan untuk mengkaji hubungan antara kepemimpinan pelayan dan perilaku inovatif karyawan di sektor jasa digital Indonesia, dengan perhatian khusus pada peran mediasi keamanan psikologis dan kesiapan teknologi. Pendekatan kuantitatif digunakan, melibatkan 150 responden dari perusahaan jasa digital. Data dianalisis menggunakan pemodelan persamaan struktural kuadrat terkecil parsial untuk menguji pengaruh langsung dan tidak langsung antar variabel. Temuan menunjukkan bahwa kepemimpinan pelayan memberikan pengaruh positif yang signifikan terhadap perilaku inovatif karyawan ($\beta = 0.45$, $p < 0.001$). Lebih lanjut, keamanan psikologis dan kesiapan teknologi ditemukan berfungsi sebagai mediator yang signifikan, dengan kesiapan teknologi menunjukkan pengaruh yang lebih kuat. Hasil-hasil ini menyoroti pentingnya kepemimpinan pelayan dalam mendorong inovasi, terutama ketika dipadukan dengan lingkungan yang aman secara psikologis dan adopsi teknologi yang proaktif.

***Kata kunci**: Layanan Digital, Perilaku Inovatif, Keamanan Psikologis, Kepemimpinan Pelayan, Kesiapan Teknologi.*

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INTRODUCTION

The rapid digitalization following the COVID-19 pandemic has fundamentally transformed business operations globally, with technology becoming central to organizational survival and growth (Bhambere et al., 2021). This transformation has been particularly pronounced in developing countries like Indonesia, where digital innovation is viewed as a catalyst for national development. The Indonesian government has emphasized that fostering innovative and technologically driven startups can significantly advance the country's development trajectory (Komdigi, 2023). Indonesia currently ranks fifth globally with 2,298 startups in 2022, demonstrating significant entrepreneurial activity (Annur, 2022). However, this impressive number masks a concerning reality: approximately 33% of startups fail within 12-20 months, with 67% that survive the initial period typically closing before reaching 36 months (Rahman et al., 2023). Even successful companies like GoTo Group have faced challenges, implementing workforce reductions of 12% due to economic pressures (Chiang, 2022).

Psychological safety and technology readiness represent critical mediating factors in explaining how servant leadership fosters employee innovative behavior, particularly in the digital services sector (Iqbal et al., 2023). Psychological safety refers to employees' perception that they can voice ideas, take risks, or challenge norms without fear of negative consequences, enabling open communication and experimentation essential for innovation. Technology readiness, meanwhile, reflects employees' confidence and willingness to embrace new digital tools and systems, which directly influences their capacity to transform ideas into practical solutions. For instance, in fintech startups, leaders who cultivate trust and provide technological support encourage employees to innovate continuously (Zhu & Zhang, 2020).

This high failure rate underscores the critical importance of innovation as a survival mechanism for organizations, particularly in the digital services sector. Employee innovative behavior, defined as individuals' ability to generate, promote, and implement new ideas, processes, and solutions, has emerged as a crucial organizational capability (Janssen, 2000). Innovation not only affects organizational survival but also contributes to broader economic development, as technological advancement drives aggregate output and long-term economic growth (Yousefi, 2011). Leadership style significantly influences employee innovative behavior, yet many organizations struggle to foster innovation despite copying successful methods (Hughes et al., 2018; Iqbal et al., 2020). Servant leadership, characterized by prioritizing employee development and well-being over traditional hierarchical control, has shown promise in creating environments conducive to innovation. Unlike conventional leadership approaches focused on organizational performance metrics, servant leadership emphasizes building relationships, facilitating growth, and empowering employees (van Dierendonck et al., 2023).

While existing research by Lan et al. (2021) and Ren and Shen (2024) has established connections between servant leadership and innovation, several gaps remain. First, limited studies have examined this relationship within digital service sectors, which operate in rapidly evolving technological environments (Su et al., 2020). Second, the mediating mechanisms through which servant leadership influences innovative behavior require deeper investigation, particularly regarding psychological safety and technology readiness. Third, most studies have been conducted in developed countries, with limited research in developing economies (Khan et al., 2022; Nawaz et al., 2024).

Based on the identified gaps, this study aims to examine the influence of servant leadership on employee innovative behavior within Indonesia's digital services sector. Specifically, it seeks to analyze the mediating roles of psychological safety and technology readiness in shaping this relationship. To achieve this aim, the research focuses on examining the relationship between servant leadership and employee innovative behavior in Indonesia's digital services sector, analyzing how psychological safety mediates this relationship, and exploring the role of technology readiness in mediating the connection between servant leadership and innovation.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Servant Leadership on Employee Innovative Behavior

Servant leadership, first introduced by Greenleaf and later refined by Spears (2005), represents a fundamental departure from traditional authority-based models by placing the growth and well-being of followers as the leader's top priority. Key characteristics include empowering and developing people, humility, authenticity, interpersonal acceptance, providing direction, and stewardship (van Dierendonck & Nuijten, 2011; van Dierendonck et al., 2014). These traits create a supportive climate where employees feel trusted and valued, which in turn reduces the perceived personal risk of proposing novel ideas or challenging existing processes. By consistently demonstrating genuine care and ethical behavior, servant leaders trigger positive reciprocity under social exchange theory, encouraging employees to go beyond routine tasks and engage in extra-role innovative efforts (Hughes et al., 2018; Nawaz et al., 2024). This reciprocity is particularly strong in collectivist cultures such as Indonesia, where relational harmony and obligation play central roles in workplace behavior.

Empirical studies across multiple contexts have repeatedly confirmed the positive link between servant leadership and employee innovative behavior. For example, Opoku et al. (2019) found a significant relationship in Ghana's manufacturing sector. More recently, Ren & Shen (2024) showed that servant leadership enhances team innovation performance through heightened self-efficacy. In fast-moving digital service environments, where startups face extreme uncertainty and high failure rates, this leadership style becomes especially potent because it simultaneously builds trust and motivates discretionary creative contributions (Iqbal et al., 2020; Iqbal et al., 2023). The effect is further amplified when leaders actively remove bureaucratic barriers that typically stifle initiative in hierarchical organizations.

H1: Servant leadership has a positive influence on employee innovative behavior.

Psychological Safety on Employee Innovative Behavior

Psychological safety is defined as a shared belief among team members that the workplace is safe for interpersonal risk-taking, such as speaking up with ideas, admitting errors, asking for help, or questioning established practices without fear of embarrassment or punishment (Edmondson, 1999; Edmondson & Lei, 2014). This climate directly facilitates innovation by lowering defensive behaviors and freeing cognitive resources for creative thinking rather than self-protection. When employees perceive high psychological safety, they are more likely to experiment, share half-formed ideas, and persist through the inevitable setbacks of the innovation process (Baer & Frese, 2003; Carmeli et al., 2010). Without it, individuals tend to withhold potentially valuable suggestions to avoid social costs.

Numerous studies have established psychological safety as a robust predictor of individual and team innovative behavior across industries and cultures. Javed et al. (2019) demonstrated its mediating role between inclusive leadership and innovative work behavior in Pakistan's textile sector, whereas Mansoor et al. (2021) confirmed similar effects in knowledge-intensive settings. In digital service firms operating under constant technological disruption and tight deadlines, the absence of psychological safety can lead to idea suppression and risk aversion, behaviors that are fatal for survival (Iqbal et al., 2023). Conversely, a psychologically safe environment unlocks the discretionary effort required to generate, promote, and implement new solutions. Its influence becomes even more critical in cross-functional teams typical of digital startups, where diverse perspectives must be openly integrated.

H2: Psychological safety has a positive influence on employee innovative behavior.

Technology Readiness on Employee Innovative Behavior

Technology readiness refers to people's propensity to embrace and employ new technologies to accomplish goals in work and life, consisting of two positive dimensions (optimism and innovativeness) and two inhibitory dimensions (discomfort and insecurity) as captured by the Technology Readiness Index (Parasuraman, 2000; Parasuraman & Colby, 2015). Employees with high technology readiness view digital tools as opportunities rather than threats, exhibit greater confidence in learning new systems, and are more willing to invest time in mastering technologies that enable creativity. This mindset dramatically lowers the practical barriers to innovation, such as slow prototyping or ineffective collaboration (Dodgson et al., 2006; Nambisan et al., 2017). It also shortens the time from idea conception to market testing, a decisive factor in hyper-competitive digital sectors.

In today's digital-intensive workplaces, most meaningful innovations are inseparable from technological platforms, cloud tools, data analytics, or emerging technologies. Employees who score high on technology readiness can rapidly transform abstract ideas into working prototypes, leverage digital collaboration spaces, and iterate solutions at the speed required by competitive markets (Zhang et al., 2020; Jafari-Sadeghi et al., 2021). Studies in technology-driven contexts consistently show that higher technology readiness translates into greater innovative output and faster implementation cycles (Vlok et al., 2019; Zhu & Zhang, 2020). In the Indonesian digital services landscape, where many employees are digital natives yet still vary widely in formal technical training, individual technology readiness often determines who actually drives innovation forward.

H3: Technology readiness has a positive influence on employee innovative behavior.

Servant Leadership on Psychological Safety and Technology Readiness

Servant leadership strongly promotes psychological safety by consistently displaying humility, active listening, empathy, and unconditional acceptance, behaviors that reduce hierarchical distance and signal that mistakes or dissenting opinions will not be punished (Irving & Longbotham, 2007; Wang et al., 2022). Leaders who prioritize follower development and well-being create an atmosphere of trust where employees feel free to voice concerns, seek feedback, and take interpersonal risks without fear of retaliation (Edmondson & Lei, 2014; Iqbal et al., 2023). This supportive relational climate is especially valuable in high-failure startup ecosystems, where learning from failure is essential for innovation. Such leaders also model vulnerability themselves, further reinforcing the norm that openness is rewarded rather than penalized.

At the same time, servant leadership directly enhances technology readiness through empowerment, resource provision, and the cultivation of a learning-oriented culture (Liden et al., 2014; Khattak et al., 2023). By investing in training, removing bureaucratic obstacles to tool adoption, and modeling curiosity toward new technologies, servant leaders reduce discomfort and insecurity while reinforcing optimism and innovativeness (Parasuraman & Colby, 2015). This dual effect, building both emotional safety and technological confidence, positions servant leadership as a powerful antecedent of the two mediators that ultimately drive innovation in digital environments (van Dierendonck et al., 2023). In resource-constrained Indonesian startups, where formal training budgets are often limited, the leader's personal commitment to employee technological growth becomes a decisive differentiator.

H4: Servant leadership has a positive influence on psychological safety.
H5: Servant leadership has a positive influence on technology readiness.

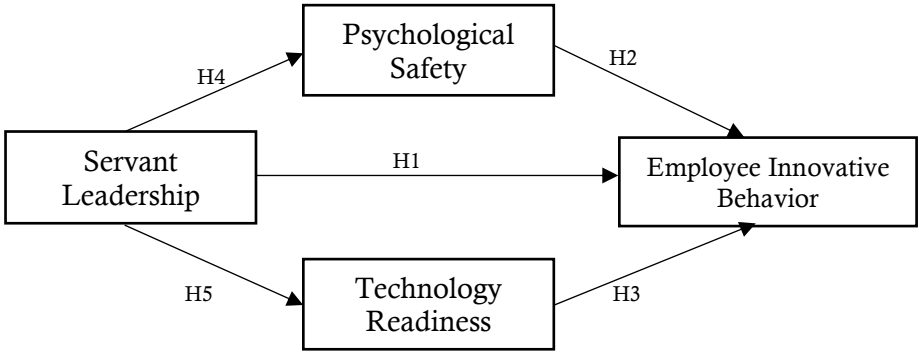

Figure 1. Conceptual Framework

Figure 1 shows a conceptual framework that illustrates the relationship between four main variables, namely servant leadership, psychological safety, technology readiness, and employee innovative behavior. Servant leadership acts as an independent variable that directly and indirectly influences employee innovative behavior. The indirect influence occurs through two mediating variables, namely psychological safety and technology readiness. Psychological safety reflects employees' psychological safety in conveying ideas or taking risks, while technology readiness reflects employees' readiness and positive attitude toward using new technology. Thus, servant leadership can increase employees' sense of safety and technology readiness, which ultimately encourages innovative behavior in the workplace.

RESEARCH METHODS

This study uses a quantitative approach, adopting a cross-sectional survey design to examine the relationships between study variables. The target population consists of employees working in Indonesia's digital services sector, defined as individuals who provide services through digital platforms, regardless of the type of service. Using convenience sampling due to accessibility constraints, data were collected through online questionnaires distributed via social media platforms and messaging applications. The questionnaire was prepared in both English and Indonesian to accommodate respondent preferences. A total of 150 valid responses were obtained, meeting the minimum sample size requirement of 110-220 suggested by Hair et al. (2010) for studies with 22 measurement items.

All constructs in this study were measured using established scales with proven reliability and validity, with responses collected on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Servant Leadership was assessed through six items adapted from Opoku et al. (2019), emphasizing key behaviors such as empowerment, ethical conduct, and employee development. Employee Innovative Behavior was measured using six items from Mansoor et al. (2021), which reflect the three phases of innovation: idea generation, idea promotion, and implementation. Illustrative items reflect employees' tendencies to search for new working methods, techniques, or instruments, and to transform innovative ideas into useful applications.

Psychological Safety was captured using five items, also adapted from Mansoor et al. (2021), focusing on employees' perceptions of whether their workplace allows interpersonal risk-taking. Representative statements reflect employees' ability to raise problems and tough issues, as well as the perception that it is safe to take risks within the organization. Meanwhile, technology readiness was evaluated using five items derived from the TRI 2.0 scale developed by Parasuraman and Colby (2015), with an emphasis on optimism and innovativeness. Sample items reflect employees' perceptions that technology increases their efficiency in their work and that new technologies are mentally stimulating. Together, these measures provided a comprehensive assessment of the core constructs.

Data analysis was conducted using SmartPLS 4.0 software for Partial Least Squares Structural Equation Modeling (PLS-SEM). This technique was selected for its effectiveness in examining complex relationships among latent variables and its appropriateness for relatively small sample sizes (Hair et al., 2017). The analysis procedure followed a two-stage approach: first assessing the measurement model (reliability and validity), then evaluating the structural model (hypothesis testing).

RESULTS

The respondents' demographic characteristics describe the overall composition of the sample in terms of age, work experience, and organizational position. This information helps to illustrate the diversity of participants and offers context for understanding their perspectives within the digital services sector. The demographic profile also supports the interpretation of subsequent analyses by highlighting the background distribution of the respondents.

Table 1 presents the demographic characteristics of the sample. The majority of respondents (54%) were aged 25-40 years, followed by 18-25 years (36.7%). In terms of organizational tenure, 58% had worked in the digital services sector for 1-5 years, while 25.3% had 5-10 years of experience. Regarding organizational positions, 44% were staff members, 27.3% were first-line managers, 19.3% were middle managers, and 9.3% were top-level managers.

Table 1. Sample Demographics

Characteristic	Category	Frequency	Percentage
Age	18-25 years	55	36.7%
	25-40 years	81	54.0%
	40-55 years	12	8.0%
	55+ years	2	1.3%
Experience	<1 year	19	12.7%
	1-5 years	87	58.0%
	5-10 years	38	25.3%
	>10 years	6	4.0%
Position	Staff member	66	44.0%
	First-line manager	41	27.3%
	Middle manager	29	19.3%
	Top-level manager	14	9.3%
Current Employment	Yes	110	73.3%
	No	40	26.7%

The data analysis began with an assessment of the measurement model to ensure that the constructs used in this study demonstrated adequate reliability and validity. Using SmartPLS 4.0, we evaluated internal consistency, convergent validity, and discriminant validity before proceeding to hypothesis testing. This step was critical to confirm that the scales for servant leadership, psychological safety, technology readiness, and employee innovative behavior were both robust and appropriate for structural model evaluation.

Following the measurement model assessment, the structural model was tested to examine the hypothesized relationships. Path coefficients, effect sizes, and significance levels were analyzed to determine the direct and indirect effects among variables. In addition, mediation analyses were conducted to evaluate the roles of psychological safety and technology readiness in linking servant leadership with employee innovative behavior. The following sections present the detailed results, beginning with the reliability and validity assessment, followed by hypothesis testing and mediation analysis.

Table 2 presents the reliability and validity statistics for all constructs. Cronbach's alpha values ranged from 0.922 to 0.936, well above the 0.7 threshold, indicating excellent internal consistency reliability. Composite reliability values exceeded 0.95 for all constructs, further confirming reliability. Average Variance Extracted (AVE) values ranged from 0.756 to 0.772, surpassing the 0.5 minimum requirement and establishing convergent validity.

Table 2. Reliability and Validity Statistics

Construct	Items	Cronbach's α	Composite Reliability	AVE	Mean	SD
Servant Leadership	6	0.935	0.951	0.756	3.362	1.169
Employee Innovative Behavior	6	0.922	0.942	0.761	3.409	1.179
Psychological Safety	5	0.936	0.951	0.759	3.423	1.163
Technology Readiness	5	0.926	0.945	0.772	3.445	1.207

Table 2 presents the psychometric properties of the constructs used in the study, including the number of items, Cronbach's α, Composite Reliability (CR), Average Variance Extracted (AVE), mean, and Standard Deviation (SD). Servant Leadership, measured with 6 items, showed high reliability (Cronbach's α = 0.935, CR = 0.951) and convergent validity (AVE = 0.756), with a mean of 3.362 and SD of 1.169. Employee Innovative Behavior, also with 6 items, exhibited strong reliability (Cronbach's α = 0.922, CR = 0.942) and validity (AVE = 0.761), with a mean of 3.409 and SD of 1.179. Psychological Safety, assessed with 5 items, demonstrated robust reliability (Cronbach's α = 0.936, CR = 0.951) and validity (AVE = 0.759), with a mean of 3.423 and SD of 1.163. Technology readiness, measured with 5 items, showed high reliability (Cronbach's α = 0.926, CR = 0.945) and validity (AVE = 0.772), with a mean of 3.445 and SD of 1.207. These metrics confirm the scales' reliability and validity for the study's constructs in Indonesia's digital services sector.

Discriminant validity was assessed using the Fornell-Larcker criterion and HTMT ratios. All square roots of AVE values exceeded inter-construct correlations, and HTMT ratios were below 0.90, confirming discriminant validity. Outer loadings for all items exceeded 0.7, ranging from 0.834 to 0.889, indicating adequate indicator reliability. Collinearity assessment revealed no multicollinearity issues, with all Variance Inflation Factor (VIF) values below 5.2, well under the 10.0 threshold. These results confirm the measurement model's quality and appropriateness for structural model evaluation.

Table 3 presents the structural model results, including path coefficients, significance levels, and effect sizes. The model demonstrated strong explanatory power with R^2 values of 0.856 for employee innovative behavior, 0.433 for psychological safety, and 0.599 for technology readiness.

Table 3. Structural Model Results

Hypothesis	Path Coefficient	t-value	p-value	95% CI	f^2	Decision
Servant Leadership → Employee Innovative Behavior	0.545	9.847	0.000	[0.436, 0.654]	0.824	H1 Supported
Psychological Safety → Employee Innovative Behavior	0.078	1.654	0.051	[-0.015, 0.171]	0.012	H2 Supported
Technology Readiness → Employee Innovative Behavior	0.370	2.736	0.006	[0.104, 0.636]	0.184	H3 Supported
Servant Leadership → Psychological Safety	0.658	11.923	0.000	[0.550, 0.766]	0.765	H4 Supported
Servant Leadership → Technology Readiness	0.774	18.456	0.000	[0.691, 0.857]	1.496	H5 Supported

The findings of this study provide strong empirical support for the proposed hypotheses. Hypothesis 1 is supported, revealing that servant leadership has a significant positive influence on employee innovative behavior ($\beta = 0.545$, $p < 0.001$) with a large effect size ($f^2 = 0.824$). This indicates that servant leadership substantially contributes to employees' innovative actions within the digital services sector. Hypothesis 2 receives marginal support, showing that psychological safety positively affects employee innovative behavior ($\beta = 0.078$, $p = 0.051$) but with a small effect size ($f^2 = 0.012$).

Although the relationship approaches conventional significance, its influence on innovation remains limited.

Hypothesis 3 is supported, demonstrating that technology readiness positively impacts employee innovative behavior (β = 0.370, p = 0.006) with a moderate effect size (f^2 = 0.184). This finding underscores that employees who are more technologically prepared tend to engage more in innovative work behaviors. Hypothesis 4 is strongly supported, confirming that servant leadership significantly enhances psychological safety (β = 0.658, p < 0.001) with a large effect size (f^2 = 0.765). This highlights the crucial role of servant leaders in fostering a workplace environment where employees feel safe to express ideas and take interpersonal risks. Hypothesis 598 is also supported, indicating a strong positive relationship between servant leadership and technology readiness (β = 0.774, p < 0.001) with the largest effect size (f^2 = 1.496). This suggests that servant leadership greatly influences employees' confidence and willingness to embrace new technologies.

Mediation analysis using the Variance Accounted For (VAF) method further reveals that psychological safety partially mediates the relationship between servant leadership and employee innovative behavior, with an indirect effect of 0.051 (p = 0.055), accounting for 8.6% of the total effect. Meanwhile, technology readiness demonstrates a stronger mediating role, with an indirect effect of 0.287 (p = 0.007), explaining 34.4% of the total effect. These results indicate that technology readiness is a more dominant mediator than psychological safety in linking servant leadership to innovation within Indonesia's digital services sector.

Table 4. Summary of Previous Research

Author(s)	Sample	Key Findings	Relation to Current Study
Iqbal and Ahmad (2020)	IT employees, Pakistan	Servant Leadership → Innovative Behavior (β = 0.21), Psychological Safety mediates	Supports H1, H2, H3
Khattak et al. (2023)	High-tech companies in China	Servant Leadership → Innovative Work Behavior (β = 0.386), Leader-Member Exchange mediates	Supports H1
Opoku et al. (2019)	Manufacturing, Ghana	Servant Leadership → Innovative Work Behavior, mediated by insider status	Supports H1
Javed et al. (2019)	Textile industry, Pakistan	Psychological Safety mediates Inclusive Leadership → Innovative Work Behavior relationship	Supports H3
Zhang et al. (2020)	Green innovation study	Technology Readiness → Innovation Performance	Supports H5
Vlok et al. (2019)	Technology companies	Leadership → Technology Readiness (β = 0.528)	Supports H4

Table 4 summarizes prior research relevant to the current study, detailing the authors, sample populations, key findings, and their relation to the study's hypotheses. Iqbal and Ahmad (2020) studied IT employees in Pakistan, finding that servant leadership positively influences Innovative Behavior (β = 0.21) with psychological safety as a mediator, supporting H1, H2, and H3. Khattak et al. (2023) examined high-tech firms in China, showing servant leadership's impact on innovative work behavior (β = 0.386) mediated by leader-member exchange, supporting H1. Opoku et al. (2019) found that servant leadership influences innovative work behavior through insider status in Ghana's manufacturing sector, supporting H1. Javed et al. (2019) confirmed PS mediates the relationship between inclusive leadership and innovative work behavior in Pakistan's textile industry, supporting H3. Zhang et al. (2020) linked technology readiness to innovation performance, supporting H5. Lastly, Vlok et al. (2019) showed leadership influences TR (β = 0.528) in technology companies, supporting H4. These findings provide a foundation for the current study's hypotheses in Indonesia's digital services sector.

DISCUSSION

The results of this study confirm that servant leadership plays a significant role in encouraging employee innovative behavior in the digital services sector in Indonesia (Deci & Ryan, 2000). This finding aligns with Social Exchange theory and Self-Determination theory, which explain that leader support encourages positive reciprocity in the form of contributions of creative ideas and new solutions (Hughes et al., 2018; Nawaz et al., 2024). The direct effect of servant leadership on innovative behavior (β = 0.545, $p < 0.001$) extends previous empirical evidence in different contexts, such as the research of Khattak et al. (2023) in Chinese high-tech companies and Opoku et al. (2019) in the Ghanaian manufacturing sector, which both found a positive relationship between servant leadership and innovation.

From the mediation perspective, psychological safety was strongly influenced by servant leadership (β = 0.658, $p < 0.001$), although its contribution to innovation was only marginal (β = 0.078, $p = 0.051$). These results differ from the findings of Carmeli et al. (2010), and Javed et al. (2019) emphasized the crucial role of psychological safety in mediating inclusive leadership toward innovation. This difference may be due to the digital service context, which places greater emphasis on technological mastery than purely psychological factors, thus making psychological safety a supporting factor, rather than a primary driver.

In contrast, technological readiness emerged as a much stronger mediator, with servant leadership having a significant effect (β = 0.774, $p < 0.001$) and a significant impact on innovative behavior (β = 0.370, $p = 0.006$). Mediation through technological readiness accounted for 34.4% of the total effect, indicating that technological mastery and readiness to adopt technology are key pathways for servant leadership to drive innovation in the digital age. These findings support the research of Zhang et al. (2020) and Jafari-Sadeghi et al. (2021), which emphasized the role of technological readiness in enhancing digital innovation and entrepreneurship.

This study significantly advances leadership and innovation literature by extending servant leadership theory to digital service contexts, where rapid technological changes pose unique challenges (Ren & Shen, 2024). The strong link between servant leadership and employee innovative behavior (β = 0.545) underscores its relevance in modern settings, while the substantial mediation effect of technology readiness (β = 0.774, 34.4% of total effect) introduces a critical technological dimension to leadership-innovation dynamics, addressing a key literature gap (Parasuraman & Colby, 2015). Although psychological safety's mediating role was marginally significant, it suggests nuanced differences in technology-intensive environments. Practically, organizations should invest in servant leadership training focusing on empowerment, ethical decision-making, and relationship-building to boost innovation. Additionally, fostering technological skill development and supportive environments for technological exploration is vital in digital service sectors, where technology readiness significantly enhances innovative capacity (Edmondson, 1999; Carmeli et al., 2010).

Despite these contributions, the study has limitations, including its cross-sectional design, which restricts causal inferences, and convenience sampling, which may limit generalizability beyond Indonesian digital service employees. Self-report measures raise potential common method bias, though statistical tests mitigated this concern. Future research should adopt longitudinal designs to establish causality and explore cross-cultural variations in these relationships. Incorporating objective innovation measures and examining specific technologies (e.g., artificial intelligence, blockchain) or organizational digital maturity levels could further elucidate technology readiness's mediating role, offering deeper insights into leadership-driven innovation in diverse contexts.

CONCLUSION

This study demonstrates that servant leadership does indeed help spark innovative behavior among employees in digital service environments, with psychological safety and technology readiness playing key mediators. The study found that technology readiness stood out, with a strong impact (β = 0.774 for servant leadership, β = 0.370 for innovation), demonstrating the critical importance of technology skills for creativity today. These results add valuable insights to our understanding of how leadership can foster innovation, particularly with a caring, human-centered approach that builds confidence in technology and a secure mindset in a rapidly changing digital world.

For businesses, particularly in Indonesia's digital service sector, investing in servant leadership training and technology skills development can significantly drive innovation, helping them remain competitive and thrive. This can even support broader goals such as economic progress in developing countries by encouraging entrepreneurship. However, this study has limitations. Its cross-sectional nature and convenience sampling make it difficult to prove causality or apply broadly. Self-reported data may have slightly skewed the results, although the study used statistics to address this. Future research should explore longitudinal studies to confirm causality and examine how these dynamics play out across cultures. Adding objective measures of innovation and exploring specific technologies like AI or blockchain, or even digital maturity levels, could provide a clearer picture of how technological readiness fits into leadership-driven innovation across different settings.

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