ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

Employee Innovation Performance Model for Traditional Small and Medium-Sized Technology Enterprises

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Publication Date: 2025/06/30

Abstract: The objectives of this research were: 1) to identify the key factors that affect employee innovation performance in traditional small and medium-sized technology enterprises, and 2) to propose an employee innovation performance model for traditional small and medium-sized technology enterprises. This research employed a quantitative approach. The sample consisted of 276 employees from traditional small and medium-sized technology enterprises, selected through a simple random sampling method. Data were collected using a structured questionnaire. Data analysis involved descriptive statistics, correlation analysis, multiple regression, and Structural Equation Modeling (SEM) to test the relationships between the variables. The findings revealed that: 1) self-efficacy, growth need strength, and creativity significantly affected employee innovation performance. Self-efficacy positively affected creativity, and growth need strength enhanced creativity, indirectly boosting employee innovation performance. Creativity was found to be a crucial driver of employee innovation performance, and 2) the employee innovation performance model for traditional small and medium-sized technology enterprises identified three key psychological factors—self-efficacy, growth need strength, and creativity. The model emphasized that fostering self-efficacy and growth need strength in employees was crucial for creating an environment conducive to creativity, which ultimately drove employee innovation performance.

Keywords: *Self-Efficacy; Growth Need Strength; Creativity; Employee Innovation Performance.*

How to Cite: Zhengyi Zhao; You Zhou; Jie Zhang (2025) Employee Innovation Performance Model for Traditional Small and Medium-Sized Technology Enterprises. *International Journal of Innovative Science and Research Technology*, 10(6), 2142-2158. https://doi.org/10.38124/ijisrt/25jun1433

I. INTRODUCTION

With the advancement of global economic integration and the rise of the knowledge economy, traditional small and medium-sized technology enterprises (TSMEs) face unprecedented challenges and opportunities. As vital contributors to technological innovation and industrial upgrading, these enterprises play a key role in national economic development. However, their relatively small scale and limited resources hinder their ability to compete in

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

dynamic markets and sustain long-term growth. Therefore, investigating innovation performance models tailored to TSMEs holds theoretical and practical significance (Gui et al., 2024).

Innovation has become essential for business survival in today's rapidly evolving global economy, intensified by fast-paced technological change and shortening product life cycles. TSMEs, as active market players, must constantly adapt to shifting demands through innovation. A scientifically sound innovation performance model is crucial to guide these enterprises in enhancing their innovation capacity and market competitiveness (Liu, 2024). Human resource management, especially performance management, is increasingly strategic in modern enterprises. For TSMEs, where each employee significantly impacts outcomes, optimizing HR allocation and improving employee performance through effective management is essential for organizational success (Armstrong & Taylor, 2023).

Despite some progress in innovation, TSMEs continue to encounter critical barriers. These include incomplete innovation performance management systems, insufficient investment in R&D, and low innovation conversion rates into market value. Such constraints impede sustainable development and must be addressed by designing robust innovation performance frameworks (Hao, 2024). Entrepreneurship and innovation are key mechanisms for converting scientific knowledge into economic productivity. In the modern economy, high-tech industries are primary drivers of global growth, with science and technology start-ups playing a pivotal role in national development. These firms rely heavily on knowledge capital, which is now recognized as a core resource for wealth creation and competitive advantage (Li & Jin, (2023). Consequently, understanding the influence of knowledge capital on enterprise performance is crucial for fostering innovation-led growth.

Enterprise performance evaluation is a critical component of management that informs strategy and resource allocation. In a globalized business environment, performance evaluation has evolved beyond financial metrics to incorporate multidimensional factors such as market positioning, technological capability, and innovation outcomes. Foreign enterprises often adopt comprehensive models that serve as valuable references for improving evaluation systems and optimizing enterprise performance.

However, a notable research gap persists in TSME literature regarding psychological factors, specifically self-efficacy, growth need strength, and creativity in employee innovation performance. While traditional performance models offer general guidance, they often overlook how these internal drivers impact innovation at the individual level (Mumtaz & Parahoo, 2020). Moreover, current evaluation frameworks lack scientifically validated indicators suited to the unique context of TSMEs (Nappi & Kelly, 2022).

Limited research examines the indirect influence of self-efficacy and growth needs strength on innovation performance through creativity (Gelaidan et al., 2024). Understanding these mediating relationships is vital for developing targeted strategies to stimulate innovation. While the role of knowledge capital is well acknowledged, its interaction with psychological factors remains underexplored. Therefore, there is an urgent need to design, apply, and validate innovation performance models that integrate psychological and organizational variables, specifically tailored to the structure and needs of TSMEs. Such models will provide nuanced insights and actionable strategies to enhance innovation capacity, employee performance, and long-term competitiveness.

Traditional small and medium-sized technology enterprises (TSMEs) operate in a highly competitive and rapidly evolving market environment, where innovation capability is critical to their long-term growth and competitiveness. This study aims to develop and validate an innovation performance model designed explicitly for TSMEs. The primary objectives are to identify the key factors influencing employee innovation performance and propose a conceptual model suited to these enterprises' unique characteristics. The study is guided by the following hypotheses: (H1) self-efficacy positively influences creativity; (H2) growth need strength positively influences creativity; (H3) creativity positively influences employee innovation performance; (H4) self-efficacy indirectly enhances employee innovation performance through creativity; and (H5) growth need strength indirectly enhances employee innovation performance through creativity.

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The research was conducted at Guangdong HK Company and focused on four variables: self-efficacy (employees' belief in their ability to handle innovative tasks), growth need strength (employees' motivation for personal and professional development), creativity (the ability to generate novel and valuable ideas), and employee innovation performance (the effectiveness of employees' innovative contributions). A total of 276 employees were selected from a population of 460 through simple random sampling to ensure representativeness. Data collection took place over six weeks between September and October 2024. The survey instrument was developed and pre-tested in the first week, and in the second week, it was distributed via electronic platforms. Data collection occurred during weeks three and four, accompanied by regular reminders to ensure a high response rate. The fifth week was used to close the survey and compile responses, followed by data review and preparation in the final week. This systematic process enabled reliable data collection to comprehensively analyze the factors affecting employee innovation performance in TSMEs.

II. LITERATURE REVIEW

➢ *Small and Medium-Sized Technology Enterprises*

Small and medium-sized technology enterprises (SMTEs) are knowledge-driven entities primarily focused on scientific research, development, production and commercialization of high-tech products and services. These enterprises, led by scientific and technological personnel, engage in electronics, information technology, biotechnology, new materials, energy and environmental technologies. They rely on research and innovation to develop products, secure intellectual property rights and contribute to sustainable development. Their core activities include technological development, technical services, and the application of scientific achievements in various high-tech sectors**.**

Small and medium-sized technology enterprises (SMTEs) in China must meet several criteria for recognition, including being registered within China (excluding Hong Kong, Macao, and Taiwan), employing fewer than 500 people and having annual sales and assets not exceeding 200 million yuan. Their products and services must not fall under prohibited or restricted categories and must have no foremost safety, quality, environmental violations or research dishonesty. Additionally, they must score at least 60 points in a comprehensive evaluation, with a non-zero score for technology personnel. SMTEs benefit from various policy supports, such as increased R&D expense deductions, extended loss-carryforward periods, financial subsidies, and post-subsidy R&D expenses. These policies aim to boost R&D investment, enhance innovation capabilities, facilitate technological transformation and support industrial upgrading.

➢ *Performance Models*

Performance management is a systematic approach to achieving organizational excellence focusing on customer orientation, employee development, process optimization, and continuous innovation. It integrates theory and practice to improve performance through strategic alignment and operational efficiency. Its core elements include leadership, where senior leaders define strategy and shape culture; strategic planning to set goals and performance indicators; customer and market focus to enhance satisfaction and loyalty; measurement and knowledge management to drive data-informed decisions and innovation; human resource development to improve satisfaction and capabilities; process management to increase efficiency and reduce waste; and business results, which assess outcomes across financial, customer, employee and social dimensions.

Widely recognized performance models include the Malcolm Baldrige National Quality Award (MBNQA) in the U.S. for excellence in quality and competitiveness, the European Quality Award (EQA) promoting Total Quality Management in Europe, and the Deming Prize in Japan, honouring achievements in total quality management inspired by Dr Deming's contributions.

➢ *Employee Innovation Performance*

Innovative concepts involve breaking conventional norms and patterns, challenging the status quo, and exploring new horizons with a clear understanding of market dynamics and industry prospects. Innovation encompasses several dimensions: technological innovation enhances efficiency and reduces costs; institutional innovation improves management structures; ideological innovation strengthens leadership direction and employee creativity; business innovation refines strategies and competitiveness; and structural innovation boosts organizational agility. The foundations of innovation

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

management are rooted in talent, science and technology, innovative thinking and methodological rigour. Papazoglou (2024) highlights that while divesting core knowledge negatively affects innovation performance, firms with high absorptive capacity can mitigate this effect positively. Kim et al. (2024) find that highly detailed financial disclosures may inadvertently hinder innovation due to competitive spillovers, especially in markets with intense product threats and emphasize that employees' awareness of perceived as either a challenge or a threat that affects innovation through their engagement with human-machine tasks, moderated by factors like AI self-efficacy and self-evaluation.

Yin et al. (2024) use system dynamics to show that R&D investment, social resource support, and talent management significantly boost innovation in high-tech firms. Sun & Li (2023) show that green HR practices promote green innovation via employees' environmentally proactive behaviours, though workplace anxiety can dampen this effect. Herb and Maria (2024) demonstrate that the capitalization of R&D under IFRS strongly predicts future innovation, as reflected in patent activity and financial performance. Chen et al. (2024) find that foreign acquisitions in emerging markets enhance target firms' green innovation by easing financial constraints, with variations across ownership structures. Finally, Nie & Qiqi (2023) reveal that while CSR generally supports innovation, regional market segmentation, particularly in labour and capital markets, can weaken or reverse this relationship, with external CSR more adversely affected than internal CSR.

- *Growth Needs Strength*

In the evolving organizational landscape, traditional role boundaries have become increasingly blurred due to flatter structures and emerging management practices like job enlargement. Using the stress cognitive appraisal theory, Chen (2023) examined how employees respond to non-compliant tasks beyond their job scope. Findings from a survey of 264 employees in Hangzhou revealed that such tasks positively predict both avoidance and proactive coping strategies, influencing counterproductive and proactive behaviours. Growth needs strength to moderate these relationships, diminishing negative and enhancing positive outcomes. Similarly, using resource conservation theory, Meng et al. (2021) found that a lack of leadership rewards heightens emotional exhaustion, reducing creative engagement with growth need intensity acting as a buffer. Another study explored the mediating roles of job crafting and satisfaction between growth needs and work engagement among 837 employees, confirming positive correlations and partial mediations.

Zhang (2021), guided by the JD-R model, showed that non-compliant tasks negatively impact role performance and engagement, but supervisor support and strong growth needs alleviate these effects. Xiong (2021) linked growth needs to radical and incremental creativity through team member exchange, moderated by team competition, where intense competition weakened incremental creativity. Lastly, Wang (2016) explored status competition in Chinese workplaces and found that growth needs intensity improves job performance, partially mediated by contribution-based leader-member exchange and moderated by superiors' own growth needs. These studies highlight the complex, moderated pathways through which growth needs and non-compliant tasks shape employee behaviour, creativity, and performance in modern organizations.

- *Self-Efficacy*

In China's evolving economy and labour landscape, recent studies highlight the importance of human resource optimization, self-efficacy, and job performance. Huang (2023) established that effective job-person fit significantly enhances task and relational performance, with self-efficacy mediating this relationship. Li (2023) emphasized that work stress among knowledge workers leads to burnout, where self-efficacy acts as a buffer; online psychological counselling effectively boosts self-efficacy and reduces burnout. Jiang et al. (2023) found similar patterns among logistics employees, showing that job stress positively correlates with burnout and negatively with self-efficacy, suggesting organizational and individual strategies for mitigation.

Li (2022) investigated adult procrastination, revealing that self-efficacy reduces procrastination through the mediating roles of time management and self-control. Finally, a study on authentic leadership in the internet industry showed that such leadership enhances employees' constructive deviant behaviour through increased organizational support and innovative self-efficacy, forming a chain mediating

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

mechanism. These findings underscore the pivotal role of self-efficacy across various workplace challenges and behaviours, providing actionable insights for organizational development and employee well-being.

➢ *Creativity*

Recent research has extensively explored the mechanisms influencing employees' creative work involvement and performance through various theoretical lenses. Yu Zhiyuan (2023) highlights the role of digital transformation in promoting creative involvement, mediated by adjustment focus and work remodelling and moderated by developmental feedback. Similarly, Tu Xingyong (2022), grounded in self-determination theory, emphasizes self-reflection as a mediator between psychological safety and creative problem-solving, with creative self-efficacy as a moderator. Meng et al. (2021) examine how harmonious work passion affects creative performance, mediated by role identity and moderated by authorized leadership. Sun & Li (2023) investigate the impact of performance appraisal orientation on creativity, with knowledge sharing as a mediator and uncertainty avoidance as a moderator.

Amabile (2018) finds that creative personality influences creativity through goal orientation, moderated by intrinsic motivation. Additionally, it emphasizes the motivational role of salary systems, asserting that appropriate compensation reforms can drive creative output. Collectively, these studies underscore the multifaceted influences ranging from leadership empathy, performance evaluations, and work passion to digitalization and structural supports that shape employee creativity, offering actionable insights for fostering innovation in organizational contexts.

➢ *Hypotheses Development*

Self-efficacy (H1) positively affects creativity, as individuals who believe in their abilities are more likely to explore novel solutions and persist through challenges, enhancing creative output, an idea rooted in Bandura's (2023) social cognitive theory. Growth need strength (H2) also positively affects creativity; individuals driven by a desire for self-development and learning tend to seek new experiences and ideas, fostering creative behaviour, consistent with Maslow's (1943) and self-determination theories (Deci & Ryan, 2013). Creativity (H3) positively influences employee innovation performance, as it serves as the basis for generating and implementing novel ideas that add value to organizations, according to organizational innovation theory (West, 2002). Self-efficacy (H4) indirectly enhances innovation performance by positively impacting creativity, indicating that creativity mediates this relationship (Gist, 1987). Similarly, growth needs strength (H5) indirectly contributes to innovation performance by first promoting creativity, establishing creativity as a key pathway linking personal traits to innovative outcomes in the workplace (Amabile, (2018).

➢ *Related Research*

Wu (2024) empirically analyzed A-share listed companies in China (2011–2021) and found that digital transformation significantly enhances innovation performance. ESG responsibility mediates this effect, particularly in large, tech-intensive firms in eastern and central regions. Similarly, Wang et al. (2024) demonstrated that digital culture improves regional innovation by fostering technological advancement and knowledge flow, though the digital industry's clustering stage moderates this relationship. Shao et al. (2024) emphasized the role of digital leadership and culture in reshaping managerial practices to promote knowledge sharing and collaborative innovation. Wang. (2024) revealed that big data technologies improve HR performance management by streamlining processes and supporting long-term HR development. In the agricultural sector, studies show that the digital economy enhances innovation and unlocks a "digital dividend" for sectoral modernization. Shen & Wang (2024) found that executive green awareness improves ESG performance through green innovation, especially in firms with high equity concentration and low media exposure in eastern and central China. Xiong & Jiang (2024) showed that allocating data elements defined via R&D, dissemination, and transformation boosts regional innovation, with more potent effects in more developed regions. Zhou et al. (2024), using fsQCA, identified that digital platform capability, leadership, openness, and supportive policies jointly foster innovation in state-owned platform enterprises through multiple effective configurations.

Lu & Guo (2024) demonstrated that regional green finance development promotes corporate green innovation by elevating risk-taking and motivation, particularly in state-owned and eastern-based firms. A study on equipment

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

manufacturing highlighted that collaborative innovation networks, openness, and knowledge management enhance innovation performance, with knowledge management mediating the effect. Zheng (2024) explored how big data strengthens HR performance management accuracy, reduces bias, and supports talent development. Liu & Zhao (2024) confirmed that standardization capability positively affects innovation, especially in tech enterprises, and this effect strengthens with mediating variables, stressing the need for tailored standardization strategies. Complementing these insights, Zhang (2024) examined how logistics firms in China can improve green innovation amid environmental and policy pressures, especially under the 14th Five-Year Plan and the 20th National Congress.

Using data from 72 listed logistics companies and fsQCA grounded in stakeholder, resource-based, institutional theories, and the TOE framework, the study analyzed seven antecedents: market pressure, competitive pressure, Government subsidies, digitalization, technological infrastructure, organizational redundancy, and employee quality. Findings show that no single factor ensures high green innovation; instead, configurations like "organization-environment," "environmental," and "technology-organization" types drive success. Conversely, "organizational weakness" and "organizational conservatism" configurations hinder innovation. Market and competitive pressures are especially influential. The study offers valuable insights for aligning internal and external factors to drive green innovation in China's logistics sector.

- *Conceptual Framework*

The framework posits that self-efficacy and growth need strength to enhance employee innovation performance indirectly by fostering creativity. Self-efficacy boosts confidence in tackling tasks, while growth needs strength to drive learning and idea application. As a mediator, creativity translates these psychological factors into innovative outcomes within small and medium-sized technology enterprises.

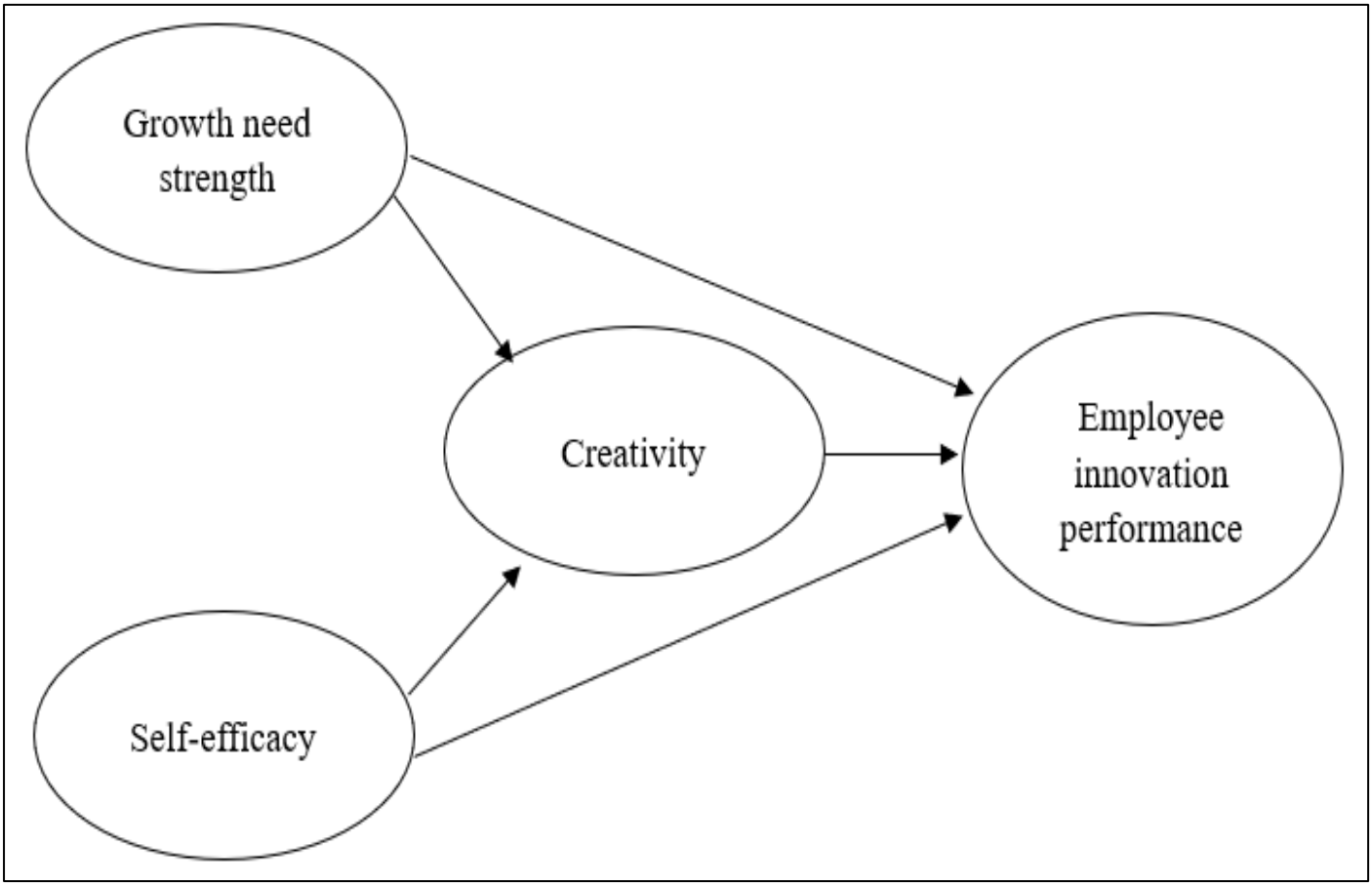

Fig 1 Conceptual Framework

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

III. RESEARCH METHODOLOGY

➢ *Research Design*

This study aimed to identify key factors influencing employee innovation performance in traditional small and medium-sized technology enterprises (TSMEs) and propose a tailored model. A structured survey was administered to 460 employees at Guangdong HK Company, focusing on self-efficacy, growth need strength, creativity, and innovation performance, measured using a Likert scale. Data analysis included descriptive statistics, correlation analysis, and multiple regression to examine the direct effects of self-efficacy and growth need strength on creativity and innovation performance. Mediation analysis explored their indirect effects through creativity. Confirmatory factor analysis (CFA) validated the measurement model, and Structural Equation Modeling (SEM) tested the hypotheses. Ethical principles, including informed consent and confidentiality, were followed. The findings provided insights into factors influencing innovation performance and practical recommendations for improving innovation management in TSMEs.

➢ *Population and Sample Size*

The study targeted all 460 employees at Guangdong HK Company, using simple random sampling to ensure each employee had an equal chance of selection, minimizing bias. A comprehensive list of employees was created, and a random number generator selected the sample. Based on the SEM rule of thumb (10 respondents per observed variable), the minimum required sample size was 250 for 25 observed variables. An additional 10% was added to account for potential non-responses, yielding a target of 275 respondents. The final sample size of 276 employees ensured sufficient statistical power and reliable insights into factors influencing innovation performance.

➢ *Research Instruments*

The questionnaire was designed based on the research hypothesis and theoretical model, incorporating subjective and objective evaluation questions. It aimed to gather insights from experts and management, providing a comprehensive understanding of the key factors influencing employee innovation performance. This approach ensured a well-rounded perspective on the variables under investigation.

➢ *Data Collection*

This study employed a structured questionnaire to collect primary data from employees at Guangdong HK Company, focusing on self-efficacy, growth need strength, creativity, and employee innovation performance, using Likert-scale items. The survey, distributed via email and online platforms, was pre-tested for clarity and remained open for four weeks, with reminders sent to encourage participation. Data analysis followed a rigorous process, including data cleaning, descriptive statistics, and reliability tests (Cronbach's alpha) and validity (factor analysis). Inferential analysis correlation, regression, and structural equation modelling (SEM) were conducted to test direct and mediated relationships among variables, with bootstrapping used to assess mediation effects. Hypotheses were tested at a 95% confidence level, and results were interpreted to develop a tailored innovation performance model for traditional small and medium-sized technology enterprises (TSMEs), offering theoretical and practical insights into enhancing employee innovation.

IV. RESULTS AND ANALYSIS

➢ *Descriptive Statistic*

Table 1 shows high mean scores (3.928 to 4.031) across all items, indicating that employees generally see themselves as actively engaged in innovation. The highest mean (4.031) reflects a strong tendency to seek innovative solutions, while the lowest (3.928) shows slightly less confidence in contributing to innovation initiatives. Standard deviations (0.969 to 1.09) suggest moderate variability, with the most significant variation in the ability to turn ideas into practical plans. All items exhibit negative skewness (-0.842 to -0.727), indicating responses are skewed toward high agreement. Kurtosis values (-0.398 to 0.060) suggest relatively normal to slightly flat distributions. Employees report strong innovation involvement, though confidence and execution vary across individuals.

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Table 1 Descriptive Statistics of Employee Innovation Performance Scale

Variable	Mean	Standard deviation	Skewness	Kurtosis
I frequently come up with new ideas that could improve the work processes at my company.	3.987	1.019	-0.795	-0.212
I actively seek out opportunities to implement innovative solutions at work.	4.031	1.053	-0.817	-0.388
I am regularly involved in developing new products, services, or processes.	4.017	0.969	-0.776	-0.226
My contributions to innovation at work are recognized and valued by my colleagues and supervisors.	3.996	1.002	-0.842	0.060
I am able to effectively translate creative ideas into practical and actionable plans.	3.939	1.09	-0.794	-0.364
I often experiment with new approaches to solve problems at work.	3.993	1.062	-0.824	-0.305
I have a significant impact on the innovative outcomes of my team or department.	3.972	1.024	-0.727	-0.398
I consistently contribute to the generation of new ideas within my organization.	3.961	1.021	-0.751	-0.234
My innovative efforts have led to measurable improvements in my company's performance.	3.952	1.016	-0.732	-0.291
I feel confident in my ability to contribute to my company's innovation initiatives.	3.928	1.027	-0.795	-0.082

Table 2 shows that Mean scores (3.741–3.832) indicate generally positive perceptions of Growth need Strength, with the highest mean reflecting a strong interest in self-directed learning. Standard deviations (1.002–1.057) show moderate variability, suggesting differing levels of engagement in continuous learning. All items are negatively skewed (-0.608 to -0.423), indicating responses toward agreement, while negative kurtosis (-0.803 to -0.390) suggests a flat, dispersed distribution. Overall, employees value professional Growth, though responses vary, highlighting the need for individualized support in skill development.

Table 2 Descriptive Statistics of Growth Need Strength Scale

Variable	Mean	Standard deviation	Skewness	Kurtosis
I have recently improved my skills or acquired new knowledge that has been highly beneficial to my work.	3.821	1.032	-0.471	-0.683
My company or team provides key support and opportunities that contribute to my professional growth.	3.81	1.043	-0.532	-0.604
I actively plan my career path to ensure continuous progress and development.	3.813	1.024	-0.423	-0.803
I regularly engage in learning and preparation to effectively handle new challenges at work.	3.741	1.057	-0.493	-0.658
There is a specific skill or knowledge area I have always wanted to learn, and I have taken steps to pursue it.	3.832	1.002	-0.608	-0.390

Table 3 shows Mean scores (3.882–3.943) of self-efficiency that indicate generally positive self-efficacy, with the highest score linked to confidence from past experiences. Standard deviations (1.011–1.032) show moderate variability,

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suggesting some differences in resilience and self-assessment. Negative skewness (-0.642 to -0.618) reflects a tendency toward agreement, while negative kurtosis (-0.632 to -0.404) suggests a dispersed response pattern. Employees express strong confidence in their abilities, though varied responses highlight the need for tailored support to boost self-belief and resilience.

Table 3 Descriptive Statistics of Self-Efficacy Scale

Variable	Mean	Standard deviation	Skewness	Kurtosis
I feel confident in my abilities when dealing with complex tasks.	3.922	1.019	-0.642	-0.544
My past experiences have strengthened my belief in my own abilities.	3.943	1.026	-0.642	-0.632
When I encounter difficulties or failures, I remain positive and believe I can overcome them.	3.911	1.032	-0.638	-0.497
I regularly assess my performance at work to ensure continuous improvement in my self-efficacy.	3.891	1.011	-0.634	-0.404
I have successfully completed tasks that I initially thought were beyond my capabilities.	3.882	1.021	-0.618	-0.473

Table 4 shows mean scores (3.765–3.8) on the creativity scale that reflect generally positive self-perceptions of Creativity, with the highest score for actively stimulating innovative thinking. The lowest score relates to perceived workplace support for Creativity. Standard deviations (0.967–1.041) indicate moderate variability, especially regarding environmental support. Negative skewness (-0.490 to -0.431) shows responses skewed toward agreement, and negative kurtosis (-0.595 to -0.424) indicates dispersed responses. Overall, employees see themselves as creative, though perceptions of organizational support vary, highlighting the need to strengthen workplace conditions that foster innovation.

Table 4 Descriptive Statistics of Creativity Scale

Variable	Mean	Standard deviation	Skewness	Kurtosis
I actively seek ways to stimulate my innovative thinking and generate creative ideas in my daily work.	3.8	1.028	-0.472	-0.563
I have introduced innovative elements or solutions into my projects.	3.797	0.967	-0.431	-0.510
My work environment provides the necessary conditions to foster creativity.	3.765	1.041	-0.445	-0.595
I regularly explore different sources of inspiration when solving problems that require innovation.	3.773	0.978	-0.490	-0.424
I encourage and support my team members in being creative and generating new ideas together.	3.784	1.004	-0.456	-0.523

➢ *Reliability Analysis*

The reliability analysis in Table 5 shows high internal consistency across all dimensions. Cronbach's α coefficients exceed 0.89 for each scale, indicating strong reliability. Employee Innovation Performance (α = 0.92), Self-Efficacy (α = 0.936), and Creativity (α = 0.931) demonstrate excellent internal consistency. Growth Need Strength (α = 0.899) also shows strong reliability. The scale (25 items) yields a Cronbach's α of 0.952, confirming that the instrument reliably measures employees' innovative performance in traditional SMEs. These results validate the scale's effectiveness for future research.

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Table 5 Reliability Test Results

Dimension	Cronbach's α coefficient	Standardized Cronbach's α coefficient	Number of terms
Employee innovation performance	0.92	0.921	10
Growth need strength	0.899	0.898	5
Self-efficacy	0.936	0.936	5
Creativity	0.931	0.931	5
Overall	0.952	0.952	25

➢ *The Validity Analysis*

Table 6 shows a KMO value of 0.949 and a significant Bartlett's test ($\chi^2 = 8841.225$, df = 300, $p < 0.01$) confirm the data's suitability for factor analysis. These results indicate strong correlations among variables and validate the structural integrity of the scale. Overall, the scale demonstrates excellent construct validity, supporting its use for analyzing the employee innovation performance model.

Table 6 Validity Test Results

KMO test and Bartlett test		
KMO value		**0.949**
Bartlett sphericity test	Approximate chi-square	8841.225
	Df	300
	P	0.000**

Note: * * and * represent the significance level of 1% and 5% respectively.

➢ *Factors Loading*

Table 7 presents the factor loading results for the latent variables such as Employee Innovation, Growth Need Strength, Self-Efficacy and Creativity. All items show significant p-values ($p < 0.001$) and standardized loadings above 0.6, indicating strong relationships between observed variables and their respective latent constructs. These results confirm that all measurement items meet the criteria for factor retention and demonstrate strong construct validity, supporting the robustness of the model's measurement structure.

Table 7 Factor Load Coefficient Table

Factor	Variable	Non-Standard Load Factor	Standardized Load Factor	z	S.E.	P
Employee innovation	E1	1	0.808	-	-	-
	E2	1.053	0.824	20.409	0.052	0.000**
	E3	0.922	0.783	19.027	0.048	0.000**
	E4	1.013	0.833	20.73	0.049	0.000**
	E5	0.891	0.673	15.618	0.057	0.000**
	E6	0.969	0.751	17.97	0.054	0.000**
	E7	0.858	0.69	16.104	0.053	0.000**
	E8	0.87	0.702	16.466	0.053	0.000**
	E9	0.821	0.666	15.406	0.053	0.000**
	E10	0.738	0.691	13.336	0.055	0.000**
Growth need strength	G1	1	0.853	-	-	-
	G2	0.952	0.804	20.699	0.046	0.000**
	G3	0.922	0.793	20.273	0.045	0.000**
	G4	1.019	0.849	22.513	0.045	0.000**

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

	G5	0.803	0.705	17.088	0.047	0.000**
Self-efficacy	S1	1	0.824	-	-	-
	S2	1.014	0.83	21.468	0.047	0.000**
	S3	1.076	0.875	23.329	0.046	0.000**
	S4	1.052	0.874	23.294	0.045	0.000**
	S5	1.114	0.915	25.064	0.044	0.000**
Creativity	C1	1	0.813	-	-	-
	C2	0.94	0.812	20.365	0.046	0.000**
	C3	1.103	0.885	23.139	0.048	0.000**
	C4	0.971	0.829	20.994	0.046	0.000**
	C5	1.119	0.931	24.977	0.045	0.000**

Note: * * and * represent the significance level of 1% and 5% respectively.

➢ *Convergent Validity*

Table 8 reports each construct's Average Variance Extracted (AVE) and Composite Reliability (CR). Employee Innovation, Growth Need Strength, Self-Efficacy and Creativity. All factors meet the standard thresholds (AVE > 0.5, CR> 0.7), confirming strong convergent validity. Specifically, CR values range from 0.901 to 0.936 and AVE values from 0.54 to 0.747, indicating high internal consistency and that each construct is well represented by its indicators. These results validate the reliability and cohesion of the measurement model.

Table 8 AVE value and CR Value

Factor	Average variance extraction (AVE value)	Combined reliability (CR value)
Employee innovation	0.54	0.921
Growth need strength	0.646	0.901
Self-efficacy	0.747	0.936
Creativity	0.733	0.932

➢ *Discriminative Validity*

Table 9 presents the discriminant validity assessment using the square root of AVE and Pearson correlation coefficients. For all four constructs, Employee Innovation (√AVE = 0.735), Growth Need Strength (0.804), Self-Efficacy (0.864), and Creativity (0.856), the square root of AVE exceeds their correlations with other constructs. This confirms that each factor is conceptually distinct and effectively measures separate underlying traits. The model demonstrates strong discriminant validity, ensuring reliable differentiation among the constructs.

Table 9 Discriminant validity: Pearson correlation and AVE root value

	Employee innovation	Growth need strength	Self-efficacy	Creativity
Employee innovation	0.735			
Growth need strength	0.568(0.000**)	0.804		
Self-efficacy	0.611(0.000**)	0.534(0.000**)	0.864	
Creativity	0.548(0.000**)	0.483(0.000**)	0.506(0.000**)	0.856

Note: * * and * represent the significance level of 1% and 5% respectively. The diagonal number is the root number of the factor AVE.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

➢ *Correlation Analysis between Dimensions*

Table 10 presents Pearson correlation coefficients (based on average scores) among four dimensions: Employee Innovation, Growth Need Strength, Self-Efficacy, and Creativity. All correlations are statistically significant at 1% (p = 0.000), indicating meaningful relationships. Employee Innovation is moderately correlated with Growth Need Strength (r = 0.563) and strongly correlated with both Self-Efficacy (r = 0.651) and Creativity (r = 0.619), suggesting that higher self-efficacy and Creativity enhance innovation performance. Growth Need Strength shows moderate positive correlations with Self-Efficacy (r = 0.541) and Creativity (r = 0.474), while Self-Efficacy is also moderately correlated with Creativity (r = 0.568). These results highlight the interdependence among dimensions and suggest that enhancing growth needs and self-efficacy can foster employee creativity and innovation..

Table 10 Correlation Analysis of Different Latitudes

	Employee innovation	**Growth need strength**	**Self-efficacy**	**Creativity**
Employee innovation	1(0.000**)			
Growth need strength	0.563(0.000**)	1(0.000**)		
Self-efficacy	0.651(0.000**)	0.541(0.000**)	1(0.000**)	
Creativity	0.619(0.000**)	0.474(0.000**)	0.568(0.000**)	1(0.000**)

Note: * * and * represent the significance level of 1% and 5% respectively.

➢ *Regression Analysis*

Table 11 shows that the regression model explains 49.6% of the variance in Employee Innovation Performance (R^2 = 0.496), with an Adjusted R^2 of 0.493, indicating a strong model fit. The Durbin-Watson statistic is 1.922, suggesting no autocorrelation in residuals. The model is statistically significant (F = 149.692, p < 0.01), confirming that Growth Need Strength, Self-Efficacy, and Creativity collectively impact Employee Innovation Performance.

Table 11 Overall Test of Regression Model

R square	**Adjusted R-square**	**Durbin-Watson**	**F**	**P**
0.496	0.493	1.922	149.692	0.000**

Note: * * and * represent the significance level of 1% and 5% respectively.

Table 12 reveals that Growth Need Strength (B = 0.239, Beta = 0.265), Self-Efficacy (B = 0.298, Beta = 0.346), and Creativity (B = 0.217, Beta = 0.245) each have a significant positive effect on Employee Innovation Performance (p < 0.01), with Self-Efficacy being the most influential predictor. The constant term (B = 1.085, p < 0.01) is also significant, ensuring proper model fit. All predictors show low collinearity (VIFs < 2; Tolerance > 0.6), indicating independent contributions to the model. These results suggest that enhancing employees' growth orientation, confidence in their abilities, and Creativity can meaningfully boost innovation performance.

Table 12 Regression Model Coefficient

	Non-standardized coefficient		**Standardization coefficient**	**T**	**P**	**Collinear statistics**	
	B	**Standard error**	**Beta**			**Tol**	**VIF**
(constant)	1.085	0.140		7.766	0.000**		
Growth need strength	0.239	0.037	0.265	6.447	0.000**	0.654	1.529
Self-efficacy	0.298	0.036	0.346	8.286	0.000**	0.635	1.576
Creativity	0.217	0.036	0.245	6.083	0.000**	0.681	1.469

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

Dependent variable: Employee innovation performance

Note: * * and * represent the significance level of 1% and 5% respectively.

Table 13 shows that Self-Efficacy (β = 0.368, p < 0.01) and Growth Need Strength (β = 0.300, p < 0.01) significantly enhance Creativity, while all three Self-Efficacy (β = 0.363), Growth Need Strength (β = 0.267), and Creativity (β = 0.234) have significant positive effects on Employee Innovation Performance (all p < 0.01). These results highlight the direct and indirect pathways through which Self-Efficacy and Growth Need Strength influence innovation, underscoring the importance of fostering employee confidence and developmental motivation to enhance Creativity and innovative output.

Table 13 Path Analysis

Path	Standard path coefficient	Nonstandard path coefficient	S.E.	C.R.	P
Self-efficacy→Creativity	0.368	0.365	0.054	6.737	0.000**
Growth need strength→Creativity	0.3	0.285	0.052	5.513	0.000**
Growth need strength→Employee innovation performance	0.267	0.184	0.036	5.064	0.000**
Self-efficacy→Employee innovation performance	0.363	0.262	0.04	6.511	0.000**
Creativity→Employee innovation performance	0.234	0.17	0.036	4.726	0.000**

Note: * * and * represent the significance level of 1% and 5% respectively.

Table 14 shows that Self-Efficacy (β = 0.368, p < 0.05) and Growth Need Strength (β = 0.300, p < 0.05) significantly enhance Creativity. Both Self-Efficacy (β = 0.363, p < 0.05) and Growth Need Strength (β = 0.267, p < 0.05) also positively impact Employee Innovation Performance. Creativity (β = 0.234, p < 0.01) positively influences Employee Innovation Performance. These findings highlight that Self-Efficacy and Growth Need Strength not only directly influence Creativity but also indirectly enhance Employee Innovation Performance through Creativity, emphasizing the importance of fostering employee confidence and Growth needs to boost innovation.

Table 14 Intermediary Effect Test

Path	Effect value	SE	Bias-corrected 95%CI			Percenntile 95%CI		
			Lower	Upper	P	Lower	Upper	P
Growth need strength→ Employee innovation performance	0.267	0.056	0.16	0.38	0.000**	0.159	0.379	0.000**
Self-efficacy→ Employee innovation performance	0.363	0.058	0.254	0.48	0.000**	0.253	0.479	0.000**
Growth need strength→ Creativity→ Employee innovation performance	0.07	0.02	0.037	0.116	0.000**	0.034	0.111	0.001**
Self-efficacy→ Creativity→ Employee innovation performance	0.086	0.025	0.043	0.144	0.000**	0.041	0.139	0.000**
Total indirect effect	0.156	0.038	0.084	0.233	0.000**	0.082	0.231	0.000**

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

Total effect	0.785	0.036	0.707	0.849	0.000**	0.707	0.849	0.000**

Note: * * and * represent the significance level of 1% and 5% respectively.

V. DISCUSSIONS

The study investigated the psychological factors influencing employee innovation performance in traditional small and medium-sized technology enterprises (TSMEs), focusing on self-efficacy, Growth need strength, and Creativity. The results offer important insights into how these factors affect employees' innovative capacity and organizational performance. Self-efficacy, the belief in one's capability to perform tasks, emerged as a key driver of Creativity, with a path coefficient of 0.368. Employees with high self-efficacy are more confident in overcoming challenges and are more likely to engage in creative behaviour. It supports existing research linking self-belief to innovation, as confident individuals tend to experiment more and contribute novel ideas.

Growth needs Strength, which captures an employee's intrinsic motivation for personal development and positively influences Creativity (path coefficient = 0.3). Employees who seek Growth are more inclined to think creatively and solve problems innovatively. Additionally, the study found that Growth needs Strength indirectly boosts innovation performance through its positive effect on Creativity. It highlights the value of cultivating a growth-oriented organizational culture that challenges employees to improve continuously. Providing avenues for personal and professional development can foster Creativity and enhance innovation.

Creativity was confirmed as a key mediating variable in the relationship between self-efficacGrowth need strength, and innovation performance. Employees who demonstrate Creativity are better equipped to recognize improvement opportunities and develop innovative solutions. The study's findings show that self-efficacy and Growth need Strength positively affect Creativity, which drives innovation performance. These results emphasize that Creativity is not merely a precursor to innovation but a vital component that transforms motivation and belief into tangible innovation outcomes.

The practical implications for TSMEs are significant. Organizations should strengthen employees' self-efficacy through skill development, mentoring, and autonomy to improve innovation performance. Similarly, fostering Growth requires Strength by offering career advancement opportunities and recognizing individual achievements, which can enhance intrinsic motivation. Encouraging Creativity through collaboration, freedom to experiment, and a supportive work culture can further boost innovation. The proposed model underscores the importance of aligning psychological empowerment with innovation goals to build a creative, competitive workforce.

VI. CONCLUSIONS AND RECOMMENDATIONS

The study highlights that employee innovation performance is vital for the sustainable growth and competitiveness of traditional small and medium-sized technology enterprises (TSMEs). The research identifies self-efficacy, growth need strength, and creativity as key psychological factors influencing innovation. Self-efficacy significantly enhances creativity, enabling employees to approach tasks with confidence and resilience. Similarly, growth needs strength an employee’s intrinsic motivation to improve and develop that plays a pivotal role in nurturing creativity. Creativity, in turn, directly drives innovation performance and mediates the impact of both self-efficacy and growth need strength. The proposed employee innovation performance model integrates these three elements, offering a comprehensive framework for understanding and improving innovation capabilities in TSMEs. The findings underscore the importance of fostering a psychologically supportive environment that encourages personal growth and creative thinking, as these factors collectively contribute to stronger innovation outcomes across the organization.

To effectively implement the proposed model and enhance innovation performance in TSMEs, it is recommended that organizations cultivate a workplace culture that actively builds self-efficacy, supports personal development, and fosters creativity. It can be achieved through leadership practices that provide regular feedback and

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1433

recognition, opportunities for skills enhancement and career advancement, and creating environments that encourage experimentation, collaboration, and open idea exchange. By embedding these practices into daily operations, TSMEs can unlock the creative potential of their employees and achieve sustained innovation-driven growth.

VII. LIMITATIONS AND FUTURE STUDY

This study has several limitations that provide opportunities for future research. Firstly, the sample was limited to a single company, which restricts the generalizability of the findings to other industries or geographical regions. Additionally, the study's cross-sectional nature only captured data at one point in time, limiting insights into how employee innovation performance may evolve. The focus was primarily on self-efficacy, growth, strength, and creativity, potentially overlooking other important factors such as organizational culture or leadership style. Future research could expand the sample size and incorporate diversity in industry, enterprise type, employee hierarchy, and geography to improve generalizability. Broader research could also explore variables influencing innovation performance, including organizational culture and personal traits like emotional intelligence. Combining multiple research methods like longitudinal studies and experimental designs would offer more profound insights into causal relationships and long-term trends. Moreover, cross-cultural studies could reveal how cultural differences affect innovation performance, helping companies develop effective cross-cultural management strategies. Finally, employing advanced statistical techniques like Structural Equation Modeling (SEM) or Hierarchical Linear Modeling (HLM) would allow for a more nuanced analysis of complex data, contributing to a better understanding of the underlying mechanisms driving innovation performance.

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