GUYUB: *Journal of Community Engagement* Vol. 6, No. 2, April-Juni 2025
p-ISSN: 2723-1232; e-ISSN: 2723-1224 DOI: http://doi.org/10.33650/guyub.v6i1.11081

Smart PLS 4 for Smart Facilitators: Optimizing PLS-SEM Analysis in TKMP Program

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Submission: 2025-04-15 *Received*: 2025-06-07 *Published*: 2025-06-28

Keywords: *PLS-SEM; SmartPLS 4; Beginner Independent Workforce.*

Abstract. *Community Service through PLS-SEM Training with SmartPLS 4 aims to enhance the analytical skills of facilitators in the Beginner Independent Workforce Program. This program is designed to strengthen the entrepreneurial capacity of beginner entrepreneurs in Indonesia, focusing on the development of micro and small businesses through comprehensive training in business planning, marketing, financial management, and product development. The training method used is participatory and practical, incorporating a real-project simulation with a focus on field data collected by participants, who are facilitators. This method encourages active engagement, allowing facilitators to directly apply their own data in PLS-SEM analysis to understand relationships between variables influencing business success. This method provides a solid foundation for making more data-driven, informed decisions. The participatory approach used in the training allows facilitators to be directly involved in the mentoring process, helping beginner entrepreneurs with relevant and effective solutions. The training results show a significant improvement in facilitators' analytical skills, with an average pre-test score of 53 and a post-test score of 89.5. The Wilcoxon Signed-Rank test confirms a significant difference, indicating the training's effectiveness in enhancing the quality and effectiveness of mentoring. Additionally, facilitators are able to provide better insights into market potential and guide beginner entrepreneurs in facing market challenges.*

Katakunci:
PLS-SEM; SmartPLS 4; Tenaga Kerja Mandiri Pemula.

Abstrak. Pengabdian Masyarakat melalui Pelatihan PLS-SEM dengan SmartPLS 4 bertujuan untuk meningkatkan keterampilan analitis fasilitator dalam Program Pendampingan Tenaga Kerja Mandiri Pemula (TKMP). Program ini dirancang untuk memperkuat kapasitas kewirausahaan wirausahawan pemula di Indonesia, yang berfokus pada pengembangan usaha mikro dan kecil melalui pelatihan komprehensif dalam perencanaan bisnis, pemasaran, manajemen keuangan, dan pengembangan produk. Metode pelatihan yang digunakan bersifat partisipatif dan praktis, menggabungkan simulasi proyek nyata dengan fokus pada data lapangan yang dikumpulkan oleh peserta, yang merupakan fasilitator. Metode ini mendorong keterlibatan aktif, yang memungkinkan fasilitator untuk langsung menerapkan data mereka sendiri dalam analisis PLS-SEM guna memahami hubungan

antara variabel yang memengaruhi keberhasilan bisnis. Metode ini memberikan dasar yang kuat untuk membuat keputusan berbasis data yang lebih informatif dan akurat. Pendekatan partisipatif yang digunakan dalam pelatihan ini memungkinkan fasilitator terlibat langsung dalam proses bimbingan, membantu wirausahawan pemula dengan solusi yang relevan dan efektif. Hasil pelatihan menunjukkan peningkatan signifikan keterampilan analitis fasilitator, dengan rata-rata nilai pre-test 53 dan post-test 89.5. Uji Wilcoxon Signed-Rank mengonfirmasi perbedaan signifikan, mengindikasikan efektivitas pelatihan dalam meningkatkan kualitas dan efektivitas pendampingan. Selain itu, fasilitator mampu memberikan wawasan yang lebih baik mengenai potensi pasar dan mengarahkan wirausahawan pemula dalam menghadapi tantangan yang ada di pasar.

1 Introduction

The beginner independent workforce (*Tenaga Kerja Mandiri Pemula*/TKMP) refers to individuals who are just starting a business or working independently, with the primary goal of becoming entrepreneurs through the development of micro or small enterprises. To support this group, the Ministry of Manpower of the Republic of Indonesia initiated the TKMP Program as one of the strategies to foster entrepreneurship growth at the grassroots level (Kesumadewi & Aprilyani, 2024). This program is designed to provide training, mentoring, and business capital assistance to TKMP participants, so they are equipped with the necessary capacity to face the challenges in the business world. It is expected that this program will not only strengthen individual economic resilience but also contribute to reducing unemployment rates in Indonesia (Saputri & Hidayat, 2025).

The TKMP program provides training that covers various essential aspects, including business planning, marketing, financial management, and product development. Participants are engaged in every stage of planning and implementation through a participatory approach aimed at enhancing their confidence and technical skills (Jamhari & Khotimah, 2022). The training is designed to offer a comprehensive understanding of the key elements required to successfully run a micro or small enterprise, as well as to prepare participants to face the challenges of a competitive market (Nuraeni, 2023).

The support provided by experienced facilitators is also an integral part of this program, ensuring that participants can run their businesses sustainably and remain competitive. With this assistance, it is expected that participants will be able to develop their businesses more effectively and efficiently, while strengthening their connections with the market and the broader business environment. With the provided support, it is hoped that the TKMP will be empowered to grow and adapt to the ever-changing economic dynamics, creating a positive impact on Indonesia's economy (Yuliastuti, 2024).

The current condition of beginner independent workforce in Indonesia reveals considerable challenges, despite the high entrepreneurial potential among the labor force. Studies indicate that although the number of graduates continues to rise, a significant gap persists between job availability and the unemployment rate in the country (Saraswati et al., 2022). Many entry-level workers struggle to secure decent employment, leading to high levels of youth unemployment (Auliya & Agusalim, 2022). This issue is further exacerbated by limited access to relevant training and mentoring programs that could enhance their entrepreneurial skills (Teguh et al., 2022). Moreover, regions in Indonesia with higher unemployment rates often face greater obstacles in creating a supportive environment for the development of TKMP (Putri & Agusalim, 2023).

The Micro, Small, and Medium Enterprises (MSME) sector, which serves as the backbone of the national economy, has also been under pressure due to a lack of innovation and limited access to capital for novice entrepreneurs (Widodo & Puspitasari, 2024). As a result, many TKMP become trapped in unproductive business activities, with entrepreneurial skills that stagnate over time (Mashita & Anggresta, 2022). This situation was further exacerbated by the COVID-19 pandemic, which forced many small businesses to close or significantly reduce their operational capacity (Azizah et al., 2022). Consequently, TKMP have had to struggle harder to survive, with many facing severe financial difficulties. Therefore, more comprehensive interventions and sustained support are needed to strengthen the capacity of TKMP in Indonesia (Jamhari & Khotimah, 2022).

Support for TKMP is crucial in efforts to reduce unemployment and improve economic independence within communities. Proper support helps novice entrepreneurs develop their entrepreneurial skills, understand managerial aspects, and utilize available resources more efficiently (Santoso & Rakhmawan, 2021). In situations where many entry-level workers face challenges entering the formal labor market, mentorship becomes crucial to help them establish and sustain businesses amidst various obstacles (Tandean, 2023). Through appropriate training, the enhancement of practical skills, and knowledge of business strategies, mentors can contribute to the development of competitive entrepreneurs who are capable of adapting to changing economic conditions (Pujiastuti et al., 2024; Saraswati et al., 2022).

Support also serves to identify the factors influencing the success of businesses run by TKMP. Through analysis conducted by facilitators, they can provide relevant input on areas that need improvement while monitoring the progress of their businesses on a regular basis. In this context, the application of technology and understanding market trends becomes an essential part of the support, so that entrepreneurs can face changes with more confidence and responsiveness (Lestari et al., 2024). Without effective support, the entrepreneurial potential of TKMP may be hindered, which will impact inclusive economic growth in Indonesia (Khurniawan et al., 2020; Santoso & Rakhmawan, 2021). The success of this program is reflected in the decrease in unemployment rates in regions with high unemployment and the creation of new jobs through the development of new entrepreneurs (Yuliastuti, 2024).

The Directorate of Employment Opportunity Expansion, Ministry of Manpower of the Republic of Indonesia, in collaboration with Universitas Trilogi, is implementing the 2024 TKMP Mentoring Program aimed at strengthening the entrepreneurial capacity of novice entrepreneurs. This program prepares 87 facilitators who will assist approximately 2,173 entrepreneurs in several regions, including Banten, West Java, DKI Jakarta, East Java, East Kalimantan, South Kalimantan, and Kalimantan (Saputri & Hidayat, 2025). The training provided covers skills development in business planning, marketing strategies, and financial management, with the goal of enhancing entrepreneurs' ability to run

their businesses independently and sustainably. Through this program, the government not only creates job opportunities but also promotes economic independence within the community, particularly among the educated youth. With the support of facilitators, participants are expected to apply the knowledge gained to develop their businesses, thereby contributing to the reduction of unemployment rates in Indonesia. This program reflects the commitment between the education and employment sectors to create an environment that fosters entrepreneurial growth and addresses the challenges faced by prospective entrepreneurs in various regions (Kesumadewi & Aprilyani, 2024).

In the increasingly complex world of entrepreneurship, the ability to analyze data is a crucial skill for facilitators to provide the appropriate guidance to novice entrepreneurs. The Partial Least Squares Structural Equation Modeling (PLS-SEM) method, implemented through the SmartPLS 4 software, is an analytical tool that is useful for exploring the relationships between variables that influence the success of the program (Cheah (Jacky) et al., 2024; Hair et al., 2019). With its flexibility and robust support, PLS-SEM enables facilitators to handle complex models and provide accurate results in understanding the key factors underlying the success of independent businesses (Wang et al., 2024). Training focused on PLS-SEM will empower facilitators with improved analytical skills, which in turn will facilitate more informed decision-making based on valid and reliable data. This is crucial for the TKMP Program, as the effectiveness of facilitation has a direct impact on the development of novice entrepreneurs and the enhancement of their entrepreneurial capacity. The optimization of analytical skills through PLS-SEM training has the potential to lay a strong foundation for facing the dynamics and challenges of contemporary entrepreneurship, while also strengthening contributions to sustainable economic growth in Indonesia.

Therefore, advanced PLS-SEM training with SmartPLS 4 is necessary to optimize the analytical capabilities of facilitators involved in the TKMP program (Cheah (Jacky) et al., 2024; Hair, Sarstedt, et al., 2025). This training aims to equip participants with the skills to use

advanced PLS-SEM analysis methods, which are useful for evaluating complex relationships between variables in social and business research. By mastering this technique, facilitators are expected to analyze data more effectively and make informed decisions in supporting novice entrepreneurs. The use of SmartPLS 4 as an analytical tool allows facilitators to perform more accurate structural models and produce more reliable estimates in program evaluation, thereby improving the effectiveness of the mentoring program. With a deep understanding of PLS-SEM, facilitators can provide better insights, enabling TKMP participants to fully leverage their potential in the business world.

2 Method

The advanced PLS-SEM training session using SmartPLS 4 software was held on September 30, 2024. The training took place in the Executive Seminar Room at Trilogi University and was a collaborative effort between the Bureau of Innovation and Entrepreneurship at Trilogi University and the Ministry of Manpower of the Republic of Indonesia. The training was designed as a single intensive session lasting three hours, comprising three main components: theoretical presentation, demonstration of software use, and hands-on practice with PLS-SEM-based data analysis. A total of 20 participants attended the training, all of whom were beginner facilitators of the TKMP program. The purpose of the training was to enhance participants' capacity to understand and apply the PLS-SEM method as an analytical tool for identifying and understanding the factors that influence the success of independent businesses.

The training method used is participatory and practical, aimed at encouraging active participant engagement. The session began with a brief presentation on the fundamental concepts of PLS-SEM, including the distinction between reflective and formative models, as well as the principles of construct validity and reliability. This was followed by a hands-on demonstration of the latest version of SmartPLS 4, used for building and estimating research models (Cheah (Jacky) et al., 2024). Participants were then guided to practice independently using simulation data, with support from the facilitators. The training

employed a real-project simulation method, focusing on field data that had been collected by the participants, who are facilitators of TKMP. This allowed participants to directly apply their own field data to the analysis, making the training more relevant and impactful. The training materials were systematically structured and are presented in Table 1. The training content covered the basic philosophy of PLS-SEM, evaluation of measurement and structural models, as well as techniques for robustness testing and advanced validation (Hair et al., 2019; Hair et al., 2025; Vaithilingam et al., 2024).

Table 1. Training Material for Advanced PLS-SEM with SmartPLS 4

Section	Duration	Topics
1. Introduction to SmartPLS 4 and PLS-SEM framework	20 minutes	Philosophical foundations of PLS-SEM
		General architecture of PLS-SEM models
		SmartPLS 4 interface and new features
		Data preparation and import formats
		Descriptive analysis
		Relationships between constructs and indicators
2. Measurement model evaluation	45 minutes	Reliability test: Outer loadings, Cronbach's alpha, composite reliability
		Validity assessment: Convergent validity (Average Variance Extracted/AVE), Discriminant validity (cross-

Section	Duration	Topics
		loadings, Heterotrait-Monotrait/HTMT ratio, and Fornell-Larcker criterion), and latent variable correlation
3. Structural model evaluation	45 minutes	Collinearity diagnostics using Variance Inflation Factor (VIF)
		Coefficient of determination (R^2 and adjusted R^2), effect size (f^2), model fit indices
		Path coefficients and statistical significance (bootstrapping results)
4. Robustness checks and advanced validation	70 minutes	PLS Predict: Predictive validity assessment using Q^2 predict and comparison of prediction errors (MAE vs RMSE)
		Linearity testing within PLS-SEM
		Endogeneity test using the Gaussian Copula approach
		Model heterogeneity testing using FIMIX-PLS (segmentation) and Multi-Group Analysis (MGA) with the Measurement Invariance of Composite Models (MICOM) procedure

The evaluation of training effectiveness was conducted using a quantitative approach through the administration of pre-tests and post-

tests (Agusalim, 2024a, 2024b). The main objective of this evaluation was to assess the extent to which the training was able to enhance participants' understanding of PLS-SEM concepts and applications. The test consisted of 10 items in true/false and multiple-choice formats, which were proportionally designed to reflect the scope of the training content. The use of this evaluation format allowed for an objective measurement of participants' knowledge change over a short period. A detailed breakdown of the test items is presented in Table 2. The questions covered topics such as the PLS-SEM method, evaluation of measurement and structural models, as well as advanced techniques like FIMIX-PLS and multigroup analysis. This evaluation will serve as the foundation for further analysis of the training program's effectiveness.

Table 2. Training Assessment Questions

No	Question	Question Type
Q1	PLS-SEM is an appropriate method for multivariate analysis involving latent (unobserved) variables.	True/false
Q2	In the PLS-SEM approach, model evaluation includes both measurement model and structural model assessments.	True/false
Q3	The Heterotrait-Monotrait Ratio (HTMT) is a test of discriminant validity used in the evaluation of the measurement model.	True/false
Q4	The R-squared value indicates the proportion of variance in the dependent variable explained by the independent variables.	True/false
Q5	FIMIX-PLS is used to identify unobserved heterogeneity in data through segmentation.	True/false
Q6	What does the outer loading value represent in PLS-SEM?	Multiple choice

No	Question	Question Type
Q7	What is the purpose of bootstrapping in PLS-SEM?	Multiple choice
Q8	If the Variance Inflation Factor (VIF) exceeds 5, what does it indicate?	Multiple choice
Q9	Which of the following is not considered part of robustness checks in PLS-SEM?	Multiple choice
Q10	In multigroup analysis (MGA) using PLS-SEM, which of the following statements is most accurate?	Multiple choice

The evaluation data were analyzed quantitatively to assess the effectiveness of the training. The analysis was conducted using descriptive statistics to calculate the percentage of correct answers on the pre-test and post-test. Data visualization using a dumbbell chart was employed to show the score changes for each participant, as well as to illustrate the distribution and trends of improved understanding (Evergreen, 2019; Schwabish, 2021). Subsequently, to test whether there were significant differences between the pre-test and post-test results, inferential statistical analysis was performed. A normality test using the Shapiro-Wilk method was first applied to the score differences, as this method is considered sensitive and suitable for small sample sizes (Shapiro & Wilk, 1965). If the data were normally distributed, the difference analysis would be conducted using a paired t-test. However, if the data were not normally distributed, the non-parametric Wilcoxon Signed-Rank test would be used as a suitable alternative (Cleophas & Zwinderman, 2016; Nurkhalim et al., 2025).

3 Results

This training was attended by 20 participants from varied background. In term of gender, the participants were predominantly female (80%), while males constituted 20 percent. The average age of the participants

was 39 years, with an age range from 21 to 60 years. This reflects that the training attracted participants from various age groups, ranging from younger generations to more senior individuals. The majority of participants, 75 percent, had prior experience using SmartPLS 4 before the training. However, this experience did not always reflect a high level of proficiency, indicating the need for further training to deepen their understanding of advanced aspects of PLS-SEM. The evaluation results through the pre-test and post-test showed significant improvement. In the pre-test, participants were able to answer approximately 53 percent of the questions correctly. After attending the training, the average post-test score increased to 89.5 percent of questions answered correctly.

Table 3. Summary Statistic

Variable	N	Mean	Min.	Max.	Std. Dev.
Gender	20	0.20	0	1	0.51
Age	20	38.80	21	60	10.10
SmartPLS experience	20	0.75	0	1	0.41
Pre-test	20	53.00	40.00	70.00	8.01
Post-test	20	89.50	80.00	100.00	5.10

Figure 1 presents a dumbbell chart comparing the percentage of correct answers between the pre-test and post-test for each question (Q1 to Q10). The red dots represent the pre-test results, while the blue dots represent the post-test results. Overall, a significant improvement is observed in the percentage of correct answers from the pre-test to the post-test across all questions. For example, for Q1 to Q4, the percentage of correct answers increased from 65 percent or lower in the pre-test to 100 percent in the post-test. Other questions also show consistent improvements, with the smallest increase ranging from 30 percent to 80 percent in Q9 and Q10. This indicates an improvement in understanding or knowledge after the learning or training intervention conducted between the two tests.

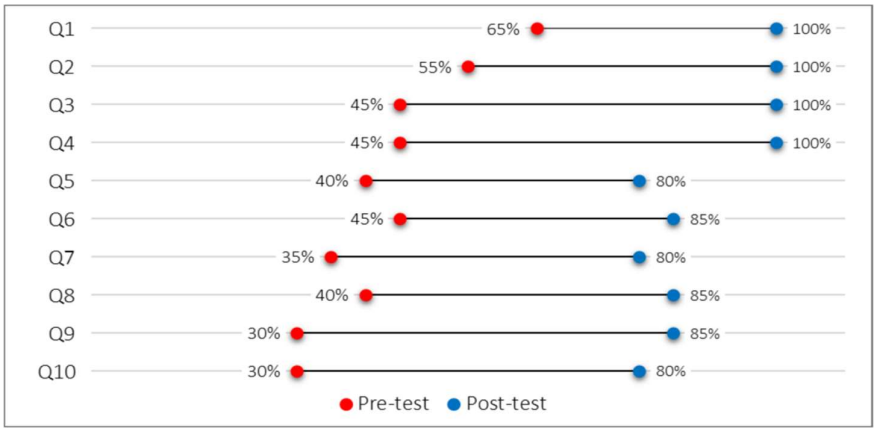


Figure 1. Dumbbell Chart of Correct Answer per Question

Furthermore, the dumbbell chart also illustrates the improvement in participants' understanding and skills, as shown in Figure 2. Overall, many participants experienced significant changes, with some recording notable score increases from the pre-test to the post-test. Several participants even achieved perfection, with improvements from 70 percent to 100 percent. Additionally, the majority of the remaining participants also demonstrated meaningful progress in their understanding. Overall, this training has enhanced participants' understanding and analytical skills in PLS-SEM using SmartPLS 4.

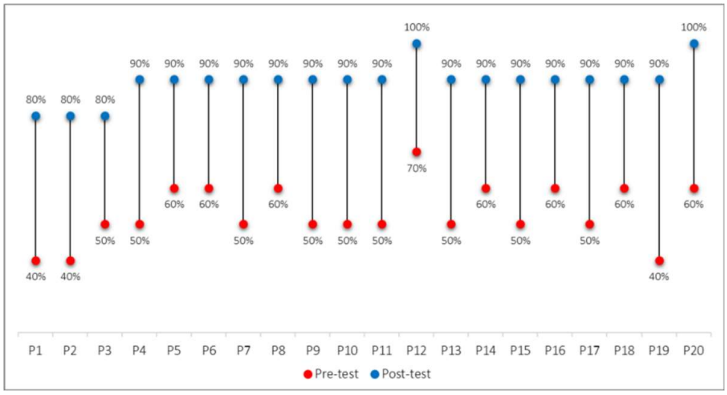


Figure 2. Dumbbell Chart of Participant Score

To ensure the success of the training, an evaluation was conducted by testing the difference between the pre-test and post-test results. Prior to conducting the difference test, a normality test was performed to assess the data distribution. The Shapiro-Wilk test was chosen due to its

effectiveness in detecting deviations from normal distribution, especially with small sample sizes. The normality test results showed a p-value of 0.012 for the pre-test and 0.000 for the post-test, both of which are smaller than 0.05. This indicates that the pre-test and post-test data are not normally distributed. Therefore, the non-parametric Wilcoxon Signed-Rank test was used to assess the differences between the pre-test and post-test.

Table 4. Shapiro-Wilk Normality Test Result

Variable	Shapiro-Wilk		
	Statistic	Df.	Sig.
Pre-test	0.870	20	0.012
Post-test	0.688	20	0.000

Based on the results of the Wilcoxon Signed-Rank test, a Z value of -4.028 was obtained, with a significant p-value of less than 0.001. This indicates a significant difference between the pre-test and post-test results. Specifically, the majority of participants demonstrated substantial improvement in their understanding of the material after the training, with a mean rank of 10.50 on the post-test, indicating that more participants achieved higher post-test scores compared to their pre-test scores. This rank reflects the difference in score positions between the pre-test and post-test; the higher the rank, the greater the difference in post-test scores compared to pre-test scores. No participants showed a decrease in their scores (post-test < pre-test), which further strengthens the evidence that the training had a positive impact on improving participants' knowledge and understanding. Therefore, these results provide strong indication that the training was successful in enhancing participants' mastery of PLS-SEM concepts.

Table 5. Wilcoxon Signed-Rank Test Results

Description	N	Mean Rank	Sum of Ranks	Z	p-value
Post-test < Pre-test	0	0.00	0.00	-	-
Post-test > Pre-test	20	10.50	210.00	-	-
Post-test = Pre-test	0	-	-	-	-
Post-test vs Pre-test	20	-	-	-4.028	<0.001

4 Discussion

The findings of this training indicate that a practice-based learning approach, integrating theoretical concepts with real-world applications of SmartPLS 4, significantly enhances participants' understanding of the PLS-SEM method. In the pre-test, participants answered 53 percent of pre-test questions correctly, and after the training, the average post-test score rose to 89.5 percent. The Wilcoxon Signed-Rank test showed a Z value of -4.028 and a p-value less than 0.001, indicating a significant improvement and supporting the claim that the training enhanced participants' understanding. These results align with the findings of Saputra et al. (2025) which is intended for researchers and Wiguna et al. (2025) for students.

The consistent increase in scores from pre-test to post-test across all participants affirms that the implemented training strategy effectively addressed the needs of learners with diverse backgrounds in experience and prior knowledge. The training employed a simulated real-project method, emphasizing the use of field data collected by the participants, who are facilitators of TKMP. This approach not only enhanced their practical application of SmartPLS 4 but also ensured that the learning was directly relevant to their professional experience. Although most participants had some initial exposure to SmartPLS 4, the advanced training proved to be relevant in further strengthening their analytical competencies. This is in line with the perspective of Hair et al. (2025), who emphasize that mastering PLS-SEM requires a systematic learning process and structured guidance, rather than relying solely on intuitive practice.

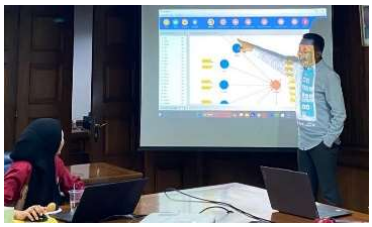
The diversity of participants' demographic characteristics further reinforced the effectiveness of this training, which successfully reached an inclusive and representative target group—ranging from younger to senior individuals and encompassing varied experiential backgrounds. In terms of adaptation strategies for inclusivity, extra attention was given to senior participants, who required one-on-one assistance at a slower pace to fully grasp the concepts. This dynamic highlights the importance of adaptive and application-based learning methods in the context of human resource development, particularly within the employment and

entrepreneurship sectors, which increasingly demand data-driven decision-making (Lu et al., 2021; Tiwari, 2024). Training of this kind serves as a strategic platform for enhancing participants' abilities to comprehend the complexity of inter-variable relationships, construct conceptual models, and interpret results in a logical and reflective manner.

The implementation of the training was carried out through several sequential stages, systematically designed to align with participants' needs, as shown in the previous Table 1. The documentation presented in Table 6 captures parts of the learning process utilizing SmartPLS 4 software. Participants were guided in constructing measurement models, evaluating construct validity and reliability, and interpreting the results of structural model estimation. Active interaction between facilitators and participants, group discussions, and case study simulations formed integral components of the learning process. The activities were not unidirectional; rather, they provided participatory space for participants to ask questions and engage in dialogue. Notably, 95 percent of participants successfully completed the training, while 5 percent were unable to finish due to issues with their laptop devices. Visual documentation of the training illustrates a dynamic and collaborative learning environment, reflecting an academic atmosphere conducive to the simultaneous development of critical and technical thinking skills. This approach is crucial in bridging the gap between theory and practice, while also fostering participants' confidence in independently applying PLS-SEM.

Table 6. Visual Documentation of the Training Sessions

No.	Photo	Captions
1		The facilitator demonstrates the basic steps of using SmartPLS 4, guiding participants through the initial setup of PLS-SEM analysis. The

No.	Photo	Captions
		group is actively engaged in the learning process.
2		Participants follow along with the facilitator's demonstration, focusing on setting up the initial model in SmartPLS 4. The facilitator ensures clarity by explaining the steps thoroughly.
3		The facilitator provides one-on-one assistance in configuring parameters in SmartPLS 4, with extra attention given to a senior participant needing slower-paced guidance.
4		Participants explore SmartPLS 4 with the facilitator's guidance, engaging in discussions to clarify their understanding of the tool and its PLS-SEM application.

No.	Photo	Captions
5		The facilitator offers further clarifications as participants progress through the PLS-SEM steps.

From a methodological perspective, the use of the Shapiro-Wilk test for normality demonstrates methodological sensitivity to the characteristics of small sample sizes (Ahadi & Zain, 2023; Isnaini et al., 2025). The results, which indicated non-normal data distribution, led to the use of the non-parametric Wilcoxon Signed-Rank test. This test validly confirmed a significant improvement in post-test scores compared to pre-test scores (Zulkipli et al., 2024). This not only reflects technical accuracy in data processing but also reinforces the legitimacy of the claim that the training had a tangible impact, rather than being merely a result of bias or perception. The data visualization using a dumbbell chart further substantiates these findings by illustrating consistent improvement across all question items and participants, including those items with higher levels of difficulty. This suggests that the training was not superficial or repetitive of basic content, but rather effectively built participants' deeper analytical thinking skills.

Overall, this training has enhanced participants' understanding and analytical skills in PLS-SEM using SmartPLS 4. Through a practical and interactive approach, participants not only learned the theory but also applied it in real-world case studies (Basir et al., 2024). This enabled them to better grasp complex concepts and understand how to apply them in the context of their own research. These positive outcomes indicate that the learning intervention not only succeeded in improving basic knowledge but also equipped participants with the analytical skills necessary for conducting effective data analysis in the future.

In the context of empowering independent workforce facilitators, analytical skills are one of the key competencies that must be possessed

by facilitators. The role of a facilitator is not merely that of an administrative advisor or motivator, but also as a strategic actor capable of interpreting data, recognizing patterns and challenges, and designing evidence-based interventions that are relevant to the needs of the community (Favero & Belfiore, 2019). When facilitators are equipped with skills in structural model analysis such as PLS-SEM, they gain an essential asset to formulate more precise policy recommendations, evaluate program effectiveness, and navigate complex socio-economic dynamics. Therefore, training that focuses on strengthening analytical capacity not only enriches facilitators' technical skills but also fosters critical and reflective thinking, which is essential in decision-making processes. Investment in the development of these skills should become an integral part of future workforce training program designs, so that facilitators can become adaptive, data-driven change agents who are responsive to local challenges.

5 Conclusion

The advanced PLS-SEM training using SmartPLS 4 has proven effective in enhancing the analytical capabilities of novice independent workforce facilitators. These facilitators, as key players in the success of the TKMP program, are crucial in guiding and mentoring participants toward sustainable entrepreneurial development. Evaluation results showed a significant improvement in participants' understanding and skills. The average pre-test score was 53, while the post-test score increased to 89.5. Statistical analysis using the Wilcoxon Signed-Rank test confirmed a significant difference, supporting the effectiveness of the training. This program was designed in an intensive and applicative manner to strengthen participants' understanding of advanced concepts in variance-based structural modeling, through a combination of theoretical exposition and hands-on practice. Participants came from diverse backgrounds in terms of age, gender, and experience, reflecting the broad and inclusive scope of the training.

While some participants were already familiar with SmartPLS 4, their mastery of advanced features remained limited, making the training highly relevant for deepening their comprehension. Evaluation results

indicated a significant improvement in participants' understanding and skills, as evidenced by both test scores and individual progress. Statistical tests supported these findings, demonstrating the effectiveness of the training without any decline in performance. These results suggest that a structured, practice-oriented training approach contributes meaningfully to human resource capacity development, particularly in strengthening data analysis skills among facilitators in the field of independent employment. Based on these findings, it is recommended to continue offering this intensive training model and potentially expand it to a wider audience to further enhance analytical skills in the workforce.

6 Acknowledgment

Sincere appreciation is extended to the Bureau of Innovation and Entrepreneurship at Trilogi University as well as the Ministry of Manpower of the Republic of Indonesia for their valuable collaboration and support.

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