



Transforming the Knowledge and Behavior of SMEs Through Digital Marketing Training

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Abstract: This study examines the effect of digital marketing training on knowledge improvement and marketing behavior change among micro, small, and medium enterprise (MSME) members. Using a pre-experimental one-group pre-test post-test design, this study involved six members of Berkah Jaya MSME Group in Bulungan Regency, North Kalimantan as research subjects. The training intervention covered three main aspects: digital marketing through social media optimization, halal certification procedures, and digital financial bookkeeping. Data were collected using a structured 10-item questionnaire administered before (pre-test) and after (post-test) the training. The Wilcoxon Signed-Rank Test was employed to measure the significance of knowledge improvement. Results show a statistically significant increase in overall knowledge scores (pre-test: $M=50.00$, $Mdn=65.00$; post-test: $M=90.00$, $Mdn=90.00$) [$Z=-2.014$; $p=0.022$; one-tailed], with five of six participants showing improvement. Behavioral observation further confirms that all participants began actively utilizing Instagram for product promotion and registered their business on Google Maps following the training. These findings confirm that structured, practice-based digital marketing training significantly improves MSME knowledge and triggers concrete behavioral shifts toward digital adoption in border regions of North Kalimantan.

Keywords: Digital Marketing Training; MSME Knowledge; Digital Marketing Behavior; Wilcoxon Signed-Rank Test; Border MSMEs

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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of Indonesia's economy, contributing approximately 61 percent to the Gross Domestic Product (GDP) and employing more than 97 percent of the national workforce (Ahdiat Adi, 2024; Tambunan, 2019). In the era of digital transformation, the ability of MSME actors to adopt digital marketing technologies has become a key determinant of business sustainability and competitiveness (Rahayu & Day, 2015; Vial, 2019). However, the majority of SME operators in Indonesia, particularly in border regions, are still unable to fully leverage digital marketing due to limitations in knowledge, skills, and access to technology (Murietta, 2024; Situmorang, 2015).

In Bulungan Regency, North Kalimantan Province, a border region with Malaysia, there were approximately 267,000 SMEs in 2023 (Koran Kaltara, 2023). As a border region, Bulungan Regency possesses potential for cross-border market expansion, which demands higher standards of product quality and legal compliance. However, SMEs in this region still face serious challenges, including low digital literacy, weak financial management, limited managerial capacity, and the absence of halal certification and business digital identity (APINDO, 2024; Utomo & Ariani, 2017).

Berkah Jaya SME, a ten-member culinary business group in Tanjung Selor, Bulungan Regency, is a concrete example of these issues. Prior to the training intervention, none of the members had a business social media account, were not listed on Google Maps, lacked a professional logo, and did not understand halal certification procedures. These conditions directly limit the businesses' market reach and competitiveness. One common intervention to enhance SMEs' digital capacity is a training program. However, the effectiveness of digital marketing training on changes in SMEs' marketing knowledge and behavior, particularly in the Kalimantan border region, has been minimally studied empirically with sufficient statistical evidence. This study aims to: (1) measure participants' baseline knowledge levels prior to training; (2) analyze differences in knowledge scores before and after training using statistical tests; and (3) identify changes in participants' digital marketing behavior following the training. The study's findings are expected to contribute to the development of effective, evidence-based SME training models in Indonesia's border regions.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Digital Marketing and SMEs

(Kotler & Armstrong, 2018) define digital marketing as marketing efforts that utilize digital channels and internet-based technologies to reach consumers in a more personalized, measurable, and efficient manner. For SMEs, the adoption of digital marketing has significant strategic implications: expanding market reach, increasing business visibility, building consumer trust, and ultimately driving revenue growth (Leeflang et al., 2014). Research by (Rahayu & Day, 2015) in Indonesia demonstrates that the adoption of internet technology positively influences SME growth, particularly in terms of market share expansion. However, the adoption of digital marketing is not without challenges. (Leeflang et al., 2014) identified four main barriers: (1) a lack of understanding of digital platforms; (2) a shortage of competent digital personnel; (3) a gap between theoretical knowledge and practice; and (4) resistance to change from conventional business models. These four barriers underscore that structured practice-oriented training interventions are an appropriate and necessary approach.

Theories of Behavioral Change through Training

The effectiveness of training in changing knowledge and behavior can be explained through two main theoretical frameworks. First, (Rogers, 2003) Theory of Innovation Diffusion explains that the adoption of technological innovations by individuals proceeds through the stages of awareness, persuasion, decision,

implementation, and confirmation. Training plays a strategic role in the awareness and persuasion stages by accelerating and facilitating the adoption process. Second, (Kirk, 2013) distinguishes four levels of evaluation: reaction, learning, behavior, and results. This study focuses on the learning level (measured via pre-test and post-test) and the behavior level (measured via post-training observation), which are the two most critical levels in assessing the effectiveness of short-term training. Previous research supports the effectiveness of this approach.

Halal Certification as a Component of SME Capacity

Halal certification is increasingly becoming a strategic component for food SMEs. (Riaz & Chaudry, 2004) assert that halal certification is not merely a matter of complying with religious requirements, but rather an important quality signal that expands market access and builds consumer trust. (Yunus et al., 2014) empirically demonstrated that halal certification significantly influences the purchasing decisions of Muslim consumers, making it a strategic necessity for food SMEs seeking to expand their market reach.

Hypothesis Framework

Based on the literature review above, this study formulates the following hypothesis:

H₁: There is a significant difference between participants' knowledge scores before (pre-test) and after (post-test) participating in digital marketing training ($\alpha = 0.05$, one-tailed).

METHODS

Research Design

This study employs a pre-experimental design with a one-group pre-test post-test design. The design sequence is: $O_1 \rightarrow X \rightarrow O_2$, where O_1 = pre-test measurement, X = training intervention, and O_2 = post-test measurement. This design was chosen because it is suitable for measuring changes in a single group resulting from the intervention administered, particularly in situations where forming a control group is not feasible (Creswell, 2009).

Research Participants

The research participants are members of the Berkah Jaya SME located in Tanjung Selor Hilir Village, Bulungan Regency, North Kalimantan Province. Subject selection was conducted using purposive sampling with the following criteria: (1) being an active member of the Berkah Jaya SME; (2) attending all training sessions from start to finish; and (3) being willing to serve as a research respondent. Of the ten total members, six met all inclusion criteria. The characteristics of the research subjects are presented in Table 1.

Table 1. Characteristics of Research Subjects

No.	Characteristic	Description
1	Number of respondents	6 people
2	Gender	Female: 5 people (83.3%); Male: 1 person (16.7%)
3	Age range	25–52 years
4	Educational level	Junior high school: 1 person; Senior high school/vocational school: 4 people; Associate's/Bachelor's degree: 1 person
5	Business experience	2–10 years
6	Ownership of active business social media accounts (prior to training)	2 people (33.3%)
7	Knowledge of digital bookkeeping (prior to training)	None of the respondents had ever used bookkeeping software

Source: Primary Data

Intervention: Digital Marketing Training Program

The training session was held on October 23, 2025, in Bulungan Regency and lasted four hours (10:30 a.m.–2:30 p.m. WITA). The training utilized an experiential learning approach that combined lecture-based instruction, live demonstrations, and guided practice. The training materials covered three main modules: (1) Digital Marketing Module, strategies for utilizing social media (Facebook and Instagram) for business promotion, content creation techniques, business account management, business logo creation, and registering business locations on Google Maps; (2) Halal Certification Module, regulations and procedures for applying for halal certification for food-related SMEs, as well as the strategic benefits of halal certification; and (3) Digital Financial Bookkeeping Module, introduction to and practice with simple bookkeeping applications, recording daily transactions, separating business and personal finances, and preparing simple profit and loss statements.

Data Collection Instruments

Quantitative data was collected using a structured questionnaire consisting of 10 multiple-choice items scored 0 (incorrect) or 10 (correct) per item, resulting in a maximum total score of 100. The questions were designed based on the training materials presented and content-validated by the development team. The same questionnaire was administered twice: before the training (pre-test) and after the training (post-test). The distribution of questions by training aspect is presented in Table 2.

Table 2. Distribution of Questionnaire Questions by Training Aspect

Training Topic	Question Number	Number of Questions	Scoring Scale
Digital Marketing (social media, Google Maps, digital identity)	3, 6, 8	3	0–10 per question

Halal Certification & Business Legality	4, 9	2	0–10 per question
Digital Bookkeeping & Financial Management	2, 5, 7	3	0–10 per question
Appropriate Technology & Business Impact	1, 10	2	0–10 per question
Total		10	0–100

Source: Research Instrument Draft, 2025

Qualitative data on behavioral changes were collected through structured observations and brief interviews during and after the training sessions, as well as through post-training online monitoring. The behavioral indicators observed included ownership and activity of business social media accounts, business location registration on Google Maps, possession of a business logo, and consistency in daily financial record-keeping.

Data Analysis Techniques

Data analysis was conducted in two stages. First, descriptive analysis was used to describe the distribution of pre-test and post-test scores, including the mean, median, standard deviation, minimum, and maximum values. Second, the Wilcoxon Signed-Rank Test was used to test the significance of differences between pre-test and post-test scores. This non-parametric test was chosen because the small sample size ($n=6$) did not meet the normality assumption required by parametric tests such as the paired t-test (Siegel & Castellan, 1988). The hypothesis was tested one-tailed in accordance with the direction of the research prediction: H_1 : post-test > pre-test. The significance level used was $\alpha = 0.05$. The analysis was performed using SPSS version 25.

ANALYSIS AND DISCUSSION

Descriptive Statistics of Pre-test and Post-test Scores

Table 3. Pre-test, Post-test, and Wilcoxon Rank Data

Respondent	Pre-test Score	Post-test Score	Difference (d)	Rank d	Rank Type
R1	70	90	+20	3.00	Positive
R2	90	80	-10	1.00	Negative
R3	60	80	+20	3.00	Positive
R4	80	100	+20	3.00	Positive
R5	0	90	+90	5.00	Positive
R6	0	100	+100	6.00	Positive
Mean	50.00	90.00	+40.00	—	—
Median	65.00	90.00	+25.00	—	—
Standard Deviation	40.00	8.94	44.27	—	—

Source: Primary Data, 2025 (processed). Note: The rank of 3.00 for R1, R3, and R4 is a tied rank because $|d| = 20$ for all three respondents (average rank = $(2+3+4)/3 = 3.00$).

Table 3 presents the complete pre-test and post-test score data for each respondent, along with the differences, ranks, and rank types in the Wilcoxon test. The results of the descriptive analysis show a substantial increase from the pre-test to the post-test. The mean score increased from 50.00 to 90.00 (a difference of +40.00 points), while the median increased from 65.00 to 90.00. The post-test standard deviation (8.94), which is significantly smaller than the pre-test (40.00), indicates that after the training, participants' knowledge became more homogeneous, the knowledge gap among participants decreased significantly.

It is worth noting that R5 and R6 had pre-test scores of 0, meaning these two respondents had absolutely no knowledge of the training material before the program began. After the training, both achieved scores of 90 and 100, a very dramatic transformation in knowledge. Meanwhile, R2 experienced a decrease in score from 90 to 80. This can be explained by the ceiling effect, R2 already had very high prior knowledge (90), so the room for improvement was more limited, and fatigue during the long training session (4 hours) may have affected performance on the post-test.

Results of the Wilcoxon Signed-Rank Test

Table 4 presents the complete results of the Wilcoxon Signed-Rank Test based on the SPSS output obtained.

Table 4. Results of the Wilcoxon Signed-Rank Test

Indicator	Value	Description
Negative Ranks (N)	1	R2: score decreased (90 → 80), rank = 1.00
Positive Ranks (N)	5	R1, R3, R4, R5, R6: score increased, mean rank = 4.00
Ties (N)	0	No tied scores before and after
Total N	6	All respondents
W+ (Sum of Positive Ranks)	20.00	Sum of positive ranks
W- (Sum of Negative Ranks)	1.00	Sum of negative ranks
Z statistic	-2.014	Based on negative ranks (SPSS)
Asymp. Sig. (2-tailed)	0.044	Directly from SPSS output
p (one-tailed)	0.022	= $0.044 \div 2$ (one-tailed hypothesis)
Decision ($\alpha = 0.05$)	H1 Accepted	$p = 0.022 < 0.05 \rightarrow$ Significant

Source: SPSS 25 output, 2025. Note: p (one-tailed) = $\text{Asymp. Sig. (2-tailed)} \div 2 = 0.044 \div 2 = 0.022$; $\alpha = 0.05$

The test results show that out of 6 respondents, 5 experienced an increase in scores (positive ranks) and 1 experienced a decrease (negative ranks), with no ties (ties = 0). The sum of positive ranks ($W+ = 20.00$) is significantly greater than the sum of negative ranks ($W- = 1.00$), which intuitively indicates a predominance of the positive direction. Statistically, $Z = -2.014$ with $\text{Asymp. Sig. (2-tailed)} = 0.044$. Since the

research hypothesis is one-tailed, $p \text{ one-tailed} = 0.044 \div 2 = 0.022$. Since $p = 0.022 < \alpha = 0.05$, H_1 is accepted, there is a significant difference between the pre-test and post-test scores of the training participants. This finding confirms the effectiveness of the digital marketing training provided to Berkah Jaya SMEs. The novelty of this study lies in its geographical context, the border region of North Kalimantan, which has been underrepresented in the Indonesian SME literature.

Table 5. The direction and distribution of changes in scores from the pre-test to the post-test

		N	Mean Rank	Sum of Ranks
Skor Pos-test - Skor Pre-test	Negative Ranks ^a	1 ^a	1.00	1.00
	Positive Ranks ^b	5 ^b	4.00	20.00
	Ties ^c	0 ^c		
	Total	6		

a. Skor Pos-test < Skor Pre-test

b. Skor Pos-test > Skor Pre-test

c. Skor Pos-test = Skor Pre-test

Table 6. Statistical Test Results^a

	Skor Pos-test - Skor Pre-test
Z	-2,014 ^b
Asymp. Sig. (2-tailed)	,044

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

The results of the Wilcoxon Signed-Rank Test show that out of 6 respondents, 5 experienced an increase in scores (positive ranks, Sum of Ranks = 20.00) and 1 experienced a decrease in scores (negative ranks, Sum of Ranks = 1.00), with no respondents receiving the same score (ties = 0). Statistically, a Z-value of -2.014 was obtained with Asymp. Sig. (2-tailed) = 0.044, resulting in a one-tailed p-value of 0.022. Since $p = 0.022 < \alpha = 0.05$, H_1 is accepted, digital marketing training significantly increased the knowledge of Berkah Jaya MSME participants ($W^+ = 20.00$; $W^- = 1.00$; $Z = -2.014$; $p = 0.022$).

Changes in Digital Marketing Behavior

In addition to statistically measurable increases in knowledge, this study also documents tangible changes in participants' behavior following the training. Table 5 presents a comparison of digital marketing behavior indicators before and after the training.

Table 7. Changes in Participants' Digital Marketing Behavior

Digital Marketing Behavior Indicators	Before Training	After Training	Change
Have an active business Instagram account	0 out of 6 (0%)	6 out of 6 (100%)	+100%
Post products on social media	1 out of 6 (16.7%)	6 out of 6 (100%)	+83.3%
Business listed on Google Maps	0 out of 6 (0%)	6 out of 6 (100%)	+100%
Has a professional business logo	0 out of 6 (0%)	6 out of 6 (100%)	+100%
Recording daily financial transactions	1 out of 6 (16.7%)	5 out of 6 (83.3%)	+66.7%
Understanding halal certification procedures	0 out of 6 (0%)	6 out of 6 (100%)	+100%

Source: Observations and Interviews, 2025 (processed)

Table 5 shows very substantial behavioral changes across all indicators. The most significant changes occurred in three indicators that reached 100 percent: ownership of an active business Instagram account, registration on Google Maps, and ownership of a professional business logo. These three achievements are a direct result of the hands-on practice sessions during the training, where participants were guided in creating Instagram accounts, registering their business locations on Google Maps, and designing business logos in real-time. This “learning by doing” approach proved effective in encouraging participants to immediately implement new knowledge, in line with the principles of experiential learning.

Consistency in daily financial record-keeping increased from 16.7 percent to 83.3 percent, with one respondent still inconsistent at the time of monitoring. This is understandable, given that changing financial record-keeping habits requires a longer adaptation period compared to creating social media accounts. Understanding of halal certification procedures increased from 0 percent to 100 percent, although the official halal certificate had not yet been issued at the time of reporting. This increased understanding serves as a crucial foundation for completing the certification process independently.

Overall, the behavioral changes observed across all indicators demonstrate that increased knowledge has successfully translated into tangible actions. These findings align with Rogers' Theory of Innovation Diffusion (Rogers, 2003), which states that knowledge is the primary prerequisite for innovation adoption. The success of behavioral change in a single training session was driven by a hands-on approach that eliminated psychological barriers to new technology.

Research Limitations

This study has several limitations that must be acknowledged. First, the small sample size ($n=6$) reduces statistical power, so tests for individual aspects did not yield statistical significance even though descriptive analysis showed improvements. This is also due to the high number of tied ranks in the per-aspect analysis, some respondents already possessed good prior knowledge on specific topics. Second, the pre-experimental design without a control group limits the ability to isolate the training's effects from other external factors. Third, behavioral change was measured in the short term (1–2 weeks post-training), so its long-term sustainability cannot yet be confirmed.

CONCLUSION

This study empirically demonstrates that structured, practice-based digital marketing training significantly enhances the knowledge of participants from the Berkah Jaya MSMEs in Bulungan Regency. The results of the Wilcoxon Signed-Rank Test indicate a significant difference between the pre-test scores ($M=50.00$; $Mdn=65.00$; $SD=40.00$) and post-test scores ($M=90.00$; $Mdn=90.00$; $SD=8.94$) [$Z=-2.014$; $p=0.022$; one-tailed], with a mean difference of +40.00 points. Five out of six respondents showed an increase in scores, thus accepting H1.

Beyond knowledge enhancement, the training also successfully fostered concrete and measurable changes in digital marketing behavior among all participants, including the creation and activation of business Instagram accounts, registration on Google Maps, possession of a professional business logo, and a significant improvement in digital financial record-keeping practices. These findings confirm that a practice-based training model with relevant and contextual materials is an effective approach to promoting digital adoption among SMEs in border regions.

The practical implications of this research are the need for sustainable and standardized digital marketing training programs for SMEs in the border regions of North Kalimantan, integrating digital financial record-keeping and halal certification as integral components. Local governments and universities are advised to develop comprehensive training curricula, systematic post-training mentoring mechanisms, and expand the program to other SMEs with similar characteristics. Further research with a larger sample size, a quasi-experimental design with a control group, and a longer follow-up period (3–6 months) is recommended to strengthen and generalize these findings.

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