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# DETERMINANTS OF BUSINESS PERFORMANCE OF PALM OIL SECTOR

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## ABSTRACT
This study examines the effects of digital marketing, marketing strategy, and knowledge management on business performance in the palm oil sector in Merangkai Village, Siak Regency. A quantitative approach with a causal research design was employed. Primary data were collected through a census of 35 business actors using a structured questionnaire. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess the relationships among variables. The results indicate that marketing strategy has a positive and statistically significant effect on business performance. In contrast, digital marketing and knowledge management do not show a significant direct effect. The adjusted R-square value of 0.443 suggests that the three independent variables jointly explain 44.3% of the variance in business performance, while the remaining 55.7% is influenced by factors outside the model. These findings imply that efforts to improve business performance should prioritize strengthening marketing strategies, particularly in terms of market segmentation, target market selection, and positioning. Meanwhile, digitalization and knowledge management initiatives require more context-specific and targeted interventions. Practical recommendations include enhancing digital literacy through capacity-building programs, integrating local knowledge into business strategies, and conducting continuous evaluations to improve marketing effectiveness.

**Keywords:** marketing; digital; knowledge; performance; palm oil

# DETERMINAN KINERJA BISNIS SEKTOR MINYAK KELAPA SAWIT

## ABSTRAK
Penelitian ini mengkaji pengaruh pemasaran digital, strategi pemasaran, dan manajemen pengetahuan terhadap kinerja bisnis di sektor minyak kelapa sawit di Desa Merangkai, Kabupaten Siak. Pendekatan kuantitatif dengan desain penelitian kausal digunakan. Data primer dikumpulkan melalui sensus 35 pelaku usaha menggunakan kuesioner terstruktur. Data dianalisis menggunakan Partial Least Squares Structural Equation Modeling (PLS-SEM) untuk menilai hubungan antar variabel. Hasil menunjukkan bahwa strategi pemasaran memiliki pengaruh positif dan signifikan secara statistik terhadap kinerja bisnis. Sebaliknya, pemasaran digital dan manajemen pengetahuan tidak menunjukkan pengaruh langsung yang signifikan. Nilai R-square yang disesuaikan sebesar 0,443 menunjukkan bahwa ketiga variabel independen tersebut secara bersama-sama menjelaskan 44,3% varians dalam kinerja bisnis, sedangkan sisanya 55,7% dipengaruhi oleh faktor-faktor di luar model. Temuan ini menyiratkan bahwa upaya untuk meningkatkan kinerja bisnis harus memprioritaskan penguatan strategi pemasaran, khususnya dalam hal segmentasi pasar, pemilihan pasar sasaran, dan positioning. Sementara itu, inisiatif digitalisasi dan manajemen pengetahuan membutuhkan intervensi yang lebih spesifik konteks dan terarah. Rekomendasi praktis meliputi peningkatan literasi digital melalui program peningkatan kapasitas, pengintegrasian pengetahuan lokal ke dalam strategi bisnis, dan pelaksanaan evaluasi berkelanjutan untuk meningkatkan efektivitas pemasaran.

**Kata kunci:** pemasaran; digital; pengetahuan; kinerja; minyak kelapa sawit

## INTRODUCTION

The economic transition from traditional rubber cultivation to oil palm plantations has led to a significant shift in local livelihood strategies. One major consequence of this agricultural transformation is the reallocation of labor resources. Oil palm cultivation is generally less labor-intensive than the meticulous daily tapping required in rubber production (Shahiri & Du, 2025). As a result, the labor cost savings generated from this transition are often redirected into a range of non-agricultural activities. This capital supports the establishment of small retail businesses (*warung*), motorcycle taxi services, and other micro-enterprises in the local service sector, thereby diversifying household income sources and enhancing resilience to commodity market fluctuations. This phenomenon reflects a broader trend of rural eco-

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nomic diversification, in which savings from one sector are strategically reinvested to build a more resilient and multifaceted economic base (Zhang, 2025).

However, the prevailing business model among small-scale oil palm farmers often prioritizes extensification over intensification. Rather than focusing on maximizing yields and profits per hectare through improved cultivation techniques, superior seeds, or better soil management, the dominant preference is for the physical expansion of agricultural land holdings. This land expansion strategy is often perceived as an easier and more obvious path to increasing total revenue, despite the expense of lower efficiency and potential long-term environmental costs. This expansionist mindset directly fuels the relentless drive to convert frontier lands, including ecologically fragile areas.

Among the most critical and vulnerable of these frontier areas are Indonesia's vast peatland ecosystems. These landscapes have become an increasingly important resource for the nation's economic development and the foundation for the livelihoods of millions of people. However, this has come at a very high environmental cost. The transformation of peatlands from vital carbon sinks into productive carbon sources is one of the most severe ecological consequences of this agricultural paradigm. When peat swamp forests are cleared and extensive drainage canals are constructed to make the land suitable for oil palm, a devastating chain reaction begins. The drainage exposes the ancient, carbon-rich organic matter within the peat to aerobic conditions, triggering rapid microbial decomposition that releases large amounts of stored carbon dioxide (CO2) into the atmosphere. Furthermore, this dry and degraded peatland is highly susceptible to fires, which are notoriously difficult to extinguish and release more potent greenhouse gases such as methane and black carbon, creating a toxic haze that blankets the region (Varkkey et al., 2024).

Therefore, the imperative to develop and implement sustainable peatland management strategies is increasingly urgent. Beyond mere conservation, these strategies must integrate paludiculture the practice of cultivating crops on wet and rewetted peatlands which allows for productive use without the need for damaging drainage. Simultaneously, stringent policies to enforce no-deforestation commitments and encourage the rewetting of degraded peatlands are crucial. The ultimate goal of this multifaceted strategy is a drastic reduction in greenhouse gas emissions, as mitigating these carbon fluxes is arguably the most significant environmental challenge posed by the ongoing transformation of this unique and vital ecosystem. Without such interventions, the short-term economic gains from land expansion will continue to be outweighed by the substantial long-term global environmental costs.

Addressing these complex environmental challenges requires a comprehensive and integrated multifaceted approach. Holistic land-use planning is a key foundation in this effort, with clearly defined zoning based on in-depth scientific studies of ecological carrying capacity. Land divisions must consider absolute protected areas, buffer zones with limited activity, and responsibly managed cultivation areas. An agroecological approach offers a broader perspective by viewing the agricultural landscape as a complete ecosystem, where practices such as crop rotation, livestock integration, and integrated pest management can enhance the resilience of the overall system.

The application of best management practices is a crucial component in operationalizing these concepts. This includes precision irrigation techniques to maintain peat moisture, balanced fertilization based on soil analysis, and the selection of plant varieties adaptive to wetland conditions. Paludiculture, as one form of best practice, is not merely an alternative cultivation method but represents a paradigm shift in how peatlands view their potential. This system enables the development of commodities with both economic and ecological value, such as jelutung (jelutung), sago (sago), or traditional medicinal plants that thrive in wet conditions (Jaya et al., 2022).

Empowering local communities through environmental education and awareness programs is key to long-term success (Yadav et al., 2022). Capacity-building programs should be designed to increase understanding of peat ecosystems while providing technical skills in sustainable management. Economic incentive schemes, such as payments for environmental services or certification of peat-friendly products, can encourage voluntary behavior change. Meanwhile, a strong regulatory framework is needed to enforce management standards and provide legal certainty.

Restoration initiatives, particularly through rewetting degraded peatlands, are technical in-

terventions that directly address the root causes of emissions. Building canal blocks, planting native vegetation, and hydrological rehabilitation not only restore ecological functions but also prevent recurrent fire disasters. Government support through consistent policies, budget allocations, and cross-sector coordination are key determinants of the scale of implementation. Private sector involvement in partnership schemes, technology transfer, and sustainable investment can accelerate the adoption of best practices (Owojori & Erasmus, 2025).

Collaboration between research institutions, universities, and actors in the field is vital to developing innovative, contextual solutions. Long-term research on carbon dynamics, crop adaptation, and sustainable economic models will provide a scientific basis for policymaking. Without coordinated, science-based intervention, continued peatland conversion not only threatens global climate stability through massive carbon release, but also destroys unique biodiversity and undermines long-term socio-economic resilience. The ripple effects will extend beyond local geographic boundaries and become a shared global burden.

The following is the area of oil palm plantations in Dayun District in 2022-2023:

**Table 1. Area of Oil Palm Plantation in Dayun District 2022-2023**

| Kecamatan / Sub-Regency | Kelapa Sawit/Oil Palm | | Kelapa/Coconut | |
|---|---|---|---|---|
| | 2022 | 2023 | 2022 | 2023 |
| (1) | (2) | (3) | (4) | (5) |
| Minas | 26.997,36 | 29.498,11 | 14,41 | 16,12 |
| Sungai Mandau | 27.313,70 | 30.619,77 | 46,33 | 0,00 |
| Kandis | 103.487,69 | 80.286,82 | 100,91 | 3,03 |
| Siak | 3.976,44 | 14.568,98 | 128,71 | 3,69 |
| Kerinci Kanan | 6.899,82 | 9.985,31 | 371,77 | 0,00 |
| Tualang | 2.494,29 | 28.698,31 | 145,21 | 57,04 |
| Dayun | 9.443,63 | 19.352,27 | 80,31 | 0,16 |
| Lubuk Dalam | 2.136,58 | 10.478,19 | 82,38 | 0,78 |
| Koto Gasib | 27.339,49 | 57.594,69 | 48,39 | 6,1 |
| Mempura | 5.397,03 | 15.362,57 | 249,24 | 1,22 |
| Sungai Apit | 10.754,09 | 30.518,49 | 355,28 | 15,31 |
| Bunga Raya | 4.937,85 | 9.507,90 | 142,12 | 0,74 |
| Sabak Auh | 1.973,85 | 3.656,13 | 112,2 | 0,00 |
| Pusako | 10.872,77 | 6.769,61 | 65,89 | 3,32 |
| Kabupaten Siak | 244.024,59 | 346.897,14 | 1.943,15 | 107,51 |

Source: BPS Statistics Siak Regency

The collected data shows significant progress in the expansion of oil palm plantations in Dayun District. There has been a dramatic increase in land area, from 9.4 million hectares in 2022 to 19.3 million hectares in 2023 (Table 1). This surge not only reflects local agrarian dynamics but also responds to growing global demand. Expansion on such a scale indicates a shift in economic strategy, positioning oil palm as a leading commodity expected to be a key driver of the regional economy. This landscape transformation naturally carries multidimensional consequences, ranging from socio-economic aspects to environmental implications that require careful management.

This increase in planted area further solidifies oil palm's position as a strategic commod-

ity, playing a role not only in providing food and oleochemicals but also as a potential renewable energy source. In the context of the global energy transition, oil palm offers a solution as a renewable biodiesel feedstock. This is particularly relevant given that fossil-based oil reserves are continuously declining and predicted to become extinct in the coming decades. The ability to be grown and harvested sustainably makes palm oil a viable alternative for the national energy mix, particularly in reducing dependence on fossil fuels.

However, the development of palm oil as a renewable energy source must be accompanied by a sustainable and responsible approach. Aspects such as land productivity, production process efficiency, and the environmental impact of area expansion must be primary considerations. Increasing productivity through environmentally friendly intensification, for example through the implementation of precision farming practices and superior plant breeding, can be a solution to meet demand without the need for continuous land expansion. Furthermore, efficiency in the supply chain, from upstream to downstream, needs to be improved to ensure that palm oil biodiesel truly provides significant clean energy benefits.

The social implications of this expansion are equally important to consider. Plantation area expansion must be accompanied by schemes that ensure the well-being of local communities, including protecting the rights of indigenous peoples, creating sustainable jobs, and empowering smallholder farmers through equitable partnership schemes. Without inclusive and equitable governance, the potential for social conflict and economic disparity could accompany the growth of this sector, ultimately disrupting the sustainability of the entire value chain.

Therefore, while data on land expansion suggests bright economic prospects for palm oil as a renewable energy source, this opportunity must be utilized wisely. Comprehensive and integrated policies are needed that balance economic objectives, environmental sustainability, and social justice. Only with a holistic and sustainable approach can the potential of palm oil as an alternative energy source be optimally realized without compromising the interests of future generations.

Oil palm also has bright prospects from the development of the oil market, which is one of the sources of foreign exchange contributors from the non-oil and gas sector, so the Government and the community are encouraged to develop oil palm plantations, both large plantations managed by the Government, private industry, and Community Core Plantations (Sibhatu, 2023).

Several factors influence palm oil production. These factors include technical and social factors. Technical factors include land use, labor, fertilizer use (type and quantity), pesticide use (type and quantity), and others (Syahza, 2019). The research employed a Cobb-Douglas production function model for data analysis, utilizing the Ordinary Least Squares (OLS) regression technique. The empirical results indicate that palm oil production is significantly influenced by two key factors: the maturity level of the palm trees and the amount of labor allocated to cultivation activities. The subsequent data illustrates the production output of palm oil plantations in Dayun District across the 2022 to 2023 cultivation period.

**Table 2. Oil Palm Plantation Crop Production in Dayun District 2022-2023**

| Kecamatan / Sub-Regency | Kelapa Sawit/Oil Palm | | Kelapa/Coconut | |
|---|---|---|---|---|
| | 2022 | 2023 | 2022 | 2023 |
| (1) | (2) | (3) | (4) | (5) |
| Siak | 14.025,76 | 38.447,54 | 153,34 | 1,55 |
| Bunga Raya | 14.866,17 | 35.038,40 | 184,27 | 0,34 |
| Sungai Apit | 35.663,34 | 102.725,71 | 424,7 | 6,43 |
| Dayun | 31.754,97 | 53.900,33 | 95,58 | 0,19 |
| Koto Gasib | 101.916,07 | 186.895,51 | 57,49 | 2,56 |
| Kandis | 393.265,11 | 231.406,89 | 100,29 | 1,06 |

| Kecamatan / Sub-Regency | Kelapa Sawit/Oil Palm | | Kelapa/Coconut | |
|---|---|---|---|---|
| | 2022 | 2023 | 2022 | 2023 |
| (1) | (2) | (3) | (4) | (5) |
| Minas | 104.559,97 | 81.702,47 | 15,49 | 6,21 |
| Kerinci Kanan | 21.408,14 | 32.544,92 | 370,33 | - |
| Tualang | 8.646,41 | 116.881,09 | 173,71 | 23,96 |
| Sungai Mandau | 93.802,46 | 97.938,87 | 50,43 | - |
| Lubuk Dalam | 7.841,36 | 39.276,20 | 98,38 | 0,94 |
| Mempura | 17.384,30 | 46.495,81 | 298,62 | 0,51 |
| Sabak Auh | 6.291,67 | 11.755,25 | 143,93 | - |
| Pusako | 29.590,50 | 16.245,68 | 71,72 | 1,28 |
| Kabupaten Siak | 881.016,2 | 1.091.254,64 | 2.238,3 | 45.02 |

Source: BPS Statistics Siak Regency, 2024

Data on oil palm plantation productivity in Dayun District shows a significant upward trend, with output jumping from 31.7 million tons in 2022 to 53.9 million tons in 2023. This achievement indicates that with the application of appropriate and specific cultivation techniques, peatlands previously often considered marginal actually possess substantial productivity potential. Peat's unique characteristics as a growing medium stem from its high organic matter content, the result of thousands of years of decomposition of organisms and vegetation, providing a potential reservoir of carbon and nutrients if properly managed.

However, realizing this potential is not without a series of complex challenges inherent in peat ecosystems. Some of the main obstacles that must be overcome include very low soil acidity (pH), which hinders the availability of essential nutrients for plants; poor micronutrient content; and drainage problems that often lead to waterlogging or even irreversible drought if excessively drained. Peatlands also have relatively low natural fertility for some commodities, and their vulnerability to pests and plant diseases tends to be higher due to specific environmental conditions.

Factors influencing palm oil production in this region can be categorized into two main aspects: technical and social. From a technical perspective, critical variables include the size of cultivated land, the intensity and qualifications of the labor involved, and the efficiency of production inputs such as fertilizers and pesticides—in terms of type, dosage, application time, and method used. Meanwhile, social factors play an equally important role, with farmer age related to physical productivity and acceptance of innovations, while formal and non-formal education levels significantly influence farmers' capacity to adopt more advanced cultivation techniques, understand technical instructions, and implement more structured business management.

Given the complexity of these factors, this study was designed to investigate the direct influence of three contemporary variables digital marketing, knowledge management, and marketing strategy on the performance of palm oil businesses in Merangkai Village, Dayun District, Siak Regency. The digital marketing context is considered crucial for examining how information technology can open broader and more efficient market access for farmers. Meanwhile, knowledge management is examined to evaluate how the acquisition, distribution, and application of technical and market knowledge can enhance business capabilities. Marketing strategy is analyzed as a key variable in creating competitiveness and product added value.

The findings of this study are expected to not only provide theoretical contributions by enriching the literature on palm oil agribusiness in peatlands and rural economies, but also generate practical recommendations. These recommendations are aimed at increasing the competitiveness of farming businesses, sustainably optimizing the potential of peatlands, and empow-

ering farmers through capacity building in the digital economy era. Thus, the recorded productivity increases will not remain merely statistics but can be transformed into inclusive and sustainable improvements in welfare for all business actors in the palm oil value chain.

In the contemporary agribusiness context, business performance is understood as a multidimensional construct that represents a business entity's success in achieving its various strategic objectives, both financial and non-financial. This performance is not only reflected in the achievement of profit targets but also encompasses aspects such as customer satisfaction, operational efficiency, market share, and level of innovation. As emphasized by Tambare et al. (2021) effective and comprehensive performance measurement serves as a crucial diagnostic tool. This measurement process enables management to identify the determinants of success, objectively monitor progress, and formulate data-driven improvement strategies. In the palm oil sector, particularly at the Micro, Small, and Medium Enterprise (MSME) scale, performance indicators often include land productivity, production quality, supply stability, profit margins, and the sustainability of relationships with core buyers (Junaidi et al., 2025).

One factor suspected of influencing performance in the modern era is digital marketing. This concept goes beyond simply using social media to encompass the entire ecosystem of promotion and market interaction through online platforms, including websites, e-commerce, email marketing, and content strategies. As observed by (Butenko et al., 2023) the essence of digital marketing is its ability to expand market reach geographically and demographically, build more personal and direct customer relationships, and increase promotional budget efficiency. For MSMEs in the palm oil sector, adopting digital marketing opens up opportunities to directly reach industrial buyers, introduce product specifications, and build brand image. However, challenges such as limited internet infrastructure, digital literacy, and qualified human resources often lead to uneven and suboptimal implementation.

Another equally important factor is knowledge management. According to Baronian (2022) knowledge management is a systematic process encompassing the creation, storage, distribution, and application of knowledge (both tacit and explicit) within an organization. The goal is to support better decision-making, drive innovation, and align business strategy. In the context of palm oil MSMEs, this process often occurs informally and is distributed among experienced farmers and business owners. Knowledge of the best cultivation techniques in peatlands, pest and disease management, and understanding market price fluctuations are valuable assets. The challenge is how to transform this fragmented tacit knowledge into explicit knowledge that can be shared, stored, and applied more widely, while still considering the limitations of available resources.

Furthermore, a marketing strategy serves as a roadmap for achieving sustainable competitive advantage (Bari et al., 2022). A solid marketing strategy is built on a foundation of in-depth market analysis, which is then translated into decisions regarding segmentation (market grouping), targeting (determining target markets), positioning (creating a unique position in the minds of consumers), and an effective marketing mix. In the palm oil agribusiness sector, which is rife with competition and limited resources, formulating a clear marketing strategy is crucial. This strategy determines whether a business will compete based on price, quality, product uniqueness, or service, thus enabling it to not only sell products, but create added value that is recognized by the market (Sulistyaningsih, 2023).

## METHOD

This study uses explanatory research modeling to test theoretical relationships between independent and dependent variables in the palm oil sector business context. The research employs a quantitative descriptive approach grounded in positivism, enabling statistical analysis to test hypotheses. The population comprises all palm oil sector business actors operating in Merangkai Village, Dayun District, Siak Regency. Based on preliminary identification, there are 35 active business actors in the area. As the population is fewer than 100, the study applies a census sampling technique, following Casteel and Bridier (2021), which recommends taking the entire population as the sample when the total population size is small. This approach ensures complete representation and eliminates sampling bias.

Primary data were collected through a structured questionnaire consisting of closed-ended questions. The instrument was designed to measure each variable based on operational defini-

tions: (1) Digital Marketing (X1) measured by indicators such as online platform usage, frequency of digital promotion, and perceived effectiveness; (2) Knowledge Management (X2) measured by knowledge acquisition, storage, sharing, and application practices; (3) Marketing Strategy (X3) measured by market segmentation, targeting, positioning, and marketing mix activities; and (4) Business Performance (Y) measured by sales growth, customer satisfaction, and profitability perception. Data were analyzed using Partial Least Squares (PLS) within a Structural Equation Modeling (SEM) framework via SmartPLS 3.0. The choice of PLS-SEM is justified by its suitability for small sample sizes, complex models, and exploratory research objectives. Reliability and validity tests were conducted before hypothesis testing to ensure robustness of the findings.

## RESULTS AND DISCUSSION

### *PLS Analysis (Outer Model)*

The analysis was conducted using Partial Least Squares (PLS) with the SmartPLS 3.0 application to test the measurement and structural models. The outer model evaluation indicated that while several indicators achieved the recommended loading factor (>0.70), some were below the threshold, suggesting the need for refinement in future studies. Reliability testing, based on Cronbach's Alpha, rho_A, and Composite Reliability, showed that most constructs met the minimum reliability standards, although Knowledge Management.

The inner model evaluation revealed that Digital Marketing (X1) and Knowledge Management (X2) did not have a statistically significant direct effect on Business Performance (Y), while Marketing Strategy (X3) demonstrated a significant positive effect ($\beta = 0.433$, $p < 0.05$). The adjusted $R^2$ value of 0.443 indicates that these three predictors explain 44.3% of the variance in business performance, with the remainder influenced by factors not included in the model.

These findings partially align with previous studies. The non-significant impact of digital marketing is consistent with (Omowole et al., 2024), who found that the adoption of digital tools in SMEs requires complementary capabilities, such as digital literacy and infrastructure, to translate into performance gains. Similarly, the limited influence of knowledge management reflects observations by Corazza et al. (2022) suggesting that SMEs often face constraints in formalizing and leveraging organization.

Conversely, the significant role of marketing strategy supports Koerniawan (2024) assertion that well-defined market segmentation, targeting, and positioning are critical for achieving competitive advantage, especially in resource-constrained settings like rural agribusiness. This result also resonates with Adepoju et al. (2023) who emphasized the strategic importance of aligning marketing activities with business objectives to drive sustainable growth.

Overall, the analysis highlights that while technological and knowledge-based interventions are important, their direct effects may be muted without a robust marketing strategy. This underscores the need for integrated approaches that combine strategic marketing with capacity building in digital and knowledge management domains. The following are the findings of construct indicator estimation using SmartPLS in the initial model:

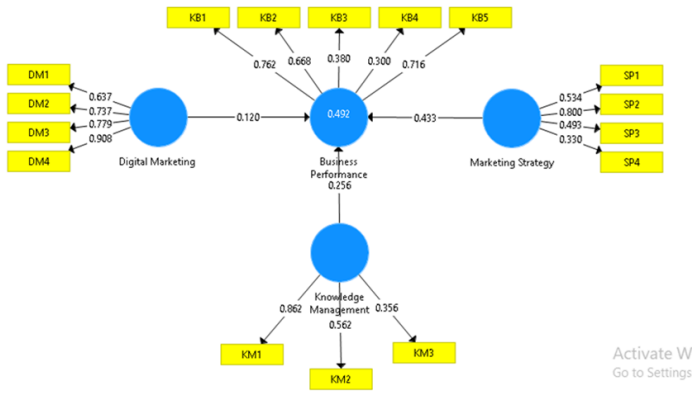


**Figure 1. PLS Algorithm Results (First Order)**

Source: Author

In outer mode, the loading factor value shows the correlation between the indicator and its construct. Indicators with low loading values indicate that the indicator does not work on its measurement model. The expected loading value is > 0.7 (Fauzi, 2022). From the results of the PLS Algorithm above, there are still loading factor values below 0.7, namely DM1, KB2, KB3, KB4, KM2, KM3, SP1, SP3, and SP4.

**Table 3. Crossloading**

| | Business Performance | Digital Marketing | Knowledge Management | Marketing Strategy |
|---|---|---|---|---|
| **DM1** | 0.233 | 0.637 | 0.181 | 0.349 |
| **DM2** | 0.259 | 0.737 | 0.065 | 0.314 |
| **DM3** | 0.355 | 0.779 | 0.212 | 0.462 |
| **DM4** | 0.477 | 0.908 | 0.350 | 0.630 |
| **KB1** | 0.762 | 0.430 | 0.281 | 0.435 |
| **KB2** | 0.668 | 0.456 | 0.260 | 0.375 |
| **KB3** | 0.380 | 0.304 | 0.325 | 0.389 |
| **KB4** | 0.300 | -0.018 | 0.324 | 0.296 |
| **KB5** | 0.716 | 0.089 | 0.475 | 0.441 |
| **KM1** | 0.525 | 0.227 | 0.862 | 0.606 |
| **KM2** | 0.299 | 0.228 | 0.562 | 0.288 |
| **KM3** | 0.139 | 0.036 | 0.356 | 0.243 |
| **SP1** | 0.230 | 0.288 | 0.312 | 0.534 |
| **SP2** | 0.600 | 0.438 | 0.524 | 0.800 |
| **SP3** | 0.339 | 0.386 | 0.331 | 0.493 |
| **SP4** | 0.160 | 0.199 | 0.248 | 0.330 |

Source: Author

**Table 4. Outer Loading**

| | Business Performance | Digital Marketing | Knowledge Management | Marketing Strategy |
|---|---|---|---|---|
| **DM1** | | **0,637** | | |
| **DM2** | | **0,737** | | |
| **DM3** | | **0,779** | | |
| **DM4** | | **0,908** | | |
| **KB1** | **0,762** | | | |
| **KB2** | **0,668** | | | |
| **KB3** | **0,380** | | | |
| **KB4** | **0,300** | | | |
| **KB5** | **0,716** | | | |
| **KM1** | | | **0,862** | |

| | Business Performance | Digital Marketing | Knowledge Management | Marketing Strategy |
|---|---|---|---|---|
| **KM2** | | | 0,562 | |
| **KM3** | | | 0,356 | |
| **SP1** | | | | 0,534 |
| **SP2** | | | | 0,800 |
| **SP3** | | | | 0,493 |
| **SP4** | | | | 0,330 |

Source: Author

**Table 5. Matrix Cronbach Alpha, rho_A dan Composite Reliability**

| | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|---|
| **Business Performance** | 0.477 | 0.529 | 0.712 | 0.358 |
| **Digital Marketing** | 0.772 | 0.843 | 0.853 | 0.596 |
| **Marketing Strategy** | 0.38 | 0.347 | 0.625 | 0.317 |

Source: Author

After the Fornel-Lacker Criterion value is checked, the next check is the Crossloading value. This Crossloading check is to check that an indicator is on a certain variable by looking at the highest value. Testing at this stage can be said to be good if the correlation between variables with each latent variable indicator is greater than the value of each latent variable indicator next to it.

To make it easier to see Crossloading, we will display only the highest Outer Loading value. Based on this Outer Loading, the Crossloading value has not been arranged consistently, meaning that there are values that are still below 0.7, namely in the indicators DM1, KB2, KB3, KB4, KM2, KM3, SP1, SP3, and SP4.

The next phase of analysis involves evaluating the constructs' reliability and validity. Reliability assessment is conducted using three key metrics: Cronbach's Alpha, rho_A, and Composite Reliability. According to conventional psychometric standards, acceptable values for these metrics should exceed 0.7. The analysis reveals several instances where these thresholds are not met. Specifically, within the Risk Perception construct, three indicators (BP, KM, and MS) demonstrate Cronbach's Alpha values below 0.7. Similarly, the rho_A reliability coefficient falls below the acceptable level for the same three indicators (BP, KM, and MS). Furthermore, Composite Reliability analysis shows two values below the 0.7 benchmark (KM and MS). To enhance readability of the results, values meeting reliability standards are highlighted in green for quick identification.

### *Inner Model*

Following the successful validation of the measurement (outer) model, the analytical process advances to evaluating the structural (inner) model. A key component of this subsequent stage involves the examination of the R-squared value, also commonly referred to as the Coefficient of Determination ($R^2$).

**Table 6. R-Square**

| | R Square | R Square Adjusted |
|---|---|---|
| **Business Performance** | 0.477 | 0.529 |

Source: Author

According to the table above, the business performance R-Square Adjusted value is 0.443. This shows that the variables of digital marketing, knowledge management, and marketing strategy have an effect of 44.3 per cent on the business performance variable. At the same time, additional factors outside this study are 55.7 per cent.

### *Goodness of Fit Model*

In quantitative research using the Structural Equation Modeling (SEM) approach, the model fit test procedure plays a fundamental and critical role. This process serves as a statistical tool to evaluate the extent to which the theoretical model proposed by the researcher—reflecting hypothetical relationships between variables—is acceptable and fits the empirical data collected in the field.

### *Goodness of Fit Model*

Several indices and criteria are used to assess model fit, each with its own distinct philosophy and measurement focus. One frequently used index, particularly within the Partial Least Squares (PLS)-SEM framework, is the Standardized Root Mean Square Residual (SRMR). As Ximenez et al. (2022) proposed, the SRMR essentially measures the average difference between the observed correlation matrix of the raw data and the correlation matrix predicted by the model. A small SRMR value indicates that the residuals between the two are also small, meaning the model is able to reproduce the correlation pattern of the data well. Based on their seminal recommendation, a model can be considered to have a good fit if its SRMR value is less than or equal to 0.08. It is important to note that there is a common misinterpretation here: an SRMR value greater than 0.08 actually indicates a poor model fit, not the opposite.

Besides the SRMR, another frequently referenced fit index is the Normed Fit Index (NFI), developed by (Sathyanarayana and Mohanasundaram (2024). The NFI operates by comparing the chi-square value of the proposed model (theoretical model) with the chi-square value of the baseline model (or null model), a model that assumes no correlation at all between the latent variables. The NFI essentially quantifies the improvement in fit provided by a theoretical model compared to the simplest baseline model. The criteria established by its developers suggest that a model demonstrates adequate fit if the NFI value reaches 0.90 or higher. A value approaching 1.0 indicates that the tested model significantly better explains the data than the baseline model.

Furthermore, in the context of PLS-SEM, which often focuses on prediction, the concept of Goodness of Fit (GoF) was introduced as a single index aimed at comprehensively validating the model's overall performance. GoF is understood as a summary measure that combines the performance of both model components: the measurement model (outer model) that assesses the relationship between indicators and their latent variables, and the structural model (inner model) that describes the relationships among the latent variables themselves. The GoF value is calculated using a specific statistical formula: the square root of the product of the average communality index (which represents the proportion of variance for each indicator explained by its latent variables) and the average $R^2$ value of the entire structural model (which represents the proportion of variance for endogenous variables explained by exogenous variables). Thus, GoF not only assesses how well variables are measured (via communality) but also the strength of the causal relationships within the model (via $R^2$). While providing a concise overview, interpretation of GoF should be approached with caution and always complemented by evaluation of other fit indices and the model's predictive power, to obtain a holistic and robust assessment of the validity of the research model being constructed.

In other words, this test answers the fundamental question: "How well does the model structure I have created represent the reality of what occurs in the study population?" The results of this evaluation determine the overall validity of the research findings; a model that does not demonstrate adequate fit with the data will call into question the accuracy of all conclusions about the influence and relationships between the variables within it.

The Goodness of Fit (GoF) index spans from 0 to 1, with established interpretive thresholds: 0.1 indicates a small effect, 0.25 represents a moderate effect, and 0.36 signifies a large effect. The current model demonstrates a Standardized Root Mean Square Residual (SRMR) value of 0.148. Following conventional psychometric standards that recommend values below 0.08 for good model fit, this result suggests the model achieves marginal fit. Fur-

thermore, the Normed Fit Index (NFI) value of 0.309 falls below the recommended threshold of 0.90 for adequate fit, indicating the model exhibits a moderate Goodness of Fit according to established criteria.

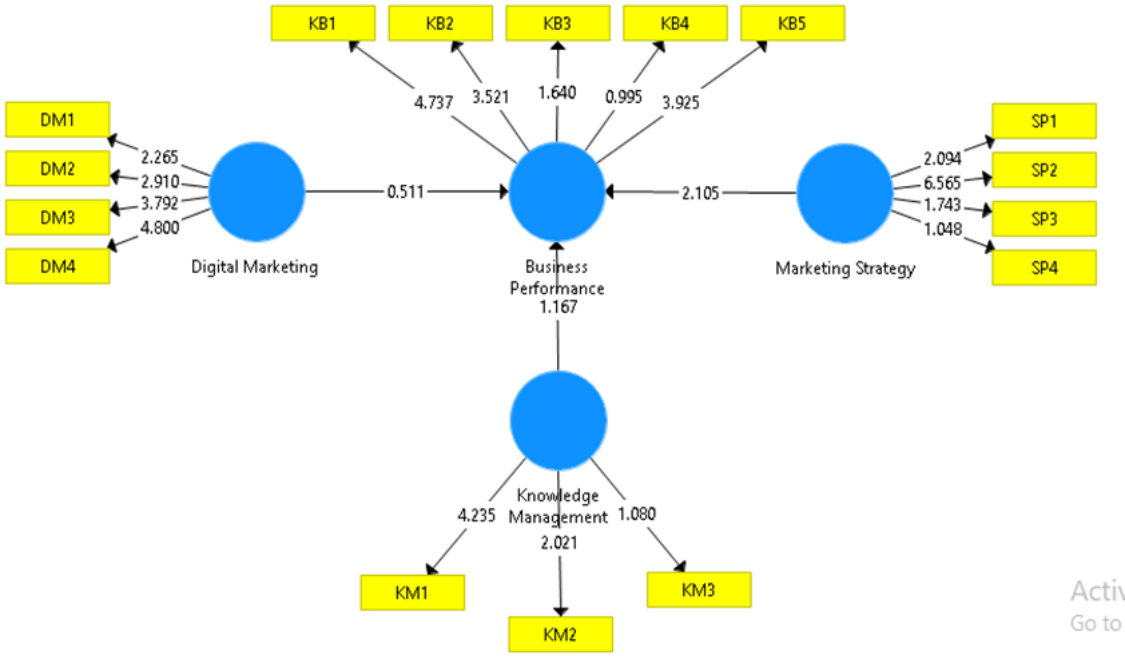


**Figure 2. Output Bootstrapping**

Source: Author

***Direct Effect Hypothesis Testing***

The direct effect hypothesis test serves to confirm whether exogenous variables significantly influence endogenous variables in the research model. This testing procedure follows statistical criteria where a relationship is declared significant if the p-value obtained is less than or equal to the predetermined significance level (α) of 5% (0.05). Practically, when the p-value ≤ 0.05, then the alternative hypothesis (Ha) stating a significant effect is accepted, while the null hypothesis (H0) stating no effect is rejected. Conversely, if the p-value > 0.05, there is insufficient evidence to state a significant effect. The complete results of this hypothesis test can be seen in detail in Table 8, which presents a summary of the path coefficient values, t-statistics, and p-values for each variable relationship tested in the research model.

Based on the tests listed, it can be seen:

1. The digital marketing variable does not have a significant positive effect on the business performance variable (t-count> t-table) = 0.502 <1.967, p-value 0.616> 0.05.
2. The knowledge management variable does not have a significant positive effect on business performance (t-count> t-table) = 1.153 <1.967, p-value 0.250> 0.05.
3. The marketing strategy variable has a significant positive effect on business performance (t-count> t-table) = 2.078> 1.967, p-value 0.0038 <0.05.

The findings of this study provide important insights into the factors influencing business performance in the palm oil sector within rural contexts. The lack of a significant direct relationship between Digital Marketing (X1) and business performance can be interpreted through the lens of the Technology-Organization-Environment (TOE) framework, which suggests that technological tools only contribute to performance when matched with adequate organizational readiness and external support. In Merangkai Village, although digital tools are available, adoption levels are still low, and integration with business processes is minimal. Technology deployment alone is not enough without complementary capabilities such as collaboration and market adaptation.

Similarly, the non-significant impact of Knowledge Management (X2) reflects the challenges faced by SMEs in institutionalizing knowledge processes. Knowledge management in small companies often operates informally, relying on the exchange of tacit knowledge rather than formal systems. Without systematic collection and dissemination of knowledge, its contribution to performance remains indirect and mediated by other factors such as leadership capacity or innovation culture.

In contrast, the significant influence of Marketing Strategy (X3) underscores the centrality of strategic market alignment in driving performance. SMEs that align their marketing mix with the characteristics of their target market are better able to adapt to market changes and sustain growth. These findings extend that understanding by demonstrating that even in rural areas with limited resources, a well-structured marketing strategy can yield measurable performance improvements.

Innovation and strategic orientation as key drivers of performance demonstrate that marketing strategy acts as both a driver and enabler for other initiatives such as digitalization and knowledge sharing. Therefore, integrating marketing with technology- and knowledge-based approaches can create a synergistic effect on business performance.

From a critical perspective, these results challenge the assumption that technology adoption and knowledge processes inherently translate into performance gains. In rural agribusiness contexts, structural barriers such as limited infrastructure, skill gaps, and market volatility can attenuate the expected benefits of these factors. Therefore, policy and managerial interventions should prioritize capacity building, infrastructure investment, and the integration of marketing strategy with technological and knowledge management practices to achieve sustainable performance improvements.

## CONCLUSIONS

This study examined the influence of digital marketing, knowledge management, and marketing strategy on the business performance of palm oil sector SMEs in Merangkai Village, Dayun District, Siak Regency. The analysis revealed that while digital marketing and knowledge management did not have a significant direct effect on business performance, marketing strategy played a crucial role in driving positive outcomes.

These results suggest that in rural agribusiness contexts, performance improvement is more strongly determined by strategic alignment with market needs than by isolated technological or knowledge-based interventions. Theoretically, this contributes to the literature by refining the understanding of performance drivers in resource-constrained settings, highlighting the need to integrate marketing strategy as a central variable in performance models for SMEs.

From a practical perspective, the findings imply that capacity building in market segmentation, targeting, and positioning should be prioritized. Digital tools and knowledge management systems, while important, require supportive infrastructure, skills development, and alignment with strategic objectives to yield measurable impacts. This points to the necessity of a phased, integrated approach that couples marketing excellence with gradual technological adoption and structured knowledge sharing.

For policymakers and development agencies, the study underscores the importance of designing interventions that not only provide access to technology but also strengthen strategic marketing capabilities among rural SMEs. For academics, the findings open avenues for future research to explore mediating or moderating variables—such as entrepreneurial orientation, innovation capacity, or market dynamics—that may enhance the link between digitalization, knowledge management, and performance. Longitudinal and comparative studies across different regions and commodities are also recommended to validate and extend these insights.

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