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ENHANCING VALUE AND COMPETITIVENESS IN FISHERY PRODUCTS: STRATEGIES IN BENGKALIS DISTRICT, RIAU PROVINCE, INDONESIA

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Abstract

The specific context of Bengkalis, Riau Province, Indonesia, necessitates a localized approach to addressing the challenges faced by the fisheries sector. This is evident in the study, which examines peatland fires in Riau, Indonesia, and their relation to land cover type, land management, and spatial management. This study adopts a quantitative research design, employing Structural Equation Modeling (SEM) as the primary analytical technique using WarpPLS. This method is chosen for its robustness in analyzing complex variable relationships and its ability to handle small to medium sample sizes, which is typical in studies involving SMFEs. Through this approach, the study aims to provide empirical insights into the strategic development of fishery products in Bengkalis, thereby contributing to the broader discourse on sustainable and competitive fisheries management in Indonesia and beyond. This research reveals the factors influencing the added value and competitiveness of UPI UMKM businesses in Bengkalis District, Riau Province. The findings indicate that raw material availability does not significantly impact, while food safety plays a crucial role in enhancing both added value and competitiveness. Although transportation equipment does not affect added value, it significantly boosts competitiveness. Meanwhile, business feasibility contributes to added value but does not impact competitiveness. In conclusion, enhancing food safety and transportation facilities are key to advancing the added value and competitiveness of the fisheries business in Bengkalis, although the relationship between business feasibility and competitiveness requires further investigation. This study provides valuable insights for policymakers and stakeholders in the Bengkalis fishery sector for strategic development of UPI UMKM businesses.

Keywords: Bengkalis, Competitiveness, Fishery Products, Structural Equation Modeling (SEM), WarpPLS

INTRODUCTION

The fisheries sector is a crucial component of the global food system, providing essential nutrition and livelihoods for millions of people worldwide (Hansson et al., 2017). Business analysis in the fishery product processing business sector in the Bengkalis Riau region has been widely researched (Harahap et al., 2021, 2023). In the Bengkalis District of Riau Province, Indonesia, fisheries play a vital role in the local economy, serving as a significant economic activity (Suryana & Amalia, 2021). However, small and medium-sized fishery enterprises (SMFEs) in this region encounter challenges in maintaining competitiveness and adding value to their products (Suryana & Amalia, 2021). These challenges include raw material availability,

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food safety, transportation or expedition logistics, and business feasibility (Suryana & Amalia, 2021). To address these issues, it is essential to analyze the interplay between these factors in enhancing the value and competitiveness of fishery products from SMFEs in Bengkalis (Suryana & Amalia, 2021). The fisheries sector's significance in providing essential nutrition and livelihoods aligns with the findings of, who evaluated the vulnerability of societies to the simultaneous impacts of climate change on agriculture and marine fisheries at a global scale (Thiault et al., 2019).

Aquatic foods, including fishery products, are rich in micronutrients essential to human health, and fisheries and aquaculture are increasingly recognized for their capacity to contribute to reducing global micronutrient deficiencies and diet-based health risks (Koehn et al., 2021). Furthermore, the fisheries sector is crucial in providing a critical source of nutrition and employment, particularly in low-income food deficit countries, where access to quality food and income is limited (Simmance et al., 2021). In addressing the challenges faced by SMFEs in Bengkalis, it is important to consider the role of inland fisheries in sustaining livelihoods and food security, as highlighted by (Cooke et al., 2021). Additionally, the study by emphasizes the contribution of inland fisheries to global food security, especially in rural and low-income areas, where they provide essential nutrients to humans worldwide (Lynch et al., 2019).

Furthermore, the study by underscores the importance of identifying policy best practices to support the contribution of aquatic foods, including fishery products, to food and nutrition security (Farmery et al., 2021). The specific context of Bengkalis, Riau Province, Indonesia, necessitates a localized approach to addressing the challenges faced by the fisheries sector. This is evident in the study, which examines peatland fires in Riau, Indonesia, and their relation to land cover type, land management, and spatial management (Prayoto et al., 2017). Additionally, the study by provides insights into the impact of global warming on mangrove land degradation on the north coast of Bengkalis Island, Riau Province (Maulana et al., 2022). These localized environmental factors directly affect the fisheries sector in the region.

Horeover, the fisheries sector in the Bengkalis District of Riau Province, Indonesia, is integral to the local economy and plays a critical role in providing essential nutrition and livelihoods. Addressing the challenges faced by SMFEs in this region requires a comprehensive analysis of factors such as raw material availability, food safety, transportation or expedition logistics, and business feasibility. By considering the interplay of these factors and drawing on insights from global and localized studies, it is possible to enhance the value and competitiveness of fishery products from SMFEs in UPI UMKM businesses Bengkalis.

The findings of this study are expected to offer valuable implications for policymakers, industry stakeholders, and the academic community. By identifying the key factors that influence the value addition and competitiveness of fishery products, this research aims to guide strategic decisions and policy formulations that bolster the fisheries sector in UPI UMKM businesses Bengkalis and similar contexts, fostering sustainable growth and international market penetration.

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MATERIAL AND METHODS

The methods used are surveys and interviews. The sampling technique was carried out by purposive sampling.

Research Design

This study adopts a quantitative research design, employing Structural Equation Modeling (SEM) as the primary analytical technique. SEM is a powerful multivariate analysis method commonly utilized to construct and assess statistical models, often causal models. SEM enables researchers to examine complex relationships among latent and observed variables within a unified framework. In this research, SEM is employed to investigate the relationships between various factors influencing the development of high-value and competitive fishery products.

The provided text appears to be an explanation of various aspects related to the research methodology, including the outer model, reflective and formative equations, the inner model, weight relations, parameter estimation, evaluation of goodness of fit, hypothesis testing, and significance criteria. It also includes information about how the software WarpPLS was used for analysis.

Outer Model

The outer model specifies the relationship between latent variables that explain the characteristics of manifest variables, both reflectively and formatively.

Reflective Equations

$$\mathbf{X} = \lambda_i\xi+\varepsilon_i \text{ ...... (1)}$$

$$\mathbf{Y} = \lambda_i+\varepsilon_i \text{ .... (2)}$$

Where X and Y are indicators for exogenous (ξ) and endogenous (η) variables, while λi represents the loading matrix in depicting the coefficients of latent variables with their indicators. Measurement errors in reflective indicator models are denoted as (ε).

Formative Equations

$$\xi = \eta_i X_i+\delta \text{ .... (3)}$$

$$\mathbf{Y} = \eta_i y_i+\delta \text{ .... (4)}$$

Where x and y are indicators for exogenous variables (ξ) and endogenous (η), while it is a link between indicators and manifest variables. Mistakes or errors are denoted by δ_x dan δ_y.

Inner Model

Describes the specifications of the relationship between latent variables (model structure). This relationship is based on the theoretical substance of the research. The structural model in GSCA can be written:

$$\boldsymbol{\eta} = \partial\beta\eta+r\xi+\zeta \text{ .... (5)}$$

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Where, η describes a vector of endogenous variables, ξ is a vector of exogenous latent variables and ζ is the residual vector. GSCA is designed to be recursive and reciprocal, so each dependent latent variable can be specified as:

$$\boldsymbol{\eta}_i = \sum \beta_y \eta_i + \sum y_i \xi_\eta + \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (6)$$

Weight relation

It is an estimation of the weights and scores from the outer model to the inner model, so that a score value for the latent variable will be obtained. The outer model provides specifications followed by the GSCA algorithm estimation.

$$\boldsymbol{\xi}_b = \sum_{xb} X_{kb} \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (7)$$

$$\boldsymbol{\eta}_i = W_{ki} Y_{kb} \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (8)$$

Where, W_{kb} and W_{ki} is the weighting produced through the estimation process between indicators and latent variables ξ_b and $\boldsymbol{\eta}_i$. The equation of the conceptual model developed can be written as follows:

$$\mathbf{Y1} = p1Xi + p2X2 + p3X3 + p4X4 + \ldots\ldots\ldots\ldots\ldots (9)$$

$$\mathbf{Y} = p5Y1 + \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Parameter Estimation

Parameter estimation involves two distinct algorithms: one for the outer model and another for the inner model. In the outer model algorithm, the focus is on deriving latent variables from the available indicator data. This process aims to calculate the underlying latent variables based on the observed indicators.

Conversely, the inner model algorithm is concerned with determining path coefficients. It entails the computation of the coefficients that represent the relationships and interactions between variables within the structural model.

Evaluation of Goodness of Fit

The assessment of goodness of fit can be categorized into two main aspects within the research:

Outer Model Evaluation: This involves the validation and reliability assessment of the research instruments, which, in this study, primarily consist of questionnaires. It aims to ensure that the data collection tools are valid and dependable for measuring the intended variables.

Inner Model Evaluation: Within this context, the focus is on evaluating the measurements of indicators related to latent variable relationships. This step involves examining how well the model's structural relationships align with the observed data, providing insights into the accuracy of the model in representing real-world relationships.

Hypothesis Testing

In the hypothesis testing phase of the study, WarpPLS software was utilized to assess the significance of the formulated hypotheses.

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The significance levels for the hypotheses were determined as follows:

- When the p-value is less than or equal to 0.10 (α = 10%), it indicates that the result is relatively less significant.
- When the p-value is less than or equal to 0.05 (α = 5%), it signifies that the result is considered
- When the p-value is less than or equal to 0.01 (α = 1%), it indicates that the result is highly significant.

The hypotheses tested in this study were as follows:

Ho: The impact of exogenous variables on endogenous variables is not significant.

H1: Exogenous variables have a significant impact on endogenous variables.

During the analysis, these hypotheses were evaluated based on the specified significance levels, helping to determine the significance of the relationships between variables. With a significance level of 0.05, Ho is rejected if p-value < 0.05 and t-value > 1.96. If p-value > 0.05 and t-value < 1.96, then Ho is not rejected. The direction of the exogenous variable's impact on the endogenous variable can be determined from the original sample values of each influence. If the impact direction is positive, it indicates a positive relationship, while a negative original sample value suggests an inverse relationship (figure 1).

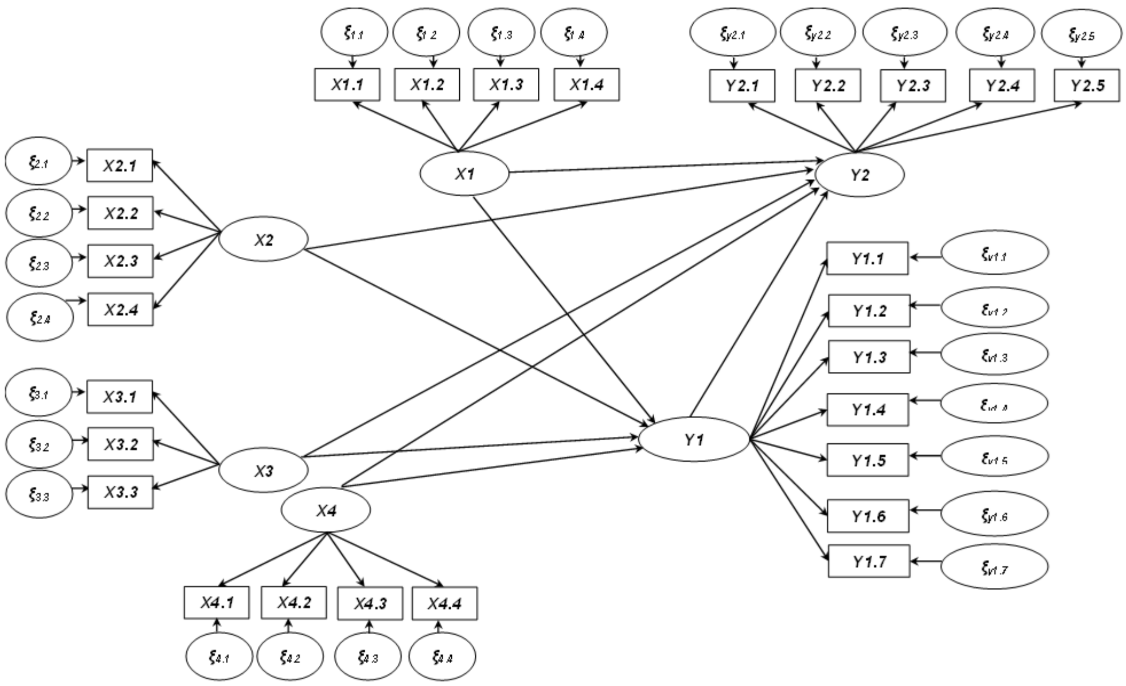

Figure 1: Structural Equation Path Diagram of research

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RESULT AND DISCUSSION

Outer Models

The tests that will be carried out to measure the Outer model with reflective indicators consist of Convergent Validity, Discriminant Validity, Cronbach's Alpha, and Composite reliability.

Convergent Validity

The results of convergent validity can be seen from the Average Variance Extract (AVE) value where the value is >0.5 (Solimun et al., 2017). Based on (Table 1), it can be seen that all variables with 1 indicator used have a factor loading value > 0.7 and a factor loading p-value < 0.050, so they are declared valid.

Table 1: Outer Model Variable Measurement Results

Variable	Loading	P-Value	Information
X1 (Availability of Raw Materials)	Factor	<0.001	Valid
X2 (Food Safety)	1,000	<0.001	Valid
X3 (Conveyance)	1,000	<0.001	Valid
X4 (Business Feasibility)	1,000	<0.001	Valid
Y1 (Product Value Added)	1,000	<0.001	Valid
Y2 (Competitiveness)	1,000	<0.001	Valid

Discriminant Validity, Cronbach Alpha, Composite Reliability, and AVE

Discriminate validity is used to ascertain whether each concept of each latent variable is different from other variables. The model has good discriminant validity if the squared AVE value of each exogenous construct exceeds the correlation between the construct and other constructs (Ghozali and Latan, 2014). An indicator is said to be discriminantly valid if the factor loading value for each item in the related variable is greater than the cross-loading value for items in the other variables (Solimun et al., 2017). To see the discriminant validity or coss loading value, see (Figure 2).

```
*****************************************
* Structure loadings and cross-loadings *
*****************************************

        X1      X2      X3      X4      Y1      Y2
X1      1.000   0.536   0.506   0.291   0.472   0.390
X2      0.536   1.000   0.277   0.461   0.442   0.436
X3      0.506   0.277   1.000   0.243   0.365   0.589
X4      0.291   0.461   0.243   1.000   0.454   0.235
Y1      0.472   0.442   0.365   0.454   1.000   0.316
Y2      0.390   0.436   0.589   0.235   0.316   1.000

Note: Loadings and cross-loadings are unrotated.
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Figure 2: Discriminant Validity Results (Cross Loading)

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Based on the discriminant validity (cross loading) table above, it can be seen that each item has a construct-forming cross loading number that is still greater for each variable than the loading number for the other variables. The factor loading value on the items of each variable is still greater than the reflected variable. Based on the discriminant validity (cross loading) table above, it can be seen that each item has a construct-forming cross loading number that is still greater for each variable than the loading number for the other variables. The factor loading value on the items of each variable is still greater than the reflected variable. The assessment of discriminant validity is crucial in ensuring that the measurement items in a study are distinct from each other and are measuring different constructs.

This is often evaluated through cross-loading analysis, which examines the extent to which each item loads onto its intended construct compared to other constructs (Hayat et al., 2023). In the context of structural equation modeling, discriminant validity is typically assessed by comparing the square root of the average variance extracted (AVE) for each construct with the correlations between constructs (Doumi, 2022). Additionally, the Heterotrait-Monotrait Ratio of correlation (HTMT) is used to evaluate discriminant validity, with values below a certain threshold indicating support for the distinctiveness of constructs (Wongtrakul et al., 2021). The Fornell-Larcker criterion is a widely used method for assessing discriminant validity, which involves comparing the square of the correlation between constructs with the AVE of each construct (Mamot et al., 2022). This criterion provides evidence that the variance captured by a construct through its indicators is greater than the variance shared with other constructs. Furthermore, the use of cross-loading analysis and HTMT ratios can also provide valuable insights into the distinctiveness of constructs and the validity of measurement models (Osman et al., 2022).

To see whether a variable is reliable or not, it can be known and seen by identifying the composite reliability value. If the composite reliability value is >0.7 then it can be said that the variable is reliable. Another criterion to see whether the variable is reliable is to look at the Cronbach's alpha value. If the Cronbach's alpha value is >0.6 then the variable is said to meet the reliability criteria. To see the results of measuring the outer reflective indicator model, see (Table 2).

Table 2: Outer Reflective Indicator Model Measurement Results.

	Composite Reliability	Cronbach's Alpha	Average Variances Extracted
X1 (Availability of Raw Materials)	1,000	1,000	1,000
X2 (Food Safety)	1,000	1,000	1,000
X3 (Conveyance)	1,000	1,000	1,000
X4 (Business Feasibility)	1,000	1,000	1,000
Y1 (Product Value Added)	1,000	1,000	1,000
Y2 (Competitiveness)	1,000	1,000	1,000

Based on the Cronbach's Alpha and composite reliability values, it can be concluded that the variables X1 (availability of raw materials), X2 (food safety), X3 (transportation equipment), X4 (business feasibility), Y1 (value add products), and Y2 (competitiveness) are reliable. The

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Cronbach's Alpha values for each variable/indicator are greater than 0.7, indicating good internal consistency (Kansra et al., 2022; Kumari et al., 2021; Dsouza et al., 2021; Yamada et al., 2021; Houte et al., 2021). Additionally, the composite reliability figures for each variable are greater than 0.7, placing these variables in the high reliability category (Ahmad et al., 2023; Demirtaş et al., 2023; Popovac et al., 2021). Furthermore, the variables have reliable AVE values greater than 0.5, indicating good convergent validity (Ahmad et al., 2023; Popovac et al., 2021). The assessment of reliability through Cronbach's Alpha and composite reliability is crucial in ensuring that the variables used in a study are consistent and dependable. These measures provide evidence of the internal consistency of the variables and their reliability in capturing the constructs they represent. The high values obtained for both Cronbach's Alpha and composite reliability indicate that the variables are robust and can be considered reliable for further analysis and interpretation.

Inner Structural Model

In this research, the PLS structural model was carried out using WarpPLS 8.0 software. Based on data analysis using WarpPLS, a research results model was obtained which can be seen in (Figure 3). The results of the structural model from the research in (Figure 3) show that all relationships have a significant direct influence between the variables because the p-value is smaller than 0.01, including the relationship between the influence of business feasibility on the added value of products, the influence of transportation factors on competitiveness.

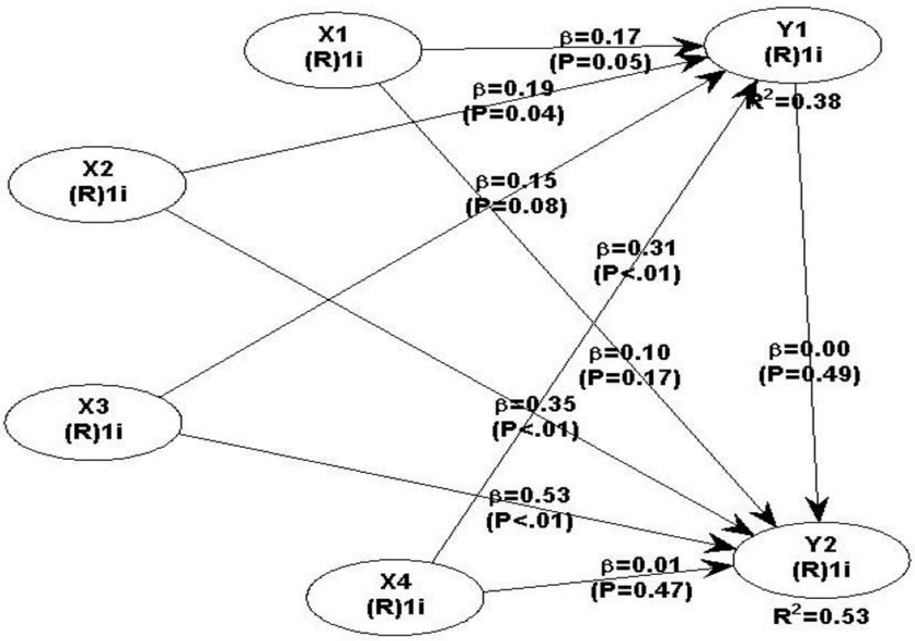

Figure 3: Structural Model of Research Results

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Based on the image above, the structural model equation is obtained as follows:

1. $Y1 = 0.173\ X1 + 0.190\ X2 + 0.150\ X3 + 0.312\ X4 + e_{i1}$; $R^2 = 0.382$.
2. $Y2 = 0.105\ X1 + 0.352\ X2 + 0.532\ X3 + 0.009\ X4 + 0.002\ Y1 + e_{i2}$; $R^2 = 0.534$.

In the inner model analysis, several tests were conducted to measure its effectiveness and reliability. These tests focused on understanding the relationships between various key variables. The variables in question included:

- *X*1: Availability of Raw Materials
- *X*2: Food Safety
- *X*3: Transportation Equipment
- *X*4: Business Feasibility
- *Y*1: Value-Added to Products
- *Y*2: Competitiveness

Additionally, the analysis considered the presence of residual errors denoted as (ei). The primary tests conducted to evaluate the inner model included:

Coefficient of Determination (R^2)

The interpretation of R Squared is the same as the interpretation of R Squared in standard regression analysis. The R Squared value shows the size of the simultaneous influence (joint effect) of exogenous variables on endogenous variables. Apart from that, the R Square value can also indicate the strength of the WarpPLS model, in this case an R Square value > 0.75 indicates a strong WarpPLS model, an R Square of 0.50-0.75 indicates a medium WarpPLS model, and an R Square value of 0.25 -0.50 indicates a weak WarpPLS model (Ghozali, 2008). To see the R Square results, see (Table 3).

Table 3: Coefficient of Determination (R^2)

	Influence	R Square
Model 1	X1, X2, X3, X4 → Y1	0.382
Model 2	X1, X2, X3, X4, Y1 → Y2	0.534

The Coefficient of Determination (R^2) values obtained from both models in this study offer insightful interpretations regarding the relationships between the variables. In Model 1, which assesses the impact of variables X1 (availability of raw materials), X2 (food safety), X3 (transportation equipment), and X4 (business feasibility) on Y1 (added value), the R^2 value is 0.382 (38.2%). This indicates a moderate level of explanatory power. Essentially, 38.2% of the variance in the added value (Y1) can be explained by these four exogenous variables. While this is not a strong model according to published classification, it still suggests a significant, albeit moderate, influence of these factors on the added value. The limited impact of raw material availability, as well as the more significant roles of food safety and business feasibility, are aspects worth noting. The moderate R^2 value suggests that other factors not included in

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the model may also play a substantial role in determining added value. Model 2 extends the analysis by including the added value (Y1) as an exogenous variable influencing Y2 (competitiveness), alongside X1, X2, X3, and X4. The R^2 value here is 0.534 (53.4%), which falls into the medium category of WarpPLS model strength. This higher R^2 value compared to Model 1 indicates that the inclusion of the added value as a predictor provides a better understanding of the factors influencing competitiveness. Over half of the variance in competitiveness can be explained by these variables, highlighting the significant impact of factors such as food safety and transportation equipment, as well as the added value itself. However, the fact that the model does not reach the strong classification ($R^2 > 0.75$) suggests that, similar to Model 1, other external factors not included in this model might also be influencing competitiveness.

Overall, these findings highlight the importance of certain variables like food safety and transportation equipment in the fishery sector's value addition and competitiveness. They also suggest that while these models provide valuable insights, they do not capture the full spectrum of factors influencing these outcomes, indicating a need for further research to explore other potential influences.

Effect Size (F^2)

In the WarpPLS analysis, the F^2 value shows the partial influence of each predictor variable on the endogenous variable. According to Cohen (1988), the F^2 values obtained can then be categorized into the categories of small influence (F^2 = 0.02-0.15), medium influence (F^2 = 0.15-0.35) and large influence (F^2 > 0, 35). To see the effect size results, see (Table 4).

Table 1: Effect Size Results

Variable	Model 1 (Y1)		Model 2 (Y2)	
	F square	Effect	F square	Effect
X1 (Availability of Raw Materials)	0.083	Small	0.042	Small
X2 (Food Safety)	0.088	Small	0.168	Currently
X3 (Conveyance)	0.059	Small	0.321	Currently
X4 (Business Feasibility)	0.151	Currently	0.002	Very small
Y1 (Product Value Added)			0.001	Very small

In the analysis results presented in Table 4, several important findings can be concluded. First, the influence of variable *X*1 (availability of raw materials) on variable *Y*1 (value-added to products) is 0.083, while the influence of variable *X*2 (food safety) on *Y*1 is 0.089. Meanwhile, the influence of variable *X*3 (transportation equipment) on *Y*1 reaches 0.059, and the influence of variable *X*4 (business feasibility) on *Y*1 is the most significant, at 0.151. These results indicate that variable *X*4 (business feasibility) has a moderate impact on increasing the value-added to products.

Second, in the context of competitiveness (*Y*2), the influence of variable *X*1 (availability of raw materials) is 0.042, while the influence of variable *X*2 (food safety) on *Y*2 is the most significant, at 0.168. The influence of variable *X*3 (transportation equipment) on *Y*2 is substantial, reaching 0.321. However, the influence of variable *X*4 (business feasibility) on *Y*2

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is very small, only 0.002. These results indicate that variable *X*3 (transportation equipment) has a moderate impact on increasing competitiveness.

The findings suggest that business feasibility (X4) significantly contributes to enhancing the value-added to products (Y1), highlighting the crucial role of overall business feasibility and operational aspects in adding value to products. Conversely, in terms of competitiveness (Y2), food safety (X2) and transportation equipment (X3) emerge as the most influential factors. This underscores the importance of ensuring food safety practices and efficient transportation systems to enhance competitiveness in the industry.

However, the limited impact of business feasibility on competitiveness suggests that other factors may have a more substantial influence on this aspect, indicating the need for further research to explore these relationships in more detail. The assessment of business feasibility and its impact on value-added to products aligns with the literature on financial feasibility analysis and its implications for business performance. Studies have emphasized the significance of conducting feasibility studies to evaluate the economic viability and potential profitability of business ventures (Savitri et al., 2021). Furthermore, the role of business feasibility in contributing to the value-added process is consistent with research on the economic efficiency of various business activities, which underscores the importance of assessing the financial feasibility of investments and operations (Olentsevich et al., 2021).

Moreover, the influence of food safety (X2) and transportation equipment (X3) on competitiveness resonates with the broader literature on supply chain quality management and its impact on firms' performance. It has been noted that ensuring food safety and efficient transportation are critical components of supply chain quality management, which directly affect the competitiveness of food firms (Hua et al., 2017). Additionally, the findings align with research on the optimization of food supply chains, emphasizing the importance of product traceability and safety investment in enhancing the overall competitiveness of the food industry (Ma et al., 2022). The limited impact of business feasibility on competitiveness also corresponds to studies on the moderating effects of various factors on business performance.

It has been suggested that psychological trust, knowledge spillovers, and other external influences can moderate the relationship between different business aspects and overall performance, indicating the need to consider a broader range of factors that may influence competitiveness (Huang et al., 2022). Furthermore, the influence of food safety incidents on competitive firms, as highlighted in the literature, underscores the complex interplay of external events and internal factors in shaping competitiveness within the food industry (Xiang et al., 2021).

Predictive Relevance (Q^2)

Based on WarpPLS analysis, Q^2 indicates the predictive power of the model. A model value of 0.02 indicates the model has weak predictive relevance, a model value of 0.15 indicates the model has moderate predictive relevance and a model value of 0.35 indicates the model has strong predictive relevance (Ghozali, 2011). The total diversity of data that can be explained by a model with Q^2. The analysis results show that the Q^2 value of the model with the

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endogenous variable added product value is 0.388 for Y1. This shows that the full Warp PLS model has strong predictive relevance, while the Q^2 value of the model with the endogenous competitiveness variable is 0.447 for Y2. This shows that the full WarpPLS model has strong predictive relevance. So, it can be concluded that the model is included in the good model category (>0).

Goodness of Fit Model (GoF)

The goodness of fit test of the WarpPLS model can be seen from the Standardizes Root Mean Square Residual) model value. The WarpPLS model is declared to have met the goodness of fit model criteria if the SRMR value is <0.10 and the model is declared perfect fit if the SRMR value is <0.08 (Ghozali, 2011). The goodness of fit model test was carried out to see the overall accuracy of the model by multiplying the average coefficient of determination value by the average communality (AVE) value. By looking at the overall model, namely model 2.

$$\text{GoF} = \sum \sqrt{\overline{\text{AVE}} \times \overline{R^2}}$$

$$\text{GoF} = \sqrt{(1.000) \times \left(\frac{0.382+0.534}{2}\right)}$$

$$\text{GoF} = \sqrt{0.458}$$

$$= 0.677$$

The GoF calculation result is 0.677, it can be concluded that the accuracy of the model is in the large category (> 0.35) so it is suitable to be used to test the research hypothesis.

Hypothesis testing

This section is an evaluation of the coefficients or parameters that show the influence of one latent variable on other latent variables. Hypothesis testing in WarpPLS analysis uses the t test. The decision rule for hypothesis testing uses resampling and is carried out with a t-test. An effect is declared significant if the p-value is smaller than 0.05, and an effect is declared not significant if the p-value is greater than 0.05. The results of calculations with the help of WarpPLS 8.0 software obtained the following results:

Direct Influence Hypothesis

The results of the model suitability test and Q square show that the WarpPLS model that has been built is suitable for testing the research hypothesis. With a significance level of 0.05, Ho will be rejected if the P value is <0.05 and the t value is > 1.96, whereas if the p value is > 0.05 and the t value is < 1.96 then Ho is not rejected. From the results of the significance test, it can also be known direction of the relationship between the influence of exogenous and endogenous variables. The direction of this relationship can be known from the original sample value of each influence relationship. If the direction of the influence relationship is positive, then the influence of the exogenous variable on the endogenous variable is positive, while if

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the original sample has a negative sign then the direction of the influence of the exogenous variable on the endogenous variable is the opposite. To see the results of the influence with the T-statistic, see (Table 5).

Table 2: Effect Results with T-statistics

Influence	Path Coefficients	SE	p-values	Information
X1 → Y1	0.173	0.106	0.053	Not significant
X2 → Y1	0.190	0.106	0.038	Significant
X3 → Y1	0.150	0.107	0.082	Not significant
X4 → Y1	0.312	0.102	0.001	Significant
X1 → Y2	0.105	0.108	0.168	Not significant
X2 → Y2	0.352	0.100	<0.001	Significant
X3 → Y2	0.532	0.095	<0.001	Significant
X4 → Y2	0.009	0.111	0.468	Not significant
Y1 → Y2	0.002	0.112	0.494	Not significant

Regarding product added value (Y1), the findings reveal a complex interplay of factors. The availability of raw materials (X1) shows a positive effect, but its lack of statistical significance suggests that while increasing raw material availability could potentially enhance product added value, this relationship is not strong or consistent enough to be deemed significant. This may imply that other factors, perhaps related to the quality or integration of these materials into the production process, might play a more critical role.

In contrast, food safety (X2) demonstrates a significant and positive influence, indicating that improvements in food safety protocols and standards are likely to lead to substantial increases in product added value. This could be due to the increasing consumer awareness and demand for safe and quality food products, especially in the fishery sector.

Transportation equipment (X3), while showing a positive impact, does not reach statistical significance. This result suggests that, although upgrades in transportation might have a favorable effect on product value, this aspect alone might not be a decisive factor. It indicates the need for a broader approach that encompasses various logistics and supply chain improvements. Business feasibility (X4) emerges as a significant positive factor, highlighting the importance of viable and sustainable business models in enhancing the value of products. This could be related to efficient business practices, market alignment, and strategic planning.

Turning to competitiveness (Y2), the study uncovers similar trends with some variations. The availability of raw materials (X1) and business feasibility (X4), while positively related to competitiveness, do not show statistical significance. This suggests that, although potentially beneficial, these factors alone are not key drivers of competitiveness in the market.

Conversely, food safety (X2) and transportation equipment (X3) display a significant positive relationship with competitiveness. This underscores the critical role of ensuring product safety and efficient logistics in gaining a competitive edge in the market. Notably, the added value of products (Y1) shows a positive but not statistically significant effect on competitiveness, indicating that while higher product value may contribute to competitiveness, it is not a definitive factor and should be considered alongside other strategic elements.

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Overall, these findings underscore the importance of food safety in enhancing both product added value and competitiveness. Additionally, business feasibility appears to significantly influence product added value but requires further investigation regarding its impact on competitiveness.

Indirect Influence Hypothesis

The model in this study is divided into 9 direct influences and 4 indirect influences. To see the results of indirect influence testing, see (Table 6).

Table 3: Results of Indirect Influence Hypothesis Testing.

Influence	Path Coefficient	SE	p-values	Information
X1 → Y1 → Y2	0.000	0.079	0.498	Not significant
X2 → Y1 → Y2	0.000	0.079	0.498	Not significant
X3 → Y1 → Y2	0.000	0.079	0.499	Not significant
X4 → Y1 → Y2	0.001	0.079	0.497	Not significant

The indirect influence of variable *X*1 (availability of raw materials) on variable *Y*2 (The analysis of the indirect influence of exogenous variables (X1, X2, X3, X4) on the endogenous variable (Y2 - Competitiveness) through the mediator variable (Y1 - Value-Added to Products) yields important insights. The results indicate that the indirect effects of these exogenous variables on competitiveness, mediated by the value-added to products, are not statistically significant. In other words, the value-added to products (Y1) does not act as a mediating factor in the relationship between the exogenous variables (availability of raw materials - X1, food safety - X2, transportation equipment - X3, business feasibility - X4) and competitiveness (Y2). This finding suggests that while the exogenous variables individually may have an impact on competitiveness and the value-added to products, there isn't a significant indirect relationship through the value-added to products. This implies that the influence of these exogenous factors on competitiveness is likely to be direct rather than being mediated by the value-added process.

It's important to acknowledge that this result provides clarity regarding the pathways of influence in the model. In practical terms, it suggests that interventions or strategies aimed at improving competitiveness in UPI UMKM businesses in the Bengkalis District should focus on these exogenous variables directly. For example, enhancing food safety or improving transportation equipment should be pursued as standalone initiatives to boost competitiveness, rather than relying on their impact through increasing product value. This discussion aligns with previous research in the field, emphasizing the multifaceted nature of factors affecting competitiveness in various industries. While the value-added process is undoubtedly important for product quality and market positioning, it may not always serve as a mediating mechanism for exogenous factors to impact competitiveness. This finding underscores the complexity of the fishery sector and highlights the need for tailored strategies that address both direct and indirect factors influencing competitiveness. The value-added to products does not mediate the relationship between exogenous variables and competitiveness, emphasizing the direct impact of these variables on competitiveness. Further research and a holistic approach to addressing these factors are essential for enhancing competitiveness in UPI UMKM businesses.

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CONCLUSION

This research reveals the factors influencing the added value and competitiveness of UPI UMKM businesses in Bengkalis District, Riau Province. The findings indicate that raw material availability does not significantly impact, while food safety plays a crucial role in enhancing both added value and competitiveness. Although transportation equipment does not affect added value, it significantly boosts competitiveness. Meanwhile, business feasibility contributes to added value but does not impact competitiveness. In conclusion, enhancing food safety and transportation facilities are key to advancing the added value and competitiveness of the fisheries business in Bengkalis, although the relationship between business feasibility and competitiveness requires further investigation. This study provides valuable insights for policymakers and stakeholders in the Bengkalis fishery sector for strategic development of UPI UMKM businesses.

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Conflict of Interest Statement

The authors declare that there is no conflic of interest.

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