The Effect of Product Quality and Modern Packaging Training on the Competitiveness of Salted Fish Products in the Belawan Coastal Area

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Abstract

This study aims to analyze the influence of product quality and modern packaging training on the competitiveness of salted fish products in the coastal area of Belawan. This research employed a quantitative approach using Partial Least Squares–Structural Equation Modeling (PLS-SEM). Research data were collected through questionnaires distributed to 100 salted fish business actors as respondents and were analyzed using measurement model and structural model testing to identify relationships among variables. The results indicate that product quality has a positive and significant effect on competitiveness, with a path coefficient of 0.398 and a p-value < 0.05. In addition, modern packaging training also has a positive and significant effect on competitiveness, with a path coefficient of 0.411 and a p-value < 0.05.The R-square value of 0.426 indicates that product quality and modern packaging training explain 42.6% of the variance in competitiveness, while the remaining variance is explained by other variables outside this study. The findings emphasize the importance of improving product quality and strengthening modern packaging skills as strategic efforts to develop salted fish businesses in order to remain competitively sustainable amid evolving market dynamics. This study is expected to serve as a practical reference for business actors and policymakers.

INTRODUCTION

The salted fish processing business is one of the important economic activities in Indonesia's coastal areas, including Belawan, a port and center of fishing activities in North Sumatra. The salted fish industry absorbs local labor, generates income for micro and small business actors, and supplies traditional food commodities that have a wide market network (local to inter-island) (Lia Indarsari et al., 2025). However, increasingly fierce market competition and changing consumer preferences require salted fish businesses to not only maintain production quantities but also improve product quality and downstream aspects such as packaging and marketing.

In traditional food industries such as salted fish, product quality reflects not only physical aspects but also food safety, process consistency, and hygiene standards. (Singh et al., 2020)product quality as a product's ability to perform its functions, including durability, reliability, accuracy, ease of use, and other characteristics that are valuable to consumers. In the context of the food industry, quality is also related to hygiene standards, food safety, taste, texture, and shelf life.

In salted fish, product quality is influenced by several factors, including the length of the drying process, which depends on sunlight, the salt content of the fish, and the packaging design used(Panggabean & Aprinawati, 2025) . In the salted fish business, quality is influenced by: Raw material quality (fish type, freshness), Salting process, Drying procedure, Production environment cleanliness, Consistency of salt content and texture. Good product quality will increase consumer confidence and strengthen the product's position in the market.

The quality of salted fish products refers to the degree of conformity of the physical, chemical, microbiological, and organoleptic properties of salted fish with the quality standards set

by the government (SNI 8273:2016) for dried salted fish and by local consumer preferences. High-quality salted fish products exhibit the following characteristics: (1) Bright color according to the type of fish, (2) Dry but not brittle texture, (3) Distinctive salted fish aroma without a rotten or rancid smell, (4) Low moisture content (< 40% depending on the type), (5) Low microbial activity, and (6) No harmful chemicals.

According to (Suryani et al., 2023) raining is a systematic process to improve an individual's knowledge, skills, and abilities so that they can perform their jobs effectively. Technical training, such as modern packaging training, aims to improve the ability of business actors to use technology, materials, and packaging procedures in accordance with standards. Modern packaging training includes: knowledge of hygienic packaging, vacuum sealing techniques or other modern packaging techniques, labeling and branding, food safety standards, and post-packaging storage practices (Ery Teguh Prasetyo et al., 2023). Training is effective if participants understand the material, are able to apply it, and produce behavioral changes in the production process. Packaging is an important element of marketing that protects products, provides information, and attracts consumers(Deliya & Parmar, 2012) . Packaging not only protects against damage but also increases sales value and competitiveness.

In the MSME scale, competitiveness is an effort to utilize and manage human resources, technology, capital, and natural resources to obtain added value, often referred to as an increase in value per unit of input(Irawan, 2020) . Modern packaging training for small-scale businesses in Belawan is a relevant intervention. Such training typically covers vacuum packaging or MAP (Modified Atmosphere Packaging) techniques, the use of food-grade packaging materials, labeling skills (nutritional information, expiration dates), as well as marketing and branding aspects. However, the effectiveness of training in improving the application of packaging practices and its implications for product competitiveness is not always clear, especially in the context of micro-businesses that face limitations in capital, technical knowledge, and access to technology.

Theoretically, the relationship between product quality, modern packaging training, and competitiveness can be examined through the framework of micro-business quality and competitiveness (García-Fernández et al., 2022). Product quality acts as a source of quality-based competitive advantage, while modern packaging training serves as a mechanism for transferring technical skills that improve the quality of final product handling and commercial added value (Triwijayati et al., 2023). The combination of these two factors is expected to influence competitiveness indicators such as selling price, market share, consumer loyalty, ability to enter the formal market segment, and profit margins (Handoyo et al., 2023).

However, empirical studies focusing on the combination of product quality and modern packaging training variables, particularly in the coastal area of Belawan, are still limited. Several studies in the small-scale food sector show the positive effects of training on production practices and hygiene standards, but the results are influenced by participant characteristics (education level, business experience), capital support, and supporting infrastructure (market access, cooling/drying facilities). Therefore, research examining the simultaneous influence of product quality and modern packaging training on the competitiveness of salted fish in the coastal area of Belawan is needed to provide empirical evidence that can be used as a basis for policies to strengthen MSMEs in the salted fish management sector.

This study aims to answer several practical questions: to what extent does product quality variation affect the competitiveness of salted fish businesses; does modern packaging training improve packaging practices and impact competitiveness indicators; and is there an interaction between product quality and the effects of training (e.g., training is more effective if the quality of raw materials is adequate). The results of this study are expected to provide recommendations for local governments, extension agencies, and economic empowerment organizations on the most effective intervention designs (training, technical assistance, facilitation of access to capital and markets) to improve the competitiveness of salted fish products in the Belawan coastal area.

This study aims to quantitatively examine the influence of product quality and modern packaging training on the competitiveness of salted fish products in the coastal area of Belawan. The main contributions include (1) Empirical evidence on the role of the combination of product quality and packaging capabilities in competitiveness, (2) Practical policy indicators for MSME strengthening programs in the salted fish management sector, and (3) Recommendations for priority interventions to improve product quality.

METHODS

This study uses a quantitative approach with explanatory research. The quantitative approach is used to test the influence between variables formulated in the hypothesis, namely the influence of Product Quality (X1) and Modern Packaging Training (X2) on the Competitiveness of Salted Fish Products (Y). This study was conducted on salted fish businesses in the coastal area of Belawan, Medan City, which is a center for traditional salted fish processing. The population in this study was all salted fish businesses in the coastal area of Belawan that routinely carry out production, drying, and packaging activities. The sampling technique used non-probability sampling with the purposive sampling method. Business operators who actively produce salted fish have implemented both traditional and modern packaging processes and are willing to be respondents. The sample size was determined using the Slovin formula:

With a margin of error (e) = 10%, the sample size was determined to be 100 respondents. Data collection techniques in this study included questionnaires, observation, and documentation. The data analysis technique used in this study was SmartPLS. SmartPLS analysis was conducted in two stages, namely the Outer Model (Measurement Model) and the Inner Model (Structural Model).

RESULTS
Measurement Model Testing (Outer Model)
Outer Loading Factor

An outer loading factor value of 0.70 or higher is considered to have sufficient validity to explain the measured construct. The outer loading values for the variables of Product Quality (X1), Modern Packaging Training (X2), and Competitiveness (X3) can be seen in Table 4.4

Table 1.
Outer Loading

	DS	KP	PPM
KP1		0.756	
KP2		0.754	
KP3		0.752	
KP4		0.788	
KP5		0.800	
KP6		0.740	
KP7		0.829	
PPM1			0.767
PPM2			0.831
PPM3			0.779
PPM4			0.771
PPM5			0.794
PPM6			0.852
PPM7			0.816
PPM8			0.781
DS1	0.823		

DS2	0.853
DS3	0.787
DS4	0.864
DS5	0.854
DS6	0.882
DS7	0.878
DS8	0.860

An outer loading factor value of 0.70 or higher is considered to have sufficient validity to explain the measured construct. The outer loading values for the variables Product Quality (X1), Modern Packaging Training (X2), and Competitiveness (X3).

There are no indicators removed in this model. All indicators have factor loading values above 0.70. The new outer loading factor values have been calculated and can be seen in the following final path diagram:
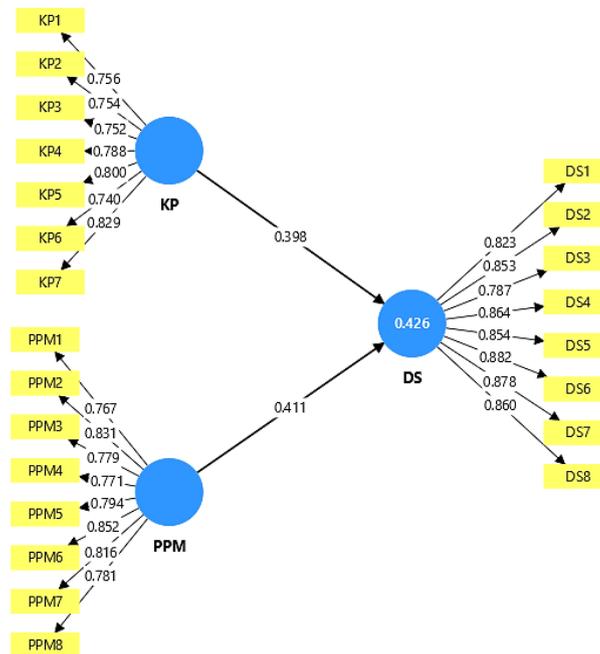

Figure 1. Final Path Diagram

Reliability and Validity Tests

The reliability instrument in this study was measured using two criteria, namely composite reliability and Cronbach's alpha. The Cronbach's alpha method usually provides a lower reliability . Aestimate than composite reliability, so it is more advisable to use composite reliability variable is considered reliable if the composite reliability value is greater than 0.70 and the Average Variance Extracted (AVE) is greater than 0.50.

Table 2.
Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
KP	0.890	0.903	0.913	0.600
PPM	0.920	0.928	0.934	0.639
DS	0.945	0.950	0.954	0.723

Based on Table 4.5, it can be seen that all research variables have a composite reliability value of more than 0.70 and an average variance extracted value of more than 0.50. Thus, the indicators used in these research variables are considered reliable. To test validity, the average variance extracted (AVE) value with a minimum limit of 0.50 was used. The table shows that all variables have AVE values above 0.50. This indicates that all indicators and variables in this study are considered valid.

Structural Model Testing (Inner Model)

4R-Square Value (R²)

Structural model testing was conducted to observe the relationship between constructs, significance levels, and R square values of the research model. The R square value can be used to assess the extent of the influence of independent variables on dependent variables. The R square estimation values can be seen in the table below.

Table 3.
R-Square Value

	R-square	Adjusted R-square
DS	0.426	0.415

Based on Table 3, it is known that the R-Square value for the competitiveness variable is 0.426. This means that the competitiveness variable influences 42.6% and the rest is explained by other variables not examined in this study.

Hypothesis Testing

The hypothesis testing in this study aims to understand the impact of product quality and modern packaging training on the competitiveness of salted fish products in Pesisir Belawan. This testing process was conducted using the Structural Equation Modeling–Partial Least Square (SEM-PLS) method with the support of SmartPLS software through bootstrapping. According to Hair et al. (2017), a hypothesis is considered significant if the t-statistic value is > 1.96 at a significance level of 5% or p-value < 0.05.

Table 4.
Path Coefficient Results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)
KP -> DS	0.398	0.405	0.074	5.355
PPM -> DS	0.411	0.417	0.072	5.728

The first hypothesis is the Effect of Product Quality on Product Competitiveness. Based on the hypothesis test conducted, a path coefficient (original sample) of 0.398 was found, with a t-statistic of 5.355 and a p-value of 0.000. A t-statistic exceeding 1.96 and a p-value below 0.05 indicate that product quality has a positive and significant impact on the competitiveness of salted fish products in Pesisir Belawan.

A positive path coefficient indicates that an increase in product quality will be accompanied by an increase in product competitiveness. This means that the better the quality of salted fish produced in terms of taste, cleanliness, texture, durability, and product uniformity, the greater the product's ability to compete in the market.

These findings indicate that product quality is a crucial factor in building competitive advantage for salted fish businesses in the Belawan Coast. Products with consistent quality will be more readily accepted by consumers, increase market confidence, and expand the marketing area.

First Hypothesis

Therefore, the first hypothesis (H1), which states that product quality affects product competitiveness, can be accepted.

Second Hypothesis

The second hypothesis is the effect of the latest packaging training on product competitiveness. The analysis results show that the latest packaging training variable obtained a path coefficient value (original sample) of 0.411 with a t-statistic of 5.728 and a p-value of 0.000.

These figures meet the significance standard, so it can be concluded that the latest packaging training has a positive and significant impact on the competitiveness of salted fish products in Pesisir Belawan.

A positive path coefficient indicates that the better the latest packaging training obtained by business actors, the higher the competitiveness of salted fish products. This training equips business actors with an understanding of packaging techniques that are cleaner, more attractive, informative, and in line with modern market demands. High-quality packaging not only protects the product but also enhances its aesthetic value and image in the eyes of consumers. With modern packaging, salted fish products have a greater chance of being sold to a wider market at a higher selling price.

DISCUSSION
The Influence of Product Quality on Competitiveness

The test results show that product quality has a positive and significant effect on the competitiveness of salted fish products in the Belawan coastal area. Based on the SEM-PLS test results, the path coefficient (original sample) value is 0.398, the t-statistic value is 5.355, and the p-value is 0.000. A t-statistic value greater than 1.96 and a p-value less than 0.05 indicate that product quality has a positive and significant effect on the competitiveness of salted fish products in the Belawan coastal area.

The coefficient of 0.398 indicates that improving product quality contributes moderately to increasing competitiveness. This means that the better the quality of salted fish produced in terms of the freshness of raw materials, cleanliness of the process, texture, taste, and consistency of quality, the stronger the position of the product in market competition.

These results are in line with (Arianto, 2020) research, which found that product quality has a significant effect on the decision to repurchase salted fish in Padang City. These findings confirm that consistent quality can build consumer loyalty, which ultimately strengthens business competitiveness.

In addition, research by (Hariyadi, 2022) also shows that quality issues such as inconsistent texture and contamination can lower product standards and weaken market position. Thus, the results of this study reinforce empirical evidence that product quality is a major determinant in improving the competitive advantage of salted fish MSMEs.

The Effect of Modern Packaging Training on Competitiveness

The results of the second hypothesis test show a path coefficient value of 0.411, with a t-statistic of 5.728 and a p-value of 0.000. This value meets the significance criteria (t > 1.96 and p < 0.05), so it can be concluded that modern packaging training has a positive and significant effect on the competitiveness of salted fish products on the Belawan coast.

The coefficient of 0.411 indicates that packaging training has a slightly greater influence than product quality in this research model. This indicates that improving skills in modern packaging techniques, such as the use of hygienic packaging, labeling, and more attractive designs, can significantly increase the selling value and image of products in the market.

This finding is consistent with the research by (Asdilvira, 2024), which states that training in hygiene, packaging, and branding contributes to improving production quality while expanding the market access of salted fish. Modern packaging not only protects the product but also serves as a differentiation tool and marketing strategy.

CONCLUSION

From the results of the study and discussion on the impact of product quality and training in modern packaging methods on the competitiveness of salted fish products in Pesisir Belawan, several conclusions can be drawn, namely that product quality has a positive and significant effect on the competitiveness of salted fish products in Pesisir Belawan. This can be seen from the path

coefficient value of 0.398, the t-statistic value of 5.355, and the p-value of 0.000. These findings indicate that if the quality of salted fish products in terms of taste, cleanliness, durability, and consistency improves, the competitiveness of the products in the market will also increase. The latest packaging training has a positive and significant impact on the competitiveness of salted fish products in Pesisir Belawan. The analysis results show a path coefficient value of 0.411, a t-statistic value of 5.728, and a p-value of 0.000. This indicates that training in the latest packaging can increase the selling value of products through cleaner, more attractive packaging that meets current market demands. The latest packaging training has a stronger influence than product quality in enhancing the competitiveness of salted fish products in the Belawan Coast. This strong influence is evident from the higher path coefficient value of the latest packaging training compared to product quality, making the latest packaging a crucial factor in strengthening the competitiveness of salted fish products.

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