

Thai Halal Food as Soft Power for Thailand Towards the Chinese Market: A Sentimental Analysis Approach

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Abstract

This study explores the significance of Thai Halal food as a means of exerting influence for Thailand in the Chinese market. The research explores consumer preferences and market trends by utilising sentiment analysis and machine learning models like BiLSTM, XGBoost, and GBR. The halal industry, with a global value of \$2.3 trillion, has immense growth opportunities, especially in China, thanks to the Belt and Road Initiative. The research emphasizes the widespread appeal of Thai cuisine, featuring popular dishes such as Massaman curry and Tom Yum Goong, as well as the importance of government support and strategic marketing to maximize cultural assets. Analysing consumer reviews and social media discussions helps identify important market drivers and potential investment opportunities for promising products. The results suggest that focusing on popular categories such as processed foods, fresh foods, and convenience items can help to optimise revenue. Forecasting models analyse consumer sentiment and sales trends to offer valuable strategic insights for long-term growth in the Chinese market. Combining different sources of strength, such as faith power, soft power, and

digital power, creates a powerful foundation for Thailand to expand its cultural and economic influence.

Keywords: Digital Power, Halal E-Commerce, Predictive Analysis, Sentiment Analysis, Soft Power.

Introduction

The halal industry, with an annual growth rate of 20% and a value of \$560 billion, is diversifying its offerings to cater to global markets, including non-Muslim consumers. Projections indicate that it will reach a value of \$2.3 trillion. Countries globally, including those with non-Muslim majority populations, are taking advantage of this market due to factors such as the increasing size of the Muslim population, economic growth in Muslim-majority countries, and the attractiveness of a halal lifestyle (Azam & Abdullah, 2020). These elements drive the industry's growth and highlight its opportunities within the global economy. This section will provide a detailed exploration of these factors and demonstrate the potential of the global halal industry (Figure 1a).

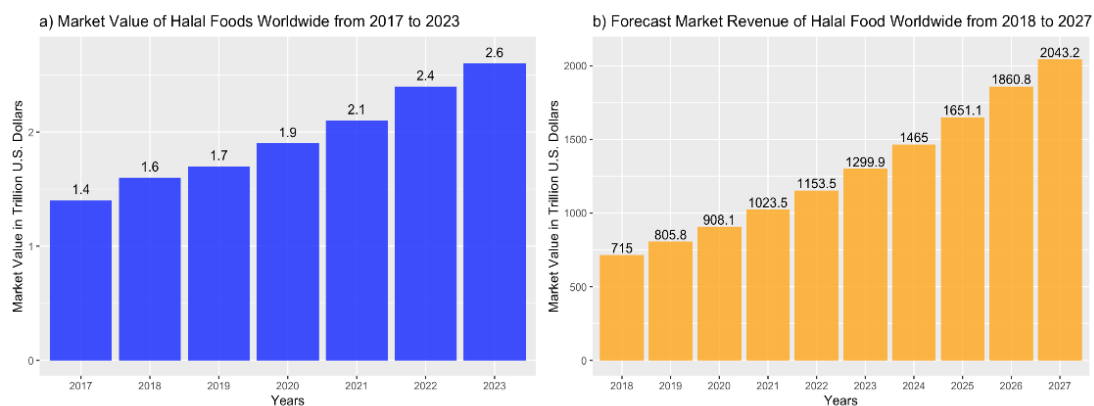


Figure 1: a) Market Value of Halal Foods Worldwide From 2017 To 2023, b). Projection of Halal Foods Market Worldwide From 2017 To 2027

Source: [Www.Statista.Com](http://www.Statista.Com).2022)

The global halal industry is experiencing significant growth, fuelled by widespread awareness initiatives and a rising demand for halal products and services in sectors such as food, tourism, and pharmaceuticals. Both Malaysia and Indonesia, as well as Thailand and China, demonstrate significant potential in various sectors. Emerging market players and cities like Yiwu in China, along with the growing US halal market, are contributing to substantial consumer spending. By 2027, projections suggest that sales could reach up to \$2.43 trillion (Figure 2b) (Mula et al., 2013).

The global halal food sector classifies its traded products into three primary groups: confectionery, bakery products, and processed food and beverages, as shown in Figure 2. According to a recent study, the category of "processed food and beverages" has consistently been the top revenue generator in the halal food market from 2014 to 2024 (Can, 2022). Among the various product groups,

bakery products generate the second-highest revenue, while confectionery falls at the bottom in terms of income. By 2024, the processed food and beverage category is expected to generate a substantial amount of revenue within the halal food sector.

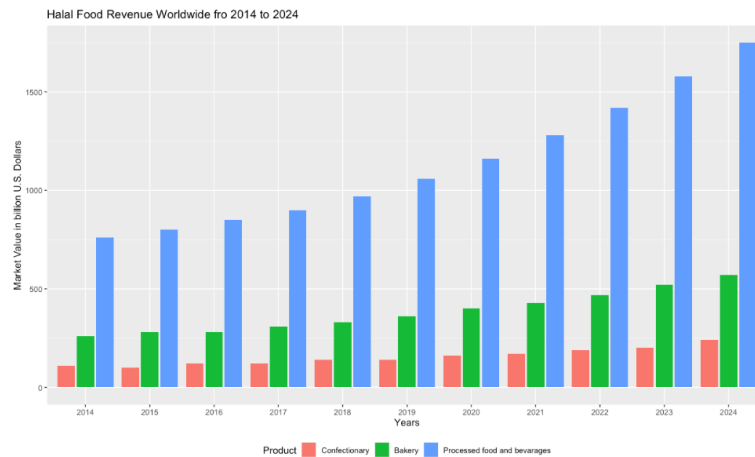


Figure 2: Halal Food Revenue Worldwide from 2014 to 2024 by Category (Can, 2022).

In 2019, Thailand emerged as a prominent player in the halal market, establishing itself as the 11th largest global exporter. The country's dedicated efforts towards standardisation and its position as a leading producer in Southeast Asia have contributed to this remarkable achievement. Over the past five years, the export of Halal food from Thailand has increased by 19%. The country's thriving tourism industry has further boosted this growth, making it even more appealing to Muslim visitors. Thailand has been actively promoting its culture through various initiatives, such as the Thai Kitchen to the World project, Thai Select, and global Thai festivals. These events aim to showcase the country's local wisdom, goods, and services in a wide range of formats (Cogan, 2024; Jones & Theerawong, 2021; Praditsilp & Pongsakornrungrungsilp, 2024). Thai cuisine enjoys widespread recognition worldwide, with dishes like Massaman, Tom Yum Goong, and Papaya Salad consistently ranking among CNN Travel's top 50 foods. The thriving Thai communities abroad contribute to the popularity of Thai cuisine. This has led to the international appreciation of dishes such as Pad Thai and Tom Kha Gai (Suanpang, Nuanla-ong, & Thanyaki, 2023). Through long-term efforts and government support, Thailand has the potential to enhance its soft power and achieve sustainable growth by capitalizing on its strengths in food, tourism, and services, with a focus on the creative industry.

Mahamud and Yama (2020) investigated the influence of halal orientation strategies (HOS) on the financial performance (FP) of halal food companies (HFC) in Thailand, with a focus on the moderating role of halal culture (HC). The study suggests that halal production has a negative effect on food quality, while halal transformation, storage, and materials have a positive effect on it. HC enhances the positive effects of these strategies by fostering a unified organisational commitment to halal principles. The presence of halal food as a faith-driven market force not only improves financial outcomes, but also enhances consumer appeal and trust on a global scale.

Researchers have conducted extensive studies on various aspects of halal tourism, such as

analysing social media discussions, probing non-Muslim tourists' perceptions, and methodically exploring the theme to shape research agendas shaped by sentiments related to "halal tourism" (Feizollah et al., 2021). Several authors have published recommendations and conducted sentiment analysis to assess the perceptions of "halal tourism" (Battour et al., 2018; Rasul, 2019). So far, "halal" research has primarily focused on "halal food." This is due to the primary association of the term "halal" with the context of food. Researchers have conducted extensive research on halal food, addressing a wide range of topics. Some of these include the examination of halal logos and their significance (Mohamed, Abdul Rahim, & Ma'aram, 2020), the export of halal food, factors influencing halal food consumption, and the establishment of standards and certification for halal food (Ab Talib & Ai Chin, 2018).

Considering the scope of sentiment analysis and the vast halal food market in China, this study recognises the significance of analysing keywords to predict potential investment opportunities. We suggested utilising Python for machine learning to create visualisations of the dataset. The visualisations would be based on keywords (English and Chinese), sales and revenue, and review analysis. The goal is to predict the future potential of Thai Halal Food in order to enhance the e-commerce chain in the Chinese market.

Literature Review

Joseph Nye, a political scientist, introduced the concept of Soft Power in a distinct time period. Soft Power refers to a nation's capacity to sway others through allure and persuasion, employing elements such as culture and policies, rather than force. This is in contrast to Hard Power, which relies on military force or economic pressure. Nye highlighted culture, political values, and foreign policy as significant contributors to Soft Power (Roongsangjun, 2023). Brand Finance's Global Soft Power Index 2021 assesses and ranks countries based on their ability to use soft power. Germany is renowned for its wide range of beer brands and its accessible education system. Japan, ranked second, employs cultural exports such as manga and sushi, along with the "Cool Japan" strategy. Despite facing internal challenges, the UK continues to exert its influence through Premier League football and the BBC. Canada, ranked fourth, is well-known for its commitment to openness and advocacy for human rights. Switzerland, ranked fifth, is renowned for its exceptional watch industry and commitment to safeguarding individual rights (Wang, 2024; Zhang & Wu, 2019). The concept of soft power, which involves shaping preferences through appeal and attraction, has motivated many nations, including Thailand, to leverage their cultural assets such as cuisine, cinema, and traditions to gain global influence and economic value (Roongsangjun, 2023). When the culture of one country aligns with the interests and values of another, it becomes a potent tool of soft power. This is facilitated through avenues such as visits, communication, and cultural exchange (Athique, 2019). In order to enhance Thailand's influence on the global stage, it is crucial for the government to provide greater financial support, implement effective policies, involve industry stakeholders, and develop a comprehensive national

strategy.

Muslim Population; A Growing Soft Power Zone Worldwide

There has been a remarkable increase in the Muslim population from 2010 to 2050, with a rise from 1.6 billion to 2.76 billion. This represents a significant growth in the global share, increasing from 23.2% to 29.67% (Figure 3). This significant growth indicates a growing consumer base, which can stimulate economic development by creating a higher demand for products and services that cater to the preferences of the Muslim community (Lipka & Hackett, 2017).

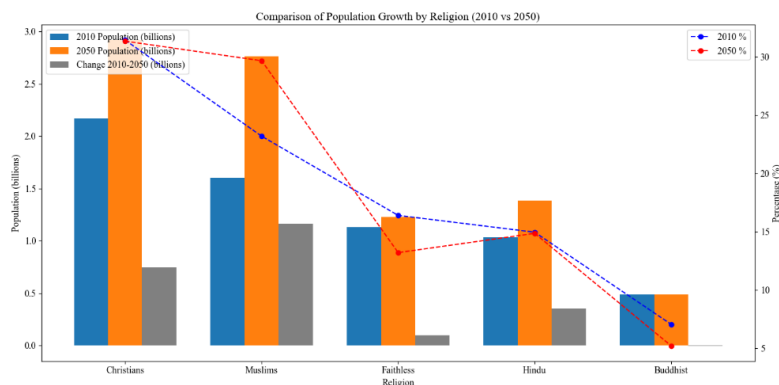


Figure 3: Comparison of Population of Growth And Its Projection Till 2050 (Lipka & Hackett, 2017).

We can examine the growth of the Muslim population by looking at different continental regions (Figure 4), based on data from the PEW 2011 report. The Asia-Pacific region (including ASEAN and Non-ASEAN Countries) continues to be the largest, with a population that has grown from 1 billion to nearly 1.3 billion. However, its global population share has slightly decreased, from 62.1% to 59.2%. There are significant increases in the Middle East and North Africa, as well as in Sub-Saharan Africa, with the latter's global share rising from 15.0% to 17.6%. Europe's Muslim population experiences gradual growth, maintaining a 2.7% global share, while the Americas witness a slight increase from 0.3% to 0.5% (Can, 2022).

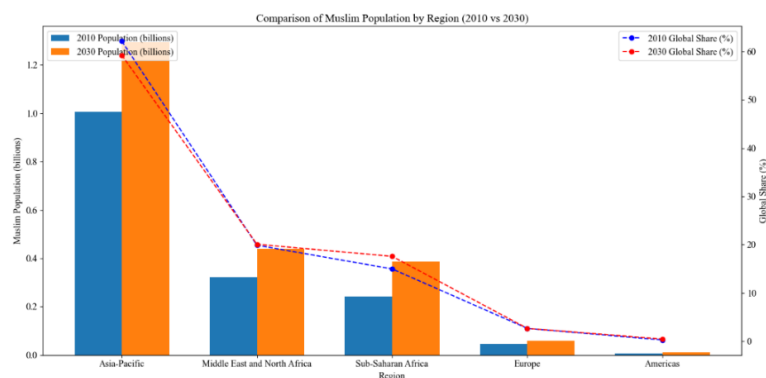


Figure 4: Continental Distribution of Muslim Population and its Growth Projection Till 2030 (Can, 2022).

Considering the significant Muslim population in the Asia-Pacific region, it would be wise to focus on this area for projecting the Halal Food Market. The halal food market in China is witnessing remarkable

growth, driven by the country's sizable Muslim population and the Belt and Road Initiative (BRI), which promotes trade and cultural interactions with Muslim-majority nations (Hidayat, Rafiki, & Nasution, 2022). The BRI facilitates the seamless connection of the halal food supply chain, enhancing the trade of halal products and establishing China as a significant contributor to the worldwide halal market. The sector's remarkable performance during the COVID-19 pandemic underscores its promising future, with projections indicating a \$1.38 trillion halal food market by 2024 (Li, 2018; Masood & Rahim, 2021). The BRI's focus on infrastructure, trade, and digital transformation resonates with the global Muslim community, promoting growth and collaboration in a mutually beneficial way (Holmes, 2018).

Thailand as a Soft Power

Thailand, ranked 33rd globally, excels in tourism and cultural exports, particularly in the areas of food, film, fashion, fighting, and festivals. In order to enhance Thailand's Soft Power on the global stage, it is necessary for the government to provide greater financial support, implement policies, and develop a national plan. This should be done by building upon existing initiatives such as the Thai Kitchen to the World project, and capitalising on the nation's abundant cultural heritage and reputation for hospitality (Kaewklub & Phetvaroon, 2023). Thai cuisine, known worldwide for popular dishes such as Massaman curry and Tom Yum Goong, also plays a significant role in Thailand's Soft Power (Jongsuksomsakul, 2024).

In order to strengthen its international relations and leverage its Soft Power, Thailand should establish a collaborative network with government backing, aimed at achieving long-term and sustainable development (Cogan, 2024). According to Jhearmaneechotechai (2024), the formation of networks and the adoption of unified strategies can significantly enhance Thailand's soft power, thereby playing a crucial role in its future social and economic development. Currently valued at USD 2.3 trillion annually, the halal market is growing at a rate of 20% annually. It encompasses food, cosmetics, and pharmaceuticals, appealing to both Muslim and non-Muslim consumers worldwide. Thailand can increase its soft power by strategically utilising market insights to tap into the potential of the halal industry, which non-Muslim countries are currently capitalising on (Feizollah et al., 2019).

Sentiment Analysis Approach

Businesses and consumers are increasingly utilising social media and online reviews for product promotion and information. This trend often results in customers browsing in physical stores but ultimately making their purchases online (Quan, Wang, & Quan, 2019). OCR systems are widely regarded as the second most reliable source of information, following personal recommendations. They provide valuable insights into the strengths and weaknesses of products by describing them in different usage scenarios from the consumer's viewpoint. Analysing OCRs is challenging due to their high volume, wide variety, and complex nature, despite their usefulness as "sales assistants" (Kordrostami & Rahmani, 2020).

Billee et al. (2019) conducted a quantitative study to examine the expectations of Muslim tourists regarding Halal tourism in Songkhla province, Thailand. The study included a sample of 404 tourists. Their findings revealed high expectations for attractions, accessibility, amenities, accommodations, and activities, especially regarding Halal food and religious practices. The study indicates that efficient management of Halal tourism can greatly contribute to the enhancement of tourism value and economic growth in the region.

E-commerce has experienced a significant increase in popularity, with consumer-generated data, such as ratings and reviews, playing a crucial role in shaping purchasing decisions. The application of Machine Learning and Natural Language Processing to analyse this data yields valuable insights into consumer behaviour, aiding e-commerce businesses in comprehending consumer intentions and preferences (Shrirame et al., 2020). This data has an impact on consumer purchasing intentions by enabling real-time, personalised recommendations that improve the shopping experience and increase organisational profits. This study investigates the factors influencing organisational strategies by analysing user-generated content.

The utilisation of various algorithms in deep learning analysis enables the accurate visualisation of big data for market prediction, achieved through keyword and sentiment analysis. Common algorithms used for initial classification and prediction include Support Vector Machine (SVM), Random Forest, and Naïve Bayes. Advanced techniques, such as Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN), specifically Long Short-Term Memory (LSTM) networks, are employed to capture temporal dependencies and intricate patterns in the data (Swathi, Kasiviswanath, & Rao, 2022). The N-CRBM model, when combined with Contrastive Divergence (CD) for optimisation, improves the learning of contextual relationships. Sentiment analysis utilises Natural Language Processing (NLP) algorithms, whereas K-Mean clustering categorises the data into meaningful clusters. The Net Promoter Score (NPS) helps to understand customer loyalty and satisfaction, leading to market insights and predictions.

This study aims to predict the halal food market in China, specifically focusing on Thai Halal Food, using a sentiment analysis approach. Several predictive analysis models have been extensively deployed and explored in literature. This study adopts a customer-centric approach and utilises three models to analyse the data set. The selection of these models is based on their suitability for the data set and the variables under analysis. The study found that the challenges associated with predicting market size, selecting accurate investment products, and forecasting future sales can be addressed by employing BiLSTM, XGBoost, and GBR algorithms. The details will be explained in the following section, along with the research framework.

Methodology

This study examines the potential of Thai Halal food to enhance Thailand's influence in the Chinese market. Qualitative approaches are employed to collect, clean, and analyse data, yielding

insights into consumer opinions and market trends. Sentiment analysis is utilised to assess public opinions on Thai Halal food. This study aims to provide a thorough analysis of the potential of Thai Halal food as a soft power tool in China. This will be achieved by integrating qualitative approaches, sentiment analysis, and mathematical algorithms.

Primary and Secondary Data Integration

Primary Data: The primary qualitative data collection involved multiple online platforms, including WeChat and relevant databases. We compiled a comprehensive dataset by including sources in both English and Chinese. In addition, we conducted structured interviews with experts and customers who are knowledgeable about Thai Halal food and the Chinese market. This included e-commerce platforms like Tmall and Taobao, which greatly influence consumer behaviour in China.

Secondary Data: The analysis incorporated secondary data obtained from market reports. The reports covered market trends, consumer behaviour, and economic indicators in the Chinese Halal products market. The utilisation of primary and secondary data allowed for a comprehensive comprehension of market dynamics and consumer sentiment.

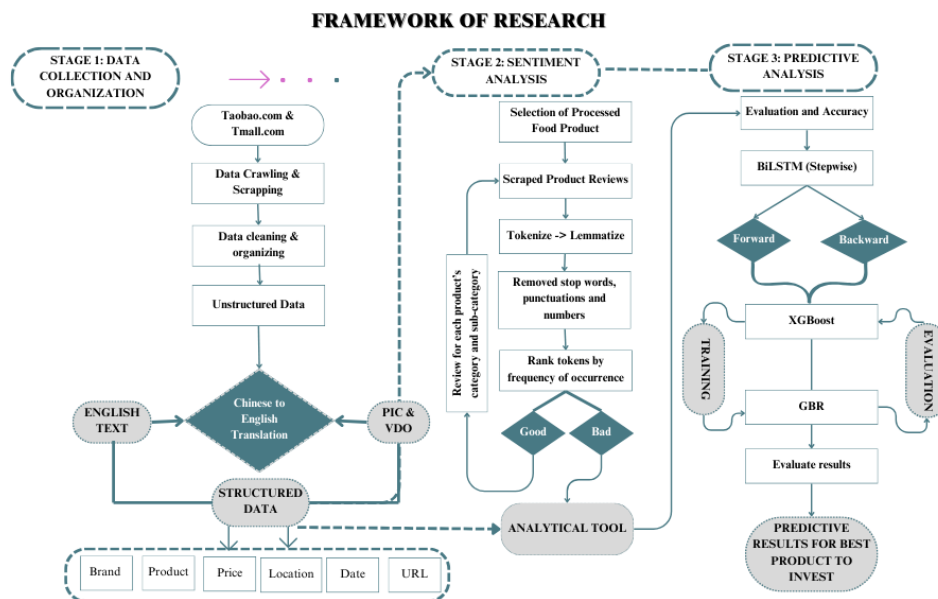


Figure 5: The Framework of Research for Sentiment Analysis of Thai Halal Food.

The data collection process included gathering consumer reviews of Halal food from various sources such as social media, forums, and e-commerce sites. The data underwent NLP techniques such as text normalisation, tokenization, lemmatization, and stop word removal for cleansing and organisation. This process prioritised significant keywords. The consumer reviews were categorised into positive, negative, or neutral sentiments and analysed for keyword frequency in sentiment analysis. Additional insights were obtained through qualitative interviews conducted with industry experts and consumers. The interview data was subjected to thematic analysis to identify recurring themes and sentiments. The analysis provided

a comprehensive understanding of consumer perceptions and market trends in the Chinese market for Thai Halal food through a combination of quantitative and qualitative methods.

The product names and reviews were further processed to accurately identify key terms and patterns. The dataset was refined by removing non-essential words, punctuation, and numbers. The tokens were ranked according to their frequency of occurrence in order to identify the dominant themes and trends.

Mathematical Algorithms

- The BiLSTM, a more advanced version of LSTM networks, processes data in both forward and backward directions to capture dependencies from past and future states. This enhances its effectiveness for sequential data tasks such as NLP and sentiment analysis. The system maps input words to dense vectors, comprehends semantic relationships, and combines outputs from both directions to make final predictions. The bidirectional approach enhances the model's accuracy in comprehending and forecasting sequential data.

Training

- **Loss Function:** For binary classification tasks, it is important to use an appropriate loss function such as binary cross-entropy.
- **Optimization Algorithm:** Maximise the efficiency of the model by utilising algorithms such as Adam or RMSprop to reduce the loss function.

Evaluation

- **Metrics:** Evaluate the model's performance on the test set by considering metrics like accuracy, precision, recall, and F1-score.

Forward LSTM

$$\begin{aligned}
 f_t &= \sigma(W_f \times [h_{t-1}, x_t] + b_f) \\
 i_t &= \sigma(W_i \times [h_{t-1}, x_t] + b_i) \\
 \check{C}_t &= \tanh(W_C \times [h_{t-1}, x_t] + b_C) \\
 C_t &= f_t \times C_{t-1} + i_t \times \check{C}_t \\
 o_t &= \sigma(W_o \times [h_{t-1}, x_t] + b_o) \\
 h_t &= o_t \times \tanh(C_t)
 \end{aligned} \tag{1}$$

- **Backward LSTM:** Similar to the forward LSTM, this model processes the sequence in reverse order and analyses the overall output using equation 2.

$$y_t = \text{Dense}\left(\begin{bmatrix} \rightarrow \\ h_t, \leftarrow \\ h_t \end{bmatrix}\right) \tag{2}$$

- **XGBoost** is a powerful ensemble learning method that utilises gradient boosting to construct a series of decision trees in a sequential manner. Every tree in the model learns from the mistakes of

its predecessors, showcasing exceptional speed and performance across a range of machine learning tasks (equation 3-4).

Data Preparation

The data features, such as sentiment score and price, are extracted from the dataset and then divided into testing sets for training purposes.

Model Training

- Adjust the hyperparameters such as the number of trees ($n_estimators$), learning rate, and maximum depth of trees. The model is trained on the training set to minimise the loss function, usually mean squared error for regression tasks.

Evaluation

- Tests were conducted on the dataset to make predictions, and the performance of the model was assessed using RMSE (Root Mean Squared Error) and other appropriate metrics.

$$L(\theta) = \sum_{i=1}^n l(y_i, \hat{y}_i) + \sum_{k=1}^K \Omega(f_k) \quad 3$$

where l is the loss function (e.g., squared error), and Ω is a regularization term.

Predictions were made using equation 4.

$$\hat{y}_i = \sum_{k=1}^K f_k(x_i) \quad 4$$

where f_k represents the k – th tree in the ensemble.

- **GBR** is another ensemble method that builds a sequence of weak learners (typically decision trees). Each subsequent model attempts to correct errors made by the previous models by focusing on the residuals (equation 5-6).

Residual Calculation

$$Lr_{im} = y_i - \hat{y}_{im-1} \quad 5$$

$$\hat{h}_m = \hat{y}_{im-1} + \lambda \hat{h}_m(x_i) \quad 6$$

where λ is the learning rate.

Results

Data Processing

The data in [Table 1](#) showcases the results of sentiment analysis, focusing on the sales revenue

generated by analysing keywords and key counts in different food and beverage categories. The category of "Processed Foods" stands out with the highest number of records, unique items, amount sold, and revenue. It boasts an impressive average price of 56.78 Yuan. Categories such as "Fresh Food" and "Snack" also demonstrate noteworthy sales and revenue. The analysis reveals that "Drinking Water" commands the highest average price per unit (229.66 Yuan), suggesting a premium pricing strategy. The table highlights the varied revenue contributions across various food and beverage categories, showcasing consumer interest and market trends based on sentiment analysis data.

Table 1: Processed Data of Categories and Their Number Counts.

Category	No. of Records	Unique Items	Amount Sold	Revenue	Average Price	Weighted Average Price
Processed Foods	350,000.00	6,693.00	25,975,932.00	1,326,460,779.53	56.78	51.06
Snack	161,000.00	4,100.00	8,479,846.00	335,360,956.48	44.88	39.55
Fresh Food	140,200.00	2,500.00	6,909,432.00	953,853,849.27	155.39	138.05
Seasoning	65,000.00	1,300.00	2,670,197.00	108,806,185.60	49.14	40.75
Dried Food	51,000.00	1,200.00	3,206,004.00	590,245,536.56	125.96	184.11
Other	27,000.00	400.00	372,636.00	18,719,282.81	105.01	50.23
Green Tea	20,000.00	4,300.00	1,915,992.00	130,689,673.23	90.17	68.21
Fruit Juice	20,000.00	4,150.00	786,308.00	89,237,114.74	135.47	113.49
Soda	20,000.00	3,200.00	874,772.00	52,173,792.17	79.18	59.64
Energy Drinks	17,000.00	2,500.00	1,567,351.00	143,518,539.12	126.87	91.57
Drinking Water	15,000.00	3,400.00	2,717,159.00	283,032,043.02	229.66	104.16
Beverages	10,000.00	3,500.00	1,152,329.00	145,527,408.18	129.67	126.29
Milk	8,000.00	100.00	127,824.00	5,042,143.21	49.39	39.45
Tea	8,000.00	100.00	86,971.00	3,084,849.76	39.89	35.47
Sparkling	0.00	0.00	2,511.00	329,999.00	106.03	131.42
Tea Powder	0.00	0.00	2,949.00	118,813.15	38.17	40.29

The bubble chart (Figure 6) provides a visual representation of the correlation between price, amount sold, and revenue across different categories. "Processed Foods" and "Fresh Food" are the top performers in terms of sales and revenue, further confirming the findings from Table 1 that these categories are most popular among consumers. The smaller sales volumes of products like "Drinking Water" are offset by the high average prices, resulting in substantial revenue. This suggests that premium pricing is having an impact. This is in line with the analysis of the topic, emphasising how consumer preferences and market trends affect revenue generation.

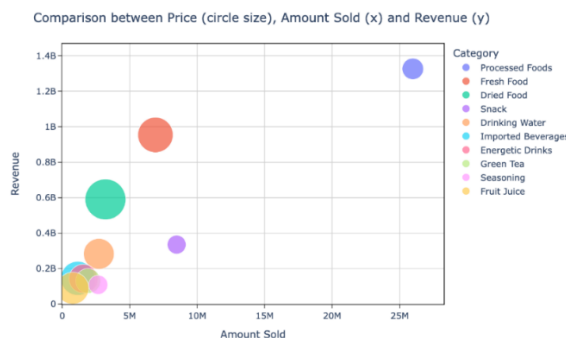


Figure 6: Relationship Between Price, Amount Sold, and Revenue for Various Categories.

The Figures 7a-c emphasise the significance of certain terms such as "halal," "snack," and "noodle," suggesting strong consumer interest and potential market influences in both English and Chinese analyses. The bubble chart 7d and keyword counts reveal the noteworthy revenue and sales volume generated by categories like "Processed Foods," "Fresh Food," and "Instant Noodles," which aligns with the data discussed earlier. The focus on factors related to convenience and specialty items indicates that consumer demand for these products is high, leading to the significant sales and revenue seen in the tabulated data. Emphasising the significance of focusing on popular keywords in e-commerce strategies to maximise revenue generation.

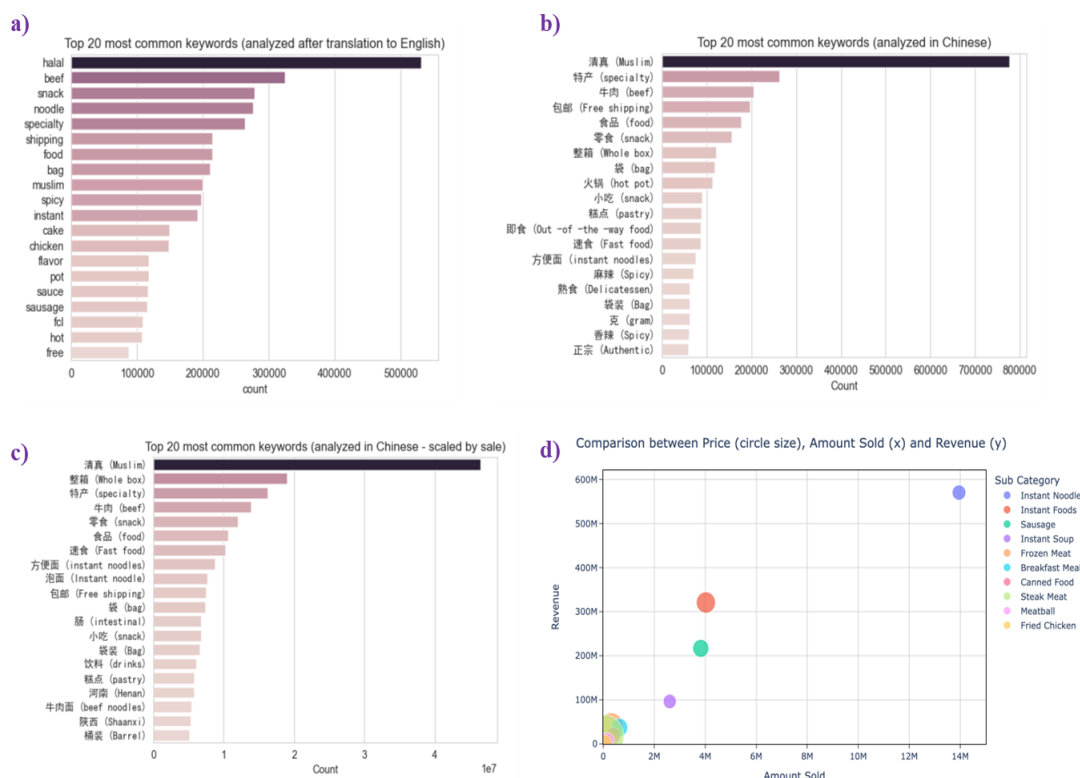


Figure 7: a): Keywords Analysis for Words Count in English., b): Top 20 Common Keywords in Chinese and Their Word Count Contribution., c): Top 20 Most Common Keywords and their contribution in Sales (Yuan)., d): Relationship Between Price, Unit Sold and Revenue Generated.

Based on the graph (Figure 8), it is evident that "Instant Noodles" outperforms other products in terms of both product count and comments count. This is consistent with the previous data that emphasises the widespread appeal of convenient food options such as instant noodles and their significant contribution to sales revenue. Categories like "Instant Food" and "Instant Soup" also demonstrate significant product counts and comments, which suggests a high level of consumer interest and demand. The strong relationship between high product counts, comments, and keyword prominence indicates a close connection between consumer sentiment and demand for these popular terms. This emphasises the significance of prioritising popular and in-demand products to take advantage of consumer behaviour and optimise revenue.

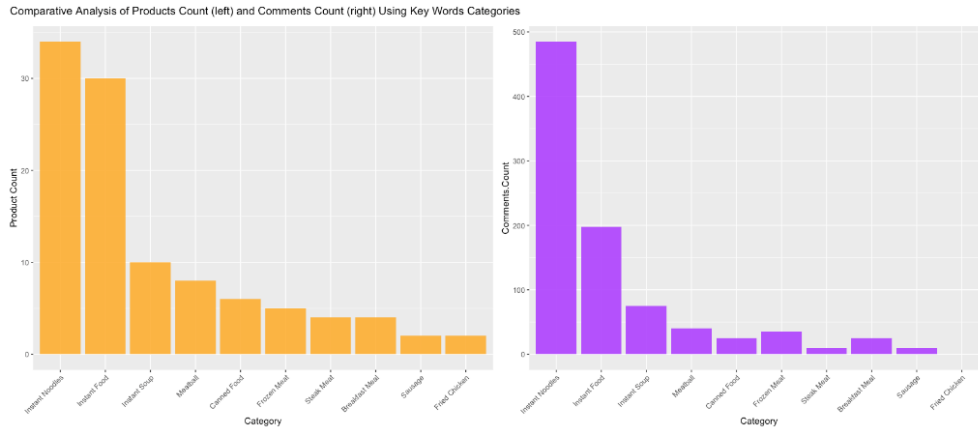


Figure 8: Relationship Between Products Counts and Comments Counts for Various Categories.

Predictive Analysis

Table 2 shows BiLSTM, XGBoost, and GBR optimisation results. These models were used to choose the best consumer sentiment predictive analytic model. The BiLSTM model performs well with 0.010 validation loss and 1.0% trait loss after 8 epochs, demonstrating fast training and validation. Despite having a greater validation loss of 0.045 and a trait loss of 4.5%, XGBoost is tuned for 100 epochs, making it acceptable for complex predictions. The GBR model balances efficiency and robustness with a 0.025 validation loss and 2.5% trait loss. BiLSTM is best for rapid, efficient predictions, according to the data. For in-depth sales and product predictive analysis, XGBoost and GBR are better due to their extended training periods (Ramadhan & Putrada, 2023).

Table 2: Optimization of Algorithms for Predictive Analysis Using Sentiments of Consumer.

Model	Epoch Number	Trait Checked	Trait Loss	Percent Loss of Trait
BiLSTM	8	Training Loss	0.016	1.6%
		Validation Loss	0.010	1.0%
XGBoost	100	Training Loss	0.12	12%
		Validation Loss	0.045	4.5%
GBR	100	Training Loss	0.016	1.6%
		Validation Loss	0.025	2.5%

The revenue generated by XGBoost and Gradient Boosting models was compared (Figure 9). Gradient Boosting demonstrates superior accuracy in revenue prediction compared to XGBoost, as evidenced by its lower RMSE of 9876.73 compared to XGBoost's RMSE of 10530.22. The revenue trends for high-demand products such as "Instant Noodles" and "Instant Soup" are accurately represented by both models, indicating the significant consumer interest and demand as identified in previous keyword and sentiment analyses (Ramadhan & Putrada, 2023). The observed consistency supports the notion that consumer sentiment and keyword frequency are reliable predictors of sales trends and revenue. This finding validates the use of these models for accurate sales forecasting, leveraging insights into consumer behaviour.

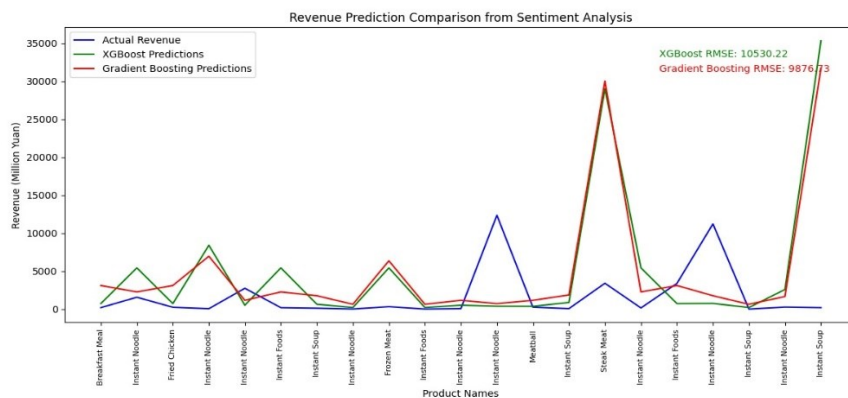


Figure 9: Prediction of Best-Selling Products Based on Consumer Sentiments Analysis.

The revenue predictions for the years 2024 to 2030 were made using GBR (Gradient Boosting) and XGB (XGBoost) models. The results are shown in Figure 10. Both models closely align with actual revenue trends, with GBR demonstrating slightly better accuracy (RMSE of 9,876.73) compared to XGB (RMSE of 10,530.22). The predictions suggest a consistent consumer demand for popular products such as "Instant Noodles" and "Instant Soup," resulting in a steady increase in revenue. The spikes in revenue predictions correspond to historical patterns, indicating potential periods of increased sales, potentially attributed to seasonal demand or marketing initiatives. The models' projections indicate market demand stabilisation and maturity towards the end of the period (Shang & Hamori, 2023). These predictive insights can inform strategic business decisions, inventory planning, and marketing strategies to leverage anticipated consumer behaviour trends until 2030.

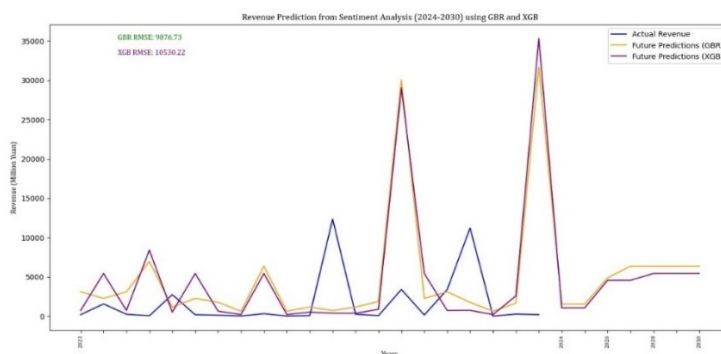


Figure 10. Prediction of Sales Projection by Using Sentiment Analysis Year 2023-2030.

Discussion

The analysis demonstrates a significant correlation between consumer sentiment, keyword analysis, and sales data in the Chinese market for Thai Halal food and beverages. The categories of "Processed Foods" and "Fresh Food" are associated with high sales volumes and commonly searched keywords such as "halal," "snack," and "noodle." Consumer sentiment analysis reveals a preference for convenience and specialty items, as evidenced by the success of "Instant Noodles" and "Instant Soup." Predictive models, particularly Gradient Boosting (GBR), demonstrate a high level of accuracy in

revenue forecasting. The projections indicate sustained growth for products such as "Instant Noodles" and "Processed Foods," making them attractive for investment. The Thai Halal food industry, specifically Instant Tom Yum Mala Halal noodles, has substantial potential to contribute to Thailand's GDP and global influence, as it aligns with consumer trends.

The data analysis reveals a significant correlation between sentiment analysis, keyword frequency, and market trends, which is essential for strategic market planning in China. The categories of "Processed Foods" and "Fresh Food" are the top performers in terms of sales and revenue. Among these, "Instant Noodles" and "Instant Soup" stand out as particularly successful products. The dominant terms in consumer searches are "halal," "snack," and "noodle," as revealed by keyword analysis. There is a clear consumer preference for convenience and specialty foods. The sentiment analysis of reviews and comments confirms that "Instant Noodles" is a popular category, indicating strong consumer involvement and satisfaction. The GBR and XGBoost algorithms accurately predict revenue data, with the GBR model demonstrating superior accuracy. This makes the GBR model crucial for strategic planning. In order to leverage the growing opportunities in the global Halal food market and stimulate Thailand's economic growth, it is advisable to prioritise investment in Instant Tom Yum Mala Halal noodles and other popular instant noodle varieties. This strategic focus aligns with consumer preferences, utilises Thailand's culinary strengths, and utilises digital e-commerce for market expansion. Thailand can optimise revenue generation, enhance its global soft power, and contribute significantly to its annual GDP growth by doing so.

The global landscape of economic and cultural influence is changing due to the forces of religious power, soft power, and digital e-commerce power, creating a new platform for growth. The potential of Thai Halal food in the Chinese market is evident. Faith power, soft power, and digital power each contribute to different aspects of market dynamics. Faith power provides a significant market base, while soft power enhances cultural appeal and consumer trust. Digital power, on the other hand, ensures efficient market penetration. Thailand can strategically position its Halal-certified food products for sustained growth by utilising these elements. The integration of cultural assets, demographic targeting, and advanced digital tools for market analysis represents a comprehensive strategy for economic development. The multifaceted platform enhances both revenue and cultural ties, thereby strengthening Thailand's global influence. The presence of Halal certification increases the attractiveness of Thai food for Muslim consumers. The sentiment analysis indicates a strong demand for processed foods, fresh foods, and convenience items in China. This suggests that the introduction of Halal-certified Thai food can potentially enhance Thailand's cultural and economic influence.

The strategic recommendations for the Chinese market should prioritise investment in high-demand categories such as "Processed Foods," "Fresh Food," "Instant Noodles," and "Instant Soup," based on these insights. Effective marketing strategies should utilise popular keywords and sentiments to optimise campaigns and target specific consumer segments. Furthermore, diversifying product

offerings in line with consumer preferences, such as convenience foods and specialty items, can enhance market positioning. The use of predictive models such as GBR can enhance revenue forecasting accuracy, facilitating informed decision-making and promoting sustained growth and profitability. Integrating sentiment analysis into market strategies enables businesses to align their products with consumer needs, leading to success in the competitive Chinese market.

Further research should investigate consumer sentiment variations among different demographic segments in the Chinese market. Examining regional preferences and variations can offer detailed insights, enabling the development of focused marketing strategies. Furthermore, there is potential for research on the influence of emerging trends, such as health and wellness or sustainability, on consumer buying habits in the food and beverage industry. Future research can improve the accuracy of sentiment analysis and revenue prediction models by using advanced machine learning techniques and real-time data analytics. This can result in better strategic planning and market responsiveness.

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