INTEGRATING PREDICTIVE ANALYTICS TO UNDERSTAND AND INFLUENCE FISH CONSUMER BEHAVIOUR

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Abstract
The fish sector must comprehend and influence customer behaviour in a time when market dynamics, sustainability, and health consciousness are changing the way people around the world consume food. This study investigates how predictive analytics can be used to understand and guide customer preferences and purchase decisions around fish consumption. There is an urgent need for sophisticated tools to forecast and impact purchasing decisions as the demand for seafood rises due to its nutritional advantages and growing awareness of sustainable food sources. A data-driven strategy that makes use of machine learning is predictive analytics. Historical data and statistical modelling are a potent tool for identifying latent patterns and predicting emerging trends. By analysing factors like price sensitivity, health perceptions, seasonality, regional preferences, socioeconomic indicators, and sustainability awareness, this study offers a thorough analysis of how predictive models might be applied to consumer datasets in the fish sector. Additionally, it investigates how retail analytics, social media sentiment, and e-commerce data might enhance predictive insights. We also go over examples of how supply chain optimization, product development, and marketing tactics in the seafood industry have been positively impacted by predictive analytics. The study assesses potential biases in predictive algorithms, data privacy issues, and ethical issues. It highlights the necessity of open, inclusive, and flexible frameworks that can react to changing environmental laws and customer demands. Stakeholders can improve consumer satisfaction, encourage sustainable consumption practices, and better match supply with demand by incorporating predictive analytics into the decision-making processes of retailers, policymakers, and fisheries. By bridging the gap between data analytics and behavioural science, this study hopes to provide practical insights for a seafood economy that is more robust and adaptable.

1. Introduction

A confluence of psychological, cultural, social, and economic elements impact consumer behaviour in the food sector. Fish consumption trends in the seafood industry are especially influenced by cultural norms, sustainability issues, health trends, and pricing dynamics. Big data and predictive analytics have emerged in recent years, opening up new avenues for comprehending and influencing these intricate behaviours. By examining how data-driven insights may be utilized to forecast trends, segment customers, tailor marketing, and ultimately influence purchasing decisions, this study seeks to understand how predictive analytics and consumer behaviour meet in the fish market. We contend that predictive analytics can enhance business results and customer experiences while advancing sustainability objectives when incorporated into the fish supply chain and marketing systems. Due to rising consumer demand, sustainability concerns, and technological improvements, the worldwide fish sector is rapidly changing. In this context, it is now essential for stakeholders, such as fisheries, aquaculture producers, merchants, and legislators, to comprehend consumer behaviour around fish consumption.

Because surveys and observational studies only record consumer preferences at one particular moment in time and may not take into consideration changing patterns influenced by socioeconomic, cultural, and environmental factors, traditional methods of studying consumer behaviour frequently yield only limited insights. By using statistical modelling, machine learning, and big datasets, predictive analytics provides a potent way to more precisely predict customer behaviour. Businesses can find hidden trends, estimate consumer demand, and create interventions that not only satisfy present market expectations but also influence future consumption patterns by incorporating predictive analytics into fisheries and seafood marketing strategies. Through this integration, stakeholders can pinpoint elements that significantly impact fish market purchases, including price sensitivity, sustainability awareness, health consciousness, and cultural preferences. Predictive analytics also makes it possible to promote sustainable consumption habits, optimize supply chain management, and provide targeted marketing.

It helps industries match production with demand while reducing waste by bridging the gap between research on consumer behaviour and workable

strategies. Finally, in an increasingly dynamic and complex seafood market, incorporating predictive analytics into the study of fish consumer behaviour offers a data-driven strategy to boost competitiveness, guarantee sustainability, and raise customer satisfaction. As the world's fish consumption continues to climb due to reasons including urbanization, income development, and shifting dietary choices, research on consumer behaviour in the seafood industry has attracted increasing focus (FAO, 2024). Although they provide insightful information, traditional research techniques like consumer surveys and econometric demand assessments are frequently unable to accurately forecast dynamic changes in customer preferences. To foresee buying trends and comprehend the fundamental forces behind consumer behaviour, predictive analytics—which integrates statistical modelling, machine learning, and big data—emerges as a crucial tool in this context (Waller & Fawcett, 2013).

An evidence-based approach for identifying important drivers like price elasticity, sustainability awareness, nutritional perception, and cultural effects is provided by incorporating predictive analytics into the research of fish consumer behaviour. In addition to improving demand forecasting accuracy, this kind of integration promotes market expansion, regulatory changes, and sustainable fisheries management. Researchers and industry stakeholders can better predict future consumption trends, reduce supply-demand mismatches, and promote ethical seafood consumption by shifting from descriptive analysis to predictive modelling. Because of changing consumer preferences, sustainability concerns, and the dynamics of global trade, the seafood market is become more and more competitive. It is critical for producers, retailers, and policymakers to understand consumer preferences, including why consumers purchase particular fish species, their price range, and the ways in which sustainability affects their choices. Finding these insights is made possible by the innovative method of predictive analytics. Through the use of data-driven forecasting and machine learning, companies can predict changes in demand, spot new consumer trends, and modify their marketing plans appropriately. Price optimization, waste reduction, and supply chain resiliency. Furthermore, by highlighting the ways in which cultural considerations, environmental concerns, and health awareness influence consumer choices, predictive models help organizations not only meet customer demands but also actively drive behaviour toward long-term, profitable results.

Objective

- Know the fundamental factors influencing people's decisions to eat fish.
- Using data-driven models, forecast future market trends and customer preferences.
- Affect purchasing decisions using dynamic pricing, focused marketing tactics, and long-term product offerings.

2. Background and Literature Review

2.1. Consumer Behaviour in the Fish Market

The way that different populations and geographical areas consume fish differs greatly. Important contributions are played by elements like access to fresh seafood, cultural background, education, and income. Consumer choices are also influenced by beliefs about food safety, environmental issues (such as overfishing and carbon footprint), and health advantages (such as omega-3 fatty acids). Over the past 30 years, the world's consumption of fish has grown by 122%, according to FAO estimates. This increase is not uniform, though, as emerging markets place a higher value on availability and cost while established economies move toward sustainable and organic seafood options.

2.2. Predictive Analytics: A Brief Overview

In order to forecast future events, predictive analytics entails gleaning knowledge from current data. Natural language processing (NLP), neural networks, decision trees, regression models, and clustering algorithms are some of the methods. Predictive analytics has been widely applied in retail for churn prediction, consumer segmentation, recommendation systems, and demand forecasting. Businesses can better understand customer preferences and market trends by using predictive analytics in the context of fish consumer behaviour. This allows for more effective manufacturing, inventory control, and targeted marketing.

3. Methodology

The study makes use of the following to investigate how predictive analytics may be included into the investigation of fish customer behaviour:

Secondary data: sources include consumer surveys, industry studies, and retail sales information.

Data modelling: - Applying machine learning methods like random forests, logistic regression, and k-means clustering to data modelling allows for the simulation of predictive insights.

Case studies: - Examples from online marketplaces and retail seafood businesses are used in case studies.

The analysis focuses on five key areas:

1. Consumer Segmentation

Determine different fish-eating groups (such as urban versus rural, income-, age-, and lifestyle-based).Examine factors such as cultural customs, price, ease of use, and taste preferences that influence purchases. Forecast demand by segment (e.g., younger consumers prefer ready-to-cook fish vs. older consumers buying fresh) using predictive analytics.

2. Price and Promotion Sensitivity

Calculate the elastic versus inelastic demand, or how customers respond to price changes. Examine marketing tactics include digital marketing campaigns, festival promotions, combo deals, and discounts. Examine how consumers perceive value and whether they associate higher prices with higher quality.

3. Impact of Sustainability

See if people are aware of and willing to pay more for fish that is sourced responsibly and sustainably. Keep tabs on certification trends (MSC, eco-labels) and their effects on customer confidence. Compare current retail (supermarkets/online), where sustainability messaging is more pervasive, with traditional purchasing behaviour (such as wet markets).

4. Health and Nutritional Motivations

Examine the effects of health trends on fish intake, such as diets high in protein, awareness of omega-3 fatty acids, and a move away from red meat. Examine variations among demographic groups (e.g., elderly, families with children, and fitness-conscious young).Forecast the rise of processed fish products (fortified, canned, and smoked) as healthier substitutes.

5. Regional and Seasonal Demand Patterns

Figure out regional preferences (for example, coastal states prefer fresh catch while inland areas eat frozen or processed).Examine periods of high demand (festivals, availability during the monsoon season, and dietary shifts from summer to winter).Examine supply

Demand imbalances and how they affect prices and consumer substitution (e.g., moving to veggies or chicken when fish costs escalate).

4. Predictive Analytics in Action

4.1. Consumer Segmentation and Targeting

Using clustering algorithms such as k-means, consumers can be grouped into categories:-

Customers who are concerned about their health: - Prefer wild-caught, low-mercury fish; frequently purchase from health stores.

Focused on sustainability: - Willing to pay more for seafood that has been certified sustainable.

Customers that care about price: - Make your selections depending on sales or discounts.

Those who value convenience: - Favour frozen or ready-to-eat fish.

Retailers can use these segments to tailor marketing strategies, such as offering recipe suggestions to health-conscious buyers or flash sales for price-sensitive customers.

4.2. Pricing and Promotion Modelling

Customer elasticity-based dynamic pricing models are made possible by predictive analytics. Businesses are able to forecast the impact of price or promotion changes on consumer behaviour by analysing past sales data.

As an illustration: A 10% salmon discount increased weekly sales in urban retail chains by 17%, but only by 5% in rural areas, according to a predictive model.

4.3. Influence of Sustainability Labels

Businesses can use natural language processing (NLP) on social media and review sites to determine how customers feel about certifications such as the Aquaculture Stewardship Council (ASC) and the Marine Stewardship Council (MSC). A Norwegian retailer's case study revealed that "sustainably sourced" products had a 23% higher repurchase rate, particularly among millennial.

4.4. Health-Driven Predictive Modelling

The demand for fish is being influenced by health trends like Kato, Mediterranean diets, and anti-inflammatory eating. Predictive models can anticipate increases in demand for fish like mackerel, sardines, or cod during food trend peaks by including search engine data (such as Google Trends), nutrition blogs, and online forums.

Example: In line with New Year's resolutions, demand for lean white fish rises by 30% during January, which is commonly referred to as the "health reset" month.

4.5. Regional and Seasonal Variations

Geo-analytics combined with historical sales data helps identify seasonal peaks and regional preferences.

North-eastern United States: Lobster is in high demand during the summer.

Japan: - December (New Year season) is when sashimi-grade tuna sales peak.

India: Because of religious dietary habits, fish intake increases during non-festive times.

Predictive stocking is made possible by models educated on these patterns, which reduce waste and boost profitability.

5. Case Studies

Case Study 1: E-commerce Seafood Retailer

A recommendation system built on collaborative filtering and browsing history was put into an

online seafood platform. Within six months, the average cart value rose by 15% and repeat purchases by 28% thanks to predictive algorithms.

Case Study 2: Supermarket Chain in the UK

In order to improve its fresh fish inventory, a major UK supermarket used predictive analytics for pricing and inventory. With increased product availability, customer satisfaction scores increased and shrinkage (spoilage) decreased by 21% over a year.

Case Study 3: Governmental Sustainable Campaign

To target fish consumers and promote underutilized, sustainable fish species like Pollock and mackerel, a European government employed predictive analytics. Campaign timing was synchronized with consumption patterns and geo-targeted. Sales of conventional fish were unaffected by the 34% increase in sales of promoted species.

6. Ethical and Practical Considerations

6.1. Data Privacy

Significant privacy problems are raised by the collection and analysis of consumer data, particularly via loyalty programs or e-commerce. Businesses are required to abide by the CCPA, GDPR, and other data protection laws.

6.2. The use of algorithms Discrimination

Predictive models may unintentionally perpetuate prejudices, such as underrepresenting minority cuisine preferences or suggesting less expensive seafood to lower-income populations. It is crucial to source data inclusively and transparently.

6.3. Excessive Use of Technology

Even while predictive analytics has a lot of potential, it shouldn't take the role of human judgment or disregard qualitative information. Cultural or religious elements, for instance, might not always be evident in data.

7. Recommendations and Future Directions

1. Integrated Platforms:- Seafood merchants ought to spend money on integrated data platforms that integrate sales, inventory, customer reviews, and outside data (health trends, festivals, and weather).

2. Real-Time Dashboards:- Predictive analytics-driven dynamic dashboards can direct purchase, marketing, and customer interaction decisions in real time.

3. Working together with academia: - Together, we can create more complex behavioral models that include psychological and sociological aspects.

4. Consumer Education: - Public campaigns about healthy and sustainable eating should also be informed by predictive findings.

8. Conclusion

Fish consumer behaviour can be better understood and influenced by incorporating predictive analytics into the seafood value chain. Through the utilization of machine learning algorithms and data from many sources, stakeholders can obtain practical insights on habits, preferences, and new trends. Increased consumer happiness, less waste, better inventory control, and the encouragement of sustainable consumption are all possible outcomes of this data-driven strategy. But in order to fully reap these rewards, companies and legislators need to address moral issues, maintain openness, and integrate human insights with data. Predictive analytics can act as a link between responsible consumption and market dynamics in addition to being an efficient tool.

References:

1. Carlucci et al. (2015) – A comprehensive systematic review of international studies on consumer purchasing behaviour toward fish and seafood, discussing demand drivers and barriers.
2. Verbeke et al. (2007) – A market segmentation study based on how consumers evaluate fish quality; useful for segment profiling.
3. Cantillo et al. (2020) – A systematic review applying choice modelling (discrete choice experiments) to understand consumer preferences for finfish.