Business Report

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Abstract

This business report introduces a predictive model poised to revolutionize Ryanair's fresh food provisioning, targeting a harmonious balance between maximizing revenue and minimizing waste. By employing Catboost to parse through vast datasets on sales, flights, and customer demographics, the model adeptly forecasts food requirements, incorporating critical variables like flight duration and seasonality. Strategically implemented monthly by the supply chain team, it promises to slash waste and bolster sales. Financially, it's a game-changer: expected to save €3,942,000 annually from a 10% reduction in food waste and boost revenue by €7,884,000 through a 5% sales increase. Environmentally, it aligns with Ryanair's ambition to cut CO2 emissions, supporting their journey towards carbon neutrality by 2050. The report lays out a phased implementation plan, emphasizing training, process re-engineering, and evaluation, setting the stage for a sustainable, profitable future in aviation.

Introduction

According to the Guardian, in 2016 Airlines generated 5.2 million tonnes of waste and it cost them 400 000 000£. These numbers alone highlight the urge for sharp predictions regarding the amount of necessary items loaded on each aircraft. Ryanair’s image could be severely damaged if they were to be personally criticized in articles for their waste. For this reason alone, building efficient models capable of predicting their sales for specific food items is a must, especially in an increasingly green world. In addition to this, having more precise sales forecasts would increase Ryanair’s revenue since reducing waste directly leads to spending less. These are the arguments that show waste reduction and accurate forecasting are vital for Ryanair’s image, and also its sales optimization. However, from a customer point of view we found evidence that leads us to believe that some flights are actually out of stock when it comes to the six food items discussed. So precise fresh food estimations can also help for the opposite scenario, where there sometimes isn’t enough food on a specific flight, thus decreasing customer satisfaction. The prediction model that we propose will not only help Ryanair protect their image, but also optimize their sales and increase customer satisfaction. Empirical evidence suggests that many airlines tend to have high waste historically. This information mixed with our findings that Ryanair sometimes does not have enough food on their flights leads us to believe a middle line can be found. Our model and business approach attempt to help Ryanair reach this middle ground.

Strategic Application of the Model

The model should be run every month for all the predicted Lines of flights by the supply chain team of Ryanair. The model provides a detailed forecast of required stock levels for each flight sequence. These projections take into account a multitude of variables, including the length of each flight sequence and the anticipated demand for specific product lines, ensuring a highly tailored approach to food provisioning.

Our model offers many advantages. By matching food supplies to projected demand for each flight (LoF), Ryanair can greatly reduce both overstocking and understocking. This minimizes waste and boosts revenue potential through better sales. The model will continuously improve as it gathers

more data, which will enhance its prediction accuracy overtime. The supply chain team is crucial in this system as it bridges the gap between forecasting insights and real-world implementation. They do more than simply operate the model; they also analyze its results, collaborate with catering providers to adjust food orders and manage the logistics of these operations. We trust that Ryanair will put effort into coaching their team to implement this, so that they can make full use of provided data solutions.

By continuously collecting data and adjusting models accordingly, Ryanair will be able to adapt to changing situations and industry challenges. This data-informed approach to in-flight catering allows Ryanair to strike a balance between efficiency and sustainability while prioritizing passenger satisfaction.

In our continuous pursuit to refine our sales and marketing strategies, we have undertaken a comprehensive segmentation of different flight routes. This endeavor stems from a need to better understand and serve the diverse preferences of our customer base.
Traditionally, our analysis has relied on the pre-defined `*st_route_group*` variable. However, it became evident that the low cardinality provided by st_route_group was insufficient. To address this, we shifted our focus to the `*st_route_subgroup*`. By analyzing these subgroups, we observed a more detailed and descriptive pattern of customer preferences and purchasing behaviors that the broader st_route_group categories were masking. Our approach to creating these new groups was meticulous and data-driven. We examined each st_route_subgroup individually, interpreting its defining features and understanding its unique customer profile. This granular review allowed us to categorize these subgroups into new, more meaningful groups.

The objective of this new segmentation is to provide a foundation for insightful analysis and informed decision-making. Our subsequent sales distribution study, detailed later in this report, leverages these new groupings to unveil patterns that will guide our strategic initiatives and operational focus areas.

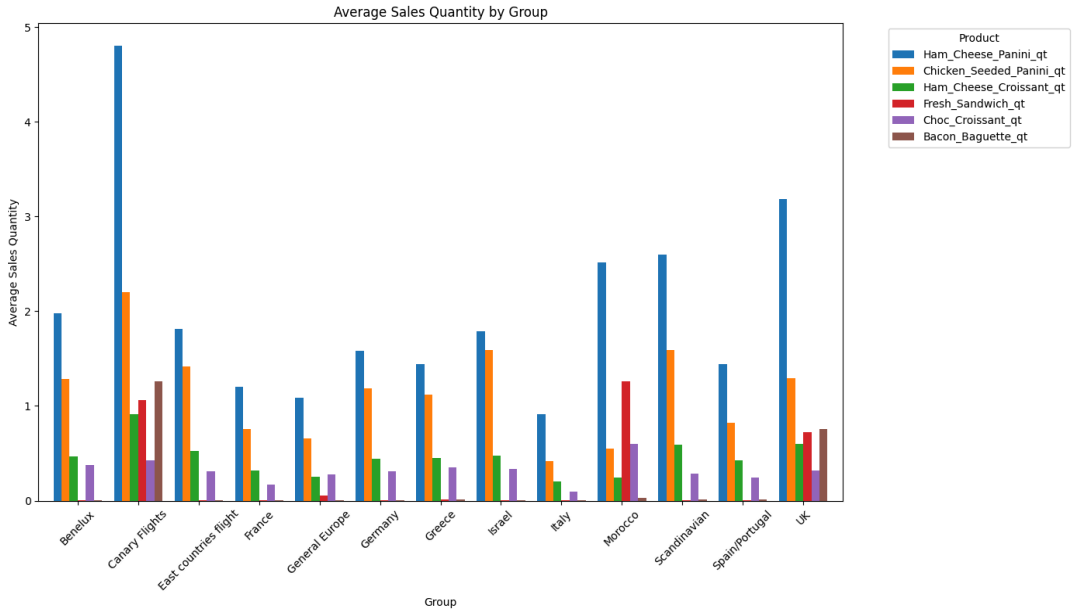

Figure 1: This bar chart represents the average sales quantity by group for a range of products.

Each of these insights can inform targeted strategies such as marketing campaigns, product development, inventory optimization, and customer experience enhancement. The differences in

product popularity by region indicate opportunities for regional customization of product offerings and marketing strategies.

Economic and Environmental Impact Analysis

Economic:

Reduced Waste: With an average cost of €5 per fresh food item (ex:Ham & Cheese Panini) and a daily operation of 3,600 flights, a conservative estimate of a 10% reduction in food waste could save Ryanair approximately €5 * 3,600 flights/day * 365 days/year * 10% = €657,000 annually. This figure is based on a single food item. To align that with the 6 products, you should multiply it by 6 which comes to the final number of €3,942,000 annually

Increased Sales: By tailoring food offerings to match passenger preferences and flight specifics, let's assume a modest increase in sales by 5%. With an average revenue of €5 per sale and assuming each of the 3,600 daily flights sells an average of 4 units of fresh food item, the annual revenue increase would be €5 * 4 sales/flight * 3,600 flights/day * 365 days/year * 5% = €1,314,000.To align that with the 6 products, you should multiply it by 6 which comes to the final number of €7,884,000 annually

Operational Efficiency: Improved forecasting reduces last-minute procurement and logistics costs. If these efficiencies result in just a 1% cost reduction in logistics, which conservatively costs €100,000 daily, the annual savings would be €100,000/day * 365 days/year * 1% = €365,000.

Environmental:

Reduce CO2 Emissions: Ryanair aims to lower carbon emissions to less than 60 grams per passenger kilometer by 2030, as stated in their sustainability report. Our predictive model complements this goal by reducing food waste on flights. Ryanair has already made progress, lowering emissions to 66 grams per passenger kilometer. Our model supports Ryanair's efforts by minimizing food waste, helping them achieve their sustainability targets faster.

Ryanair's use of predictive analytics not only improves their operations and reduces environmental impact but also furthers their goal of becoming carbon neutral by 2050. By combining sustainability and analytics, Ryanair is a pioneer in the push towards a greener aviation industry.

Implementation Plan:

Phase 1: Model Integration:

Ensuring seamless connectivity between Ryanair's existing IT systems and the new predictive model, we will integrate them to allow for compatibility with existing data management methods. This involves establishing data pipelines to provide real-time access to vital information, such as sales, flight, and customer data to the supply chain model.

Phase 2: Training:

Staff training (at the same time of Phase 1)**:** Train the supply chain team in-depth on the predictive model. Specifically, target procurement specialists and logistics coordinators for these training sessions.
Process Re-engineering (2-3 Months):Adjust supply chain activities to work smoothly with forecasts from the predictive model.
-Actions:

- Review and update procurement plans, food handling methods, and loading procedures. Make these changes so that supply chain operations can respond quickly and effectively to the model's predictions.
- Establish an adaptable ordering system that considers the model's monthly projections. This system will guarantee that food acquisitions closely align with demand predictions for each Line of Flight (LoF).

Phase 3: Evaluation and expansion:

Performance Evaluation (After 6-12 Months): Thoroughly evaluate the model's effects on increasing sales, minimizing waste, and enhancing customer happiness. Determine the financial and environmental advantages gained from its use in real numbers instead of an estimate.

Strategic Expansion: After reviewing the model's performance, explore extending its use to include products that aren't fresh or other parts of the business where predictive analytics could make things run more smoothly and make customers happier.

Conclusion:

All in all, building a sharp Machine Learning model will without doubt help Ryanair achieve its Carbon reduction goals. Not only will it reduce their waste, but it will also allow them to put more money aside to potentially make other areas of their business more sustainable. However, the extent to which our solution helps Ryanair truly depends on them. Having a powerful predictive model is one thing; deploying it and smoothly implementing the changes it suggests is another. For this, staff training, process re-engineering, and performance evaluation will be vital.
Through perpetuous effort and obsession for maximizing customer satisfaction and sales while reducing waste, we engineered a model that is not only powerful but also robust when it comes to dealing with errors in data records or even large quantities of missing data.
Not to forget that the more data the model sees, the better it will perform over time. So we hope Ryanair will use this long-term tool to its full capacity, not only to maximize sales and reduce waste but also to gain deeper insights into their business.

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