From Dine-In to Takeaways: Surviving the Covid-19 Disruption

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Summary: "Kedai Kopi" has 175 food and beverage stock keeping unit (SKUs) and faces constant excess or shortages of SKUs on a daily basis, resulting in losses and wastages. Before the Covid-19 pandemic, the majority of the sales came from dine-in customers. However, due to the lockdown and implementation of the emergency measures in Malaysia. "Kedai Kopi" had to focus on items that are more likely to be ordered as take-aways item. Hence today, we need to understand the current demand to have a monthly plan on the optimal SKUs, removing certain SKUs and minimizing inventory levels.

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KEY INSIGHTS

- Segmentation of the SKUs contributing to 80% of the revenue (Class A) and identifying the other SKUs (Class B) that are tied to Class A.
- Newsvendor model determined the optimal level to produce and optimal inventory policy developed.
- Simulation carried showed the robustness of the model. The results have also predicted significant increase in profit, reduction in wastage and stock outs.

Introduction

"Kedai Kopi" is a café, established in February 2018 and located in Selangor, Malaysia. The café serves typical Kelantanese cuisine. Kelantan is a state in North East Malaysia with a unique culture reflected by their art, dialect and food. The owners consists of young adults with high determination and eagerness to learn and expand the business. Even though they had little experience in the food and beverage services, they have persevered. In reward, since the launch, they have been approached by numerous personnel keen to open a franchise under the "Kedai Kopi" name. Therefore, the owners have targeted to open up the 2nd outlet in 2022. Before moving forward with the plan to open more outlets, "Kedai Kopi" is currently reviewing the overall process in their business operations to further enhance and improve their business. In total, "Kedai Kopi" have 175 food and beverage SKUs. Raw material is pre-ordered and kept before being prepared on a daily basis based on the demand. However, due to the lack of experience of the managers of the business, no forecasting method is being used. Thus, they face constant excess or shortages of SKUs on a daily basis which Kedai Kopi believe is resulting in losses and halt their profitability.

Literature Review - Supply Chain Segmentation

Based on the study from Fichtinger, Chan, & Yates(2019), supply chain segmentation has become an important instrument to classify multiple supply chains from an initial single supply chain. It is hoped that this can create effective and profitable multiple classes of supply chain instead of a single supply chain. According to Sarstedt (2008), in a real-world scenario, homogeneity is not realistic. Every single person is heterogenous and therefore has their own views. Therefore, this differece in views may form different segments.

The supply chain segmentation suggested includes pareto analysis and demand variability. However, Fichtinger et al (2019) use a combined approach of supply chain segmentation to achieve optimal supply

chain network. The study classifies the empirical data from large fast moving consumer goods (FMCG) into three (03) categories. Type 1 was an unsegmented supply chain, Type 2 was segmented by using a pareto based segmentation and Type 3 was segmented by using quantitative techniques. Based on the results, the Type 3 supply chain model has a substantive increase in cost savings compared to Type 1 and Type 2 supply chain models. Therefore, it was suggested that multiple approach in segmentation will increase the cost benefits.

Sheth (1972) approached segmentation by using multiple regression analysis and automatic interaction detectors in analysing consumer's long distance telephone expenditure. The multiple regression analysis thus made it possible see the relationship between variables and group them together. The results were very important for the telecommunication industry to understand the customer behaviour and then provide suitable products to them.

Multivariate analysis could also be used as an instrument for segmentations. Ip et al (2004) analysed gaming related behaviour. By using factor analysis, a multivariet technique, the study reveals three (03) major factor. The results of the study provided the game developers with a targeted approach in generating ideas for future games.

Literature Review - Newsvendor Model

Liman (2014) suggested reducing the shortages and surplus in the case of low-cost airline inflight food by implementing the newsvendor model. The newsvendor model provides high forecast accuracy, and thus increases profitability and provides the airline with a steady source of revenue.

The data collected was based on the flights to and from Kuala Lumpur and Hong Kong. However, there are two (02) conditions. Firstly, Ratio A assumes that pre-booked meal and inflight sales fall under the same demand. However, Ratio B assumes that pre-booked meal and inflight sales are not under same demand. Figure 1 shows the newsvendor model equation using the average profit margin of the aviation company.

$$\frac{Cu}{Cu + Co}$$

Where

$$Cu = Profit\ margin\ \times\ Selling\ price$$

$$Co = Material\ cost = (1 - Profit\ margin)\ \times\ Selling\ Price$$

Therefore

$$\frac{Profit\ margin}{(1 - Profit\ margin) + profit\ margin} = Profit\ Margin$$

Figure 1: Newsvendor Model for Low-Cost Airline

Literature Review - Inventory Optimization

According to Vyskocil (2018), inventory optimization is an important element to keep a company competitive. A shortage in inventory will result in loss of opportunity and decrease in customer satisfaction. However, a bloated inventory can lead to high holding costs and may lead to obsolescence. Both scenarios are not an ideal situation and thus, there is a need to have a balanced inventory policy.

In addition to supply chain segmentation, Fichtinger et al (2019) state that an inventory policy is also vital in having an efficient supply chain model. Based on the results of the study, they found that an agile supply chain is better compared to the lean supply chain. This is because the agile supply chain is able to provide a better reaction to any change in demand and also reduces the need to hold any safety stock.

Methodology

In this study, the data was collected via interviews and Point of Sale (POS) System. Secondly, using segmentation, contributing a total of 80% from the total revenue, Class A were prioritized and their demand understood. Then, since Class A items were served as ala carte, other Class B and Class C SKUs that were strongly correlated with Class A were mapped using multivariate and multiple regression analysis. Next, the newsvendor model for daily SKU Forecast was used. Simultaneously, the cost of raw materials, preparation lead time, optimal purchasing frequency and period for stocking was calculated to form the inventory policy. Finally, a simulation was performed to assess the robustness of the forecasting model. Figure 2 shows an overview of the research process mentioned above.

Figure 2 - Research Methodology

Results - Segmentation (Pareto Analysis, Demand Distribution Analysis, Multivariate and Multiple Regression Analysis)

The pareto analysis indicates that 80% of the sales come from only a few SKUs. Out of the 11 SKUs, only 8 were chosen based on the criteria of the production lead time, quantity of safety stock and total cost to produce the SKU. The Class A SKUs are given the name of A1, A2, A3, A4, A5, A6, A7 and A8. The other three SKUs have short lead time and can easily be prepared. The Class B SKUs are given the name of B1 till B35 while the three (03) Class C SKUs are given the name C1, C2 and C3.

Demand Distribution Analysis shows seasonality assumptions is correct especially for the month Ramadan where sales and demand drops. The multivariate and multiple regression analysis determined B1 and B2 as the SKUs that are correlated with Class A. Thus, SKU B1 and SKU B2 is included in the Newsvendor Model.

Results – Newsvendor Model

From the findings in from Demand Distribution Analysis, there are some months where the demand is lower. The month that shows low demand notably in 2018 were during the Introductory Phase where the Café had only started operations and during Ramadan, MCO & CMCO months also saw a drop in demand. In order to analyze whether removing the low demand days will improve the model, two (02) Newsvendor model will be used. The first Newsvendor model (all days) will be based on the demand from all the days.

Description	A1	A2	A3	A4	A5	A6	A7	A8	B1	B5
Frequency	707	795	813	810	824	761	777	693	640	547
Minimum	1	1	1	1	1	1	1	1	1	1
Maximum	377	226	271	100	55	33	48	62	20	37
Variable (q)	142	44	32	36	16	9	7	30	5	4

Table 1: Result on the Newsvendor Model for All Days

The second Newsvendor model (high days) will be based on the days remaining after removing the demand from the low days.

Description	A1	A2	A3	A4	A5	A6	A7	A8	B1	B5
Frequency	634	610	750	643	450	471	480	602	506	419
Minimum	54	26	11	11	11	6	6	6	4	2
Maximum	377	226	271	100	55	33	48	62	20	37
Variable (q)	147	52	34	39	23	12	9	32	6	5

Table 2: Result on the Newsvendor Model for High Days

Overall, the results from the Newsvendor model (high days) shows an improvement in the amount of variables (q) to be produced compared to the results from the Newsvendor model (all days).

Results – Inventory Policy

An inventory policy is crucial to help manage the stock flow efficiently without compromising customer service level. It is also vital in ensuring the sustainability and profitability of the business. Keeping low inventory of raw material potentially could lead to stock outs, while keeping to much will require a higher capital.

One of the key elements is to understand the raw ingredients from the top producing SKUs. The major ingredients for the SKUs are mapped out. SKUs that have similar ingredients are combined together to further optimize the inventory policy via cost savings through consolidated purchasing and replenishment. In the case of Kedai Kopi, two (02) major ingredients across the SKUs are rice and chicken. They constitute over 50% of the inventory cost.

Ingredients	SKU Equivalent	Use Per Day (kg)	Inventory Policy
Rice	A1	24.6	Replenish in every 12th day with order of 300 kg to achieve a 5% discount from vendor and safety stock
	A3		
	A4		
	A5		
	A6		
	A7		
	B5		
¼ Chicken	A1	75.5	Replenish every day with order of 80 kg to achieve a 5% discount from vendor and safety stock
	A6		

Table 3: Inventory Policy

Based on the Newsvendor model variable (q) results, the amount of rice used on a daily basis is 24.6 kg; and ¼ chicken will require 75.5 kg daily. In order to achieve a discount from vendor, Kedai Kopi has to order 300 kg of rice and 80 kg for chicken. Therefore, the optimal inventory policy for rice is to order and replenish 300 kg every 12th day. For chicken, 80kg should be ordered and replenished every day. Both these measures ensure that Kedai Kopi receive the vendor's 5% discount and at the same time carry sufficient safety stock

Results – Simulation

Figure below shows the Total Profit Comparison between the existing setup and the proposed model. The graph reinforces the statement that the total profit for all the SKUs from the proposed model is higher than the existing setup. Thus, we can conclude that the newsvendor model would benefit Kedai Kopi in the future.
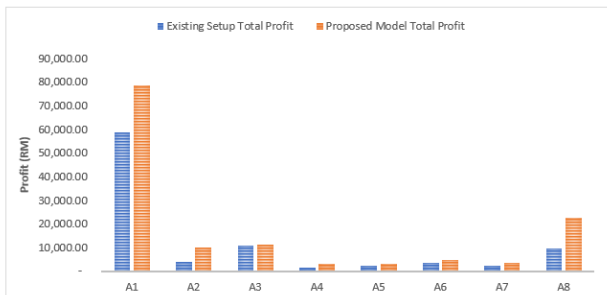

Figure 3: Total Profit Comparison

Conclusion

The research was aimed to provide the best solutions to optimize the current setup at Kedai Kopi by increasing revenue and profitability, and reduce shortage and wastages compared to the current model through the understanding of the SKUs segmentation class, demand variability and relationship between the SKUs. Next, a daily forecast by using Newsvendor Model and optimal policy based on the daily forecast was provided. The model was tested using a simulation and the results based on the research have shown a significant increase in profit, reduction in waste and stockouts.

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