**The Background and Goal**

Hello Mary, after reviewing the data sent to our department, it became clear that some restructuring and cleaning was needed. Based on the information you provided for us, we conducted analysis on trends between the different sales groups (Student, Staff, and Tourists) along with trends between flavors. Since the goal of this facility was to act as a lab for flavors (since retail stores were difficult to measure insights from), we primarily focused our analysis on what was selling, who was purchasing the product the most, and when these purchases were occurring. This information will offer overall insights into the retail industry with some specific trends to the store that can also help the store with improved stock management and insights into customer demographics for targeted promotions.

**Standard Assumptions**

For the purposes of this analysis, we assumed that for every date stated $0 in revenue is likely due to the Ice Cream shop being closed for the entirety of that day. When initially looking through the excel file, within the Happy Cow Daily Total sheet, most Sundays are closed. We also made the assumption based on the information available to us that these closed dates reflect the University’s limitations which were explicitly placed on store hours. We are also assuming that the majority of our sales will record student purchases as this store is on the campus of Hong Kong University. Additionally, we grouped certain flavors into categories according to what we believed to be regular, summer, and winter flavors.

**Limitations**

The project was handed to us over the course of a couple weeks, giving us limited time to clean, analyze, and present the data. The data is also recorded over the course of 6 months rather than the full fiscal year. Since only Spring/Summer seasons were recorded (April-September), attempting to analyze customer behavior and flavor trends becomes difficult considering the time that is absent from records (Fall/Winter). Lastly, the recorded data comes from a shop on a university campus, so the data is limited to the demographic within the area, which is primarily students

**Analysis**

According to our data, across all three recorded customers datasets, **the recorded amount for tubs purchased was $0.** Whether the lack of purchasing tubs is due to poor branding, the tubs being priced too high, or simply because customers aren’t there to purchase in large quantity is unclear. We want to better understand if this is due to branding as it would largely affect our overall sales in retail stores. Given the limited information, we looked into the quantity of double or triple scoop purchases in respect to single scoop purchases to get a better idea of whether people were willing to purchase larger quantities of ice cream. Since the recorded data for double or triple scoops is a negative number, as this number reflects the discount of purchasing a double instead of two single scoops, we can only roughly estimate how much was sold. **The total recorded revenue for double scoops is -$6,352 and -$15,172 for triple**. Sales recorded for the 6-month total to 273,857, so it is safe for us to assume that the **demographic within the area of the store is there for small quantity purchases**, which can mean that branding is likely not the issue with sales of tubs. For the store itself, investing in tubs that don’t sell not only takes up room on storage shelves, but these tubs that sit around too long are disposed of which drives up variable costs that can be otherwise avoided. **These tubs should be removed immediately going forward.**

*Side note: This assumption does not consider the convenience aspect of whether the customer wanted to carry a container (tub) of ice cream home after purchasing it from the ice cream shop.*

With our data, each flavor was recorded separately to match with a customer group (i.e. chocolate for students was labeled Choc St., Staff was labeled Choc Staff., etc.) For proper analysis, each flavor was grouped into categories to see which flavors were most popular.

According to the chart above, **Salted Caramel is the top seller** at this location with sales of approximately **$38,988** over the 6-month period. Flavors that follow include **Mango ($26,469), Chocolate ($24,769), Mint Chocolate ($22,963), Pure Coconut ($22,539),** and **Strawberry ($20,728)**. The overall **average revenue by flavor is $14,142**, so with each of these flavors being far above the average revenue per flavor, they should be marked as Regulars that do not rotate out during specific seasons. Additionally, **these six flavors should be in high stock all year round** (assuming they perform similarly in the Fall/Winter).

With these flavors in mind, we wanted to compare them to some of the other Regular Flavors that were referenced in the information provided along with some basic assumed regulars like Vanilla and Chocolate and placed their monthly revenue by flavor in the chart below.

Upon looking at the chart, we can see that **Salted Caramel, Mint Chocolate, Chocolate, and Strawberry are performing quite well** according to our former analysis. We do notice that **Salted Caramel took a small dip in sales, being just shy of $4k in the month of August**. When looking at some reasons this occurred, considering Salted Caramel is our best seller, we can notice upon reviewing the academic calendar for HKU (Hong Kong University) that students’ final weeks of their summer semester is during the first couple weeks of August. When looking at the flavor Vanilla Bean, it pales in comparison to many of the regular flavors. According to our data, **the average revenue by flavor per month is $2,357.** With vanilla, the flavor came short of 2,000 each month. Considering this the flavor can be repurposed and potentially promoted as a winter flavor given the nature of its name “vanilla bean”. This might reduce the wasted storage of a low selling regular flavor, and by promoting it as a limited time only, this might create higher demand which can result in a higher sales revenue for the flavor. **For the flavors in this chart (excluding vanilla bean), keeping inventory high is recommended**, especially for salted Caramel, as not having the supply to match these high demand flavors would result in a direct loss.

After analyzing the Regular flavors, we wanted to look at seasonal flavors that are performing well along with those that could be consuming storage space where they otherwise could be removed entirely. To do this, we created a bar chart displaying the monthly revenue for each assumed summer flavor.

The data visualized above shows us that both Mango and Pure Coconut are much higher than other flavors before and during the summer. Even despite Pure Coconut taking a small dip during the hottest summer months, the sales are still consistently higher than the others along with remaining above our average revenue by flavor per month. For flavors like Lime Coconut, Pina Colada, Cherry Almond, and Apricot, the monthly sales dip too low to justify keeping them in stock for the entirety of these six months. With these flavors, according to the data within the chart**, Apricot should be promoted/limited to the month of June, a new or existing flavor outside of this table should be promoted and limited to the month of July, Pina Colada should be promoted/limited to the month of August, and Cherry Almond should begin selling in September.** By limiting these flavors to these summer months where flavor revenue trends higher, it will allow for an even higher demand for that summer flavor, potentially boosting sales. **With Cherry Almond, the flavor dips in the summer but looks to be consistently trending upwards**, so further analysis of how this flavor behaves in the Fall/Winter might help with promotional/limitation ideas. For Mango and Pure Coconut, the company as mentioned before should add them to their regulars, keeping high stock during the summer while excluding them from seasonal rotation.

After looking at the Summer Flavors, we wanted to apply the same ideas to flavors we assumed would be better to sell during the wintertime, that is, low in sales for the summer. Below is the chart containing these assumed winter flavors.

When reviewing these winter flavors, it appears that the tea flavors sell much more than expected during warmer months with sales consistently exceeding averages, with the month of May containing lower sales. One method to control these sales would be to **alternate between the tea flavors every month during warmer months**. Since sales with Chai are higher than **Green Tea in the months April, June, and August**, the flavor would be in store for those months**. Sales for Green Tea are higher than Chai during May, July, and September**, so promoting and limiting the Tea flavors to just Green Tea during those months could provide boosted sales to that flavor. It is important to add that both recorded tea flavors spike in September, but this of course makes sense due to colder temperatures appearing during that time period.

Looking at other flavors in this chart, **Banana Caramel and Hazelnut both have high recorded months outside of the summer**, but for the months May-August, these flavors don’t perform as well as they do during the end of spring and beginning of Fall. This lines up with some of the information Mary provided us with in regard to the seasonality of these flavors. With Sales typically ranging our $2,000 **for Banana Caramel, it is worthwhile to keep this option within the store during summertime, but probably not worth investing promotions into during this time**, as we can assume from the trend that sales during winter seasons increase for this flavor. For Coffee, we see a similar trend of sales increasing in the month of September, so we can expect this flavor to be more popular during the Fall/Winter season, but considering the extremely low revenue for the first two months recorded, **Coffee is not worth putting on shelf until June**. Lastly, we have the flavors that should be considered for removal from the store for these 6 months recorded due to low return on investment (revenue is low). **The flavors that should be removed beginning from April until September include Giger, YY Seasame, and Red Bean.** Despite Red Bean being popular in the month of June, the flavor performs poorly in the other recorded months. These flavors might do better during the winter months, which can also allow for more focus to be on the higher performing summer flavors, but **the flavors should not be readded until September as the earliest time.**

Most of the prior analyses can be used for both in-store and retail improvements, improving flavor promotions, stock insights, and overall revenue. For the following chart and analysis, this recommendation will be primarily focused on the store demographics. Below is a chart visualizing the weekly revenue recorded over the last 6 months for each customer group.

Looking at trends in the data, right away we can see that sales for students start decreasing near the end of April and don’t pick back up until September. For this time, according to the academic calendar for HKU, students are out of school (unless attending the optional summer semester), and thus likely away from campus. Considering this shop operates on campus, this is likely the leading factor as to why revenue for students takes a huge dip in sales. Since we know that the students’ favorites are in fact the most popular flavors like Salted Caramel, Mango, Mint Choco etc., we can offer promotions around these flavors during the summertime months to draw in university students who might still be in the area during summer break to increase revenue during those months.

**Staff revenue appears to be much higher for the Month of June and July.** This is likely due to the nature of the HKU calendar, where the semester ends during the final week of May, and **the optional summer semester begins during the 4th week of July, which is when we see staff sales reach peak performance**. After the 4th week of July, sales begin to decline. During this time between semesters, it seems like the staff frequent the store with the end of July being the highest and most consistent sales throughout the recorded 6-monthmperiod. **Offering targeted discounts and promotions on some of the staff’s favorite flavors could incentivize higher revenue for these already active months.** These flavors are in fact in the same order as the highest selling flavors within the “Total Revenue By Flavor” chart. So, **during the months of June and July, high-selling flavors like Salted Caramel or Mango should be advertised, offered specific promotions for staff, and stocked heavily** to meet the demand of these staff purchases, especially for the final week of July.

**Conclusion**

When reviewing the entirety of this document, the business now has plenty of actionable insights backed by our 6 months of recorded data. Considering that this data was limited to end of Spring through Summer, and even spanning slightly into the fall, **there is much relevant flavor data that is still missing**. I want to emphasize that the **data here can be implemented for efficiency purposes across both the retail industry and the ice cream shop** itself, but I do believe that **the company should continue to collect the missing 6 months of data before implementing any major changes across the retail industry**. **Once the data amounting to a full year is collected, the company should reconduct analyses to improve the accuracy of any insights previously recommended from this document and then implement major changes based on the findings from those analyses**. This is only the case if the company can afford to wait until the full year is recorded, as it can gain a better understanding of retail specific recommendations for flavor offerings in stores. If the business needs to change now, then these insights can be used to enhance the probability of success but are not perfect and therefore **we cannot guarantee with 100% certainty that they will work.** Nonetheless, **the visuals and data are accurate** and can give the business a better understanding of **how to manage inventory in store, what flavors to focus on during which months and which customers to target down to the specific week** if needed. We hope these recommendations are what you are looking for and are excited to hear back from you!