[redacted]

A. Simulation Report

Executive summary

After four rounds of simulation, our financial performance in 2022 are as follow:

1. Final market share: 21.3% (from 11% in 2018)
2. Cumulative profit: $314.6M (from $75.4 in 2018)
3. Cumulative revenue: $2040.7M (from $779.9 in 2018)

To understand how we achieved this, let's take a few steps back…

At the start of the simulation, Blue barely has innovative breakthroughs, particularly in terms of the 4Ps. Firstly, for product and place, Blue used to produce all types of formulations, distribute in all types of stores and was perceived as a traditional brand until 2018. Secondly, for price and promotion, the unit price was always $7 and the brand was advertised through all different promotion channels (TV, Radio, Digital ads, Print). This indicates that Blue lacked an accurate segmentation and a clear positioning. It has done a little bit of everything. On the other hand, Blue's biggest competitor, Turbo, established as a pioneer of new formulation and a premium brand. Likewise, Fresh and Store set up the millennial and price centric brand image, respectively.

Therefore, our initial goal was to define a clear positioning for Blue, combining with the objective to become the leading laundry detergent brand by being disruptive and innovative. It was time for a fresh start: we wanted to become a top quality detergent at an affordable price.

Accordingly, we divided our strategy into three steps. Firstly, we analyzed the competitive landscape and confirmed our target segment. Throughout four years' decision-making, we maintained the same formulation and product features, which are pods and odor elimination respectively, as they continue to generate the highest demand in the whole detergent market. Moreover, we fix our target segment on big households (4 people and above are the largest quantity in households population), regions except northeast (as Turbo dominates almost 73% of northeastern market), and aged below 44 (in alignment with pods' primary customer segments). Secondly, we constantly monitor our target segment and adjust plans based on their preference as well as competitors' reactions, such as investing heavily on digital channels in media spend and reducing the unit price gradually lower than $7. Thirdly, we always closely observed outcomes and iterated until achieving our goals by using data-driven measures. For example, running a regression model and utilizing demand forecast tools.

There were fluctuations in four years of our financial performance. We experienced a continuous increase in market share, revenue, and profit in Round 1 and 2. We faced a slight drop in Round 3 triggered by a price reduction from Turbo and Store since the market is very price sensitive, and finally rebounded in Round 4 as we reacted fast to the market changes and consistently aligned our strategies to our target segmentation.

Decision 1 – 2019

Observations

Blue has been "stuck in the middle" for four years among the four brands' financial performance. Firstly, Blue's market share was the lowest at 11.0% in 2018, which only increased by 2.1% from 2015. Secondly, it's revenue ranked third place, with around 47 million dollars during the 4-year period. Thirdly, Blue's operating profit was also ranked third in 2018 [Appendix 1].

The laundry detergent market is price-sensitive regardless of the market's income (leading price point demand <$5 for any income segment) [Appendix 2]. We can't charge a high price but we must deliver quality and a stronger brand. To target our chosen segment we adapted our marketing mix (price, promotion, product formulation and feature, and trade channels) to meet their needs.

We have chosen to target customers under the age of 44, in households of over four people, in all regions barring the Northeast. We decided upon this target segment as Blue already holds a 31.1% market share in this segment which is a close second to Turbo with 34.6%. Furthermore, Blue's sales and operating profit have been consistently growing within this segment over the past four years, suggesting that this is a growing market that can be taken advantage of. By targeting this segment with our strategic decisions regarding formulation, price and product feature, we aim to overtake Turbo in market share for this segment and get closer in terms of revenue and operating profit. [Appendix 1]

Actions

We opted for pods as our formulation as they are not only the most highly demanded formulation for our target segment but also overall, with almost 20% higher demand than liquid and 40% higher demand than powder [Appendix 3]. Pods are also considered as the most modern and trendy formulation, being especially popular with our younger target segment. Similarly with our chosen product feature, odor elimination, which is also the most highly demanded feature among our target segment [Appendix 4].

We decided to maintain our current price of $7 as this allows Blue to be the budget option for consumers wanting pods, as Turbo and Fresh both have higher prices at $10 and $8 respectively [Appendix 5]. This also allows Blue to benefit from a higher demand within our target segment. As seen from the price point demand, the $5-$7 range has maintained a demand of around 14Million units over the past four years. This is compared with 7.5Million and 5Million units for the $7-$9 and $9+ ranges respectively.

We have chosen to dedicate the largest proportion of our media budget (36%) to digital ads as this is the most consumed media of our target segment. This is followed by radio and TV at 25% each as we do not want to alienate our current customers who view Blue as a traditional brand. Least investment will go into print media (14%) as this is by far the least consumed media among our target segment [Appendix 6].

Results

The change of Blue's strategy was successful. We achieved our short-term objective to grow Blue's market share in the 1st round. Blue started to shift from an unexciting brand to a new-fashioned one that surprised the market, reaching 14.5% of market share. Blue also increased its operating profit by $67M in 2019, while all competitors saw a large decrease. Our pricing strategy brought in healthy profit margins when offering more costly products (pods).

Blue's improvement was also due to the delayed response of competitors in the market. All competitors kept their price the same in 2019, losing competitiveness when Blue changed its strategy to also supply premium products but with lower price. However, we underestimated our successful turnaround and produced 42M units while demand was 48M units.

Overall, Blue outperformed Fresh and dominated our target segment in 2019. We believe that investing more in digital ads, convenience and club as distribution and media channels partially explains how we reached our new target segment. After changing our strategy and targeting a new segment, our customers reacted very strongly on social media, 35% negatively and only 15% positively [Appendix 7].

Blue made its first step towards becoming an attractive brand that sells innovative detergent at a competitive price, achieving higher demand, revenue and market share. However, the transition could have been smoother as a rough change resulted in negative customer sentiment on social media. We should have produced more units in order to prevent the supply shortage.

Decision 2 – 2020

Observations
Results from 2019 were a success. We managed to increase revenue, profit, and market share. Therefore, we decided to continue along with our strategy- supply top products at an affordable price.

Actions
In 2020, we aimed to reinforce our value proposition and nurture the relationship with our current segment, so we continued with Pods (formula demand is highest and shows constant growth in all segments) and the product feature of Odor Elimination (highest demand and constant growth in the target segment). [Appendix 3&4]

With this segmentation strategy, profit has increased by 78.6% in 2019 (from $37.8M to $67.5M). In 2020, however, our objective was to increase revenue and market share as the growth in 2019 was relatively minimal (3.5% growth in market share and 30% growth in revenue). In the long term, we wanted to surpass Turbo (the current leader) in terms of market share, revenue, and profit.

The data has suggested the detergent market is very price sensitive. As seen from Appendix 8, when a brand increases price, demand falls significantly. Therefore, with strong price elasticity, we lowered price from $7 to $6.5 to boost demand and grow market share. We only decreased to $6.5 because we did not want a huge impact on our profit since producing pods would incur +15% in variable cost. We concluded that it was best to observe the market given that it would be our first time adjusting the price.

Additionally, we decided to add the Northeast to our target segment as it has shown to have relatively high unit demand per household, giving us more potential customers [Appendix 9]. At the time, Northeast was dominated by Turbo. We aimed to acquire some Turbo customers as many of them are in our target segment (young individuals), which was another reason why we reduced the price- to create a switching incentive for current Turbo consumers due to our offering of high-quality products at a valued price.

With the price reduction, we recalculated the demand based on price factor and prior demand growth. We hope to increase our market share to 19% (+4.5% increase which as we expected a higher exponential % growth factor in 2020). Given that, we ran a regression model which gave us a result of 62M units (Appendix 10) and planned to supply +20% more units based on the demand forecast tools to make sure we can serve our demand with a lower price. In 2019, we were under a supply shortage hence we chose to go a little bit more than our forecast demand. We therefore produced 75M units.

Our budget allocation for media was based on the habits of our target consumers. Although print has the highest consumption among the total population, we decided to continue to invest more in digital ads since our target is individuals under 44 years old. The data has shown that among our target segment, Digital Ads received the highest share of consumption and lowest on print, hence our media strategy.

In terms of trade channels, the distributions were also based on the target customers. Regardless of that, the data illustrates the same trend across the wide range of consumers with the highest demand on convenience, club, mass, and grocery, respectively.

Results

Results in 2020 are positive, yet with less incremental increase than in 2019. Since we continued to focus on our core strategy, we have witnessed an increase in our operating profit by 3% (from 8% YOY), revenue by 11.4% (from 30%), and market share by 2.5% (from 3.5%) [Appendix 1]. Our social media performance has improved with strong positive comments, confirming we've pursued the right strategy [Appendix 11]. Demand, however, was not as high as we expected where we sold only 50M units, and we were left with 25M units in inventory. We concluded that dropping price was the correct move, only that we have underestimated the move of our competitors. Price reduction from Turbo(from $10 to $9) and Store(from $6 to $5.25) softened our demand, instead rising for these two competitors. 9M additional units were sold for Turbo and another 10M units for Store in 2020. Fresh, on the contrary, increased their price and therefore their demand declined even further (by 19M units in 2020). Another factor for this overestimated demand was that we didn't have enough data points to run the regression. Decisions were made on a limited amount of data. Moreover, the model appeared to be non-linear due to various underlying factors such as competitor strategy, advertising, social media reviews, resulting in diminishing returns and non-constant growth.

Decision 3 – 2021

Observations

Round 2 was also a successful round for Blue. The growth across the three KPI metrics suggests that the actions taken in round 2 were positive and that we acted well in comparison to our competitors.

A key development in round 2 was the decision of Fresh to raise their price by 50c to $8.50. This turned out to be a poor decision by them considering every competitor lowered price and thus resulted in a loss of market share (-7.2%), significant decrease in revenue (-$128M), and operating profit (-$75.3M). It reinforced our awareness of the price sensitivity in this market, and how lower cost players (Blue and Store) can steal market share and sales from the more premium products (Turbo and Fresh), by reducing their price. We were wary however, of reducing price too far, as despite Store holding and gaining a greater market share than Blue in round 2, and making an increase in their revenue (+$17.4M), they were still operating at a loss and this loss in fact increased by around $700k.

Actions

Taking on board our observations from round 2, we decided to maintain Blue's price of $6.50. Our rationale for this was the fact that two of our three competitors lowered their price at the same time, suggesting to us that they can react quickly to market changes. This, in combination with our examination of Store's strategy of further reducing an already low price and the fact that they were still operating at a loss despite gaining market share and increasing revenue, informed our decision to maintain Blue's price as we were already operating at a mid-to-low price-point.

In the previous round, we overproduced by 25M units and hence needed to account for this in our units produced in round 3. Using the forecast demand tool, along with some basic linear regressions using the limited data available, we predicted a demand of 55M units and therefore produced 35M units [Appendix 12]. This provided a margin of 5M over the forecast as we did not want to miss any sales in the case that we underestimated our demand.

We decided to raise Blue's presence in convenience stores by 5% (up to 35%), making it our most prominent trade channel. To do this, we reduced the investment into grocery stores from 20% to 15%. This closely aligned Blue with our target segment which predominantly use convenience (27%) and club (27%) stores. This also allowed us to invest more in the channels most important to Blue while conceding somewhat the channels that were dominated by competitors.

In conjunction with this change to meet our target segment's needs more closely, we adapted our media strategy. We raised investment into digital ads from 36% to 45%. This was due to digital ads being by far the most consumed media of our target segment and in reaction to the positive feedback received on social media about Blue's marketing and product after round 2. To complement this move and to somewhat reduce the risk of investing so heavily into digital ads, we opted to raise our investment into print media from 17% to 25% and reduced TV and radio investment by 3% and 6% respectively. The rationale behind this was that print was still the most consumed in the overall market, and this would offset any potential risks of investing so heavily into digital ads.

We maintained the same product formulation (pods) and feature (odour elimination) as these remained the most demanded by our target segment.

Results

Round 3 was Blue's least successful year. Blue reported a decrease in operating profit of $30M, a 43% decrease. This compares to Turbo and Fresh which both recorded decreases in profit of $57M and $45M respectively with Store making the only gain in profit of $4M. This gain, however, still leaves Store operating at a loss of $1.3M. These results are also reflected in the revenue as Blue, Turbo and Fresh all reported a decrease of $39.1M, $50M and $76M respectively with Store increasing revenue by $35M. Market share also mainly follows this pattern with Blue and Fresh losing 2.1% and 3.9% respectively while Turbo maintained with a gain of 0.02% and Store gained 5.8%.

Following on from our discoveries in the previous round regarding the price sensitivity of the market, we can explain these results by looking at the respective changes in price by Blue's competitors. Turbo reduced their price by 50c to $8.50 while Store lowered their price by a further 75c to $4.50, thereby giving them the most successful year in terms of market share growth. This is also seen with the changes in unit sales, with Turbo raising sales by 2M units and Store by a significant 18M units. This is mirrored by Fresh's decision to raise price by 50c to $9 which led to their very unsuccessful year in which they lost a portion of market share, reported a significant decrease in revenue and profit, and reported a first net loss of $26.4M for the year. With Blue being the only player to maintain the same price, they fell victim to Store's growth, considering they are the closest competitor in terms of their price point.

These results show that the decision to maintain price after starting a price war was flawed and that we did not anticipate a continued price war or that Store, Blue's closest competitor, would continue to reduce price. The results suggest that despite Turbo reducing their price, they also fell victim to Store's growth as they were unable to generate enough demand through their price reduction to compensate for their smaller margin, hence the $57M decrease in profit.

It is difficult to assess the extent to which the changes in Blue's media or trade channel strategy contributed to or limited the damage of round 3 to Blue as the data for the competitors is unavailable. However, in reflection, increasing investment into print media strayed from the strategy of trying to cater as much as possible to our target segment, which consumes print media the least.

In 2021, we were left with 15.5M units of inventory, meaning that Blue sold 44.2M units in total which was around 10M shy of our forecasted demand of 55M. This inaccuracy likely due to the failure to anticipate competitors reducing price and therefore Blue's demand being lower.

[redacted]

Decision 4 -2022

Observations

Despite producing fewer units in round 3 to reduce our inventory, demand (around 44 million units) still left us with some; therefore in round 4, Blue needed to further lower the amount of inventory (over 15 million units) and sell as much as possible. To achieve the turnaround in 2022, we reevaluated pricing strategy as well as media budget and trade channel distribution.

Actions

In this round we were able to take advantage of relatively ample data from 2015 to 2021, so we developed a simple linear model to help us choose the ideal price for this round. For the specific explanation, see the formula below.

$$Demand_i = \beta_0 + \beta_1 Stgy_i + \beta_2 BlueP_i + \beta_3 TurboP_i + \beta_4 StoreP_i + \beta_5 FreshP_i$$

Demand: demand of Blue's product in million units
Stgy: if marketing strategies change (formulation & attribute), =1; if not, =0
BlueP: Blue's price ($US) in each year **TurboP**: Turbo's price ($US) in each year
StoreP: Store's price ($US) in each year **FreshP**: Fresh's price ($US) in each year

Based on our low price strategy and assumption that competitors cannot afford more decrease in their prices, we decided to lower price to $5.50 and assumed our competitors will keep the same prices; therefore estimated demand in 2022 would be 63.15 million units [Appendix 13]. In case of low price impact, we believed the total demand would reach 70 million units. As we had about 15 million units inventory, we finally decided to produce 55 million units.

Our target segmentation remained the same.We kept the same formulation and product attributes to maintain brand consistency because pod and odor elimination were still the most demanded features in our target market. And social media sentiment in the last round indicated positively about our selected formulation and odor elimination as well.

We raised the investment in Club and made both Convenience and Club account for 35% budget respectively because they were the most popular sectors among all trade channels. Besides, we distributed a 20% budget to Mass and only left 10% for Grocery as they were not highly utilized in our target segmentation.

The increase in print ads budget in 2021 turned out to be ineffective. Print was not consistent with target segment media consumption, making less contribution to our brand strategy. Therefore, in round 4, we decided to cut off print share (from 25% to 12%) and ensure digital ads still shared the largest proportion (44%) in our target segmentation. Moreover, our target customers' preference also indicated radio and TV cannot be ignored [Appendix 6], so we raise both radio (14% in round 3) and TV (16% in round 3) to 22% to make sure we can reach more customers in the final round.

Results

Blue's performance in 2022 reached our expectations. On profit, Blue generated $63M profits, beating Turbo ($38M) and won first place. Meanwhile, Blue's revenue was $353M and ranked the second among four brands. Further, Blue had accounted for 21.3% of total market share, almost doubling the share in 2018. In our target segment, Blue dominated 46.7% market share in 2022, far ahead of our competitors.

Based on our observations in the last few rounds, we are certain that demand in the detergent market was price-sensitive and competitors often reacted quickly to our pricing strategy. In round 1, we kept Blue's price at $7, so other three brands maintained their previous prices as well. In round 2, we decreased price to $6.5; therefore Turbo decreased its price from $10 to $9 and Store also lowered price from $6 to $5.25 as a countermeasure against Blue's low price policy. However, competitors strategies seemed to have a carryout effect in the following year. Although we stopped dropping price in round 3, Turbo and Store still decreased their prices to $8.5 and $4.5 respectively, making a heavy impact on our sales which dropped around 6 million units in 2021. Considering we did not change price from 2020 to 2021 and competitors may not be willing to sell at much lower prices, we then assumed they would not make dramatic changes about prices and that was a fundamental assumption used in linear regression. The fact was that Turbo slightly increased its price to $9 while Fresh and Store remained the same price ($9 and $4.5) from 2021 to 2022. Therefore Blue's high quality product at low price ($5.5) was even more attractive in the whole market, effectively raising our sales from 44 million units to 64 million units. According to the specific reviews on prices through all four rounds, we could say our decision for 2022 was correct and success in the last round was achieved based on our recognition of price-sensitive competition and price-related data analysis.

Conclusion and recommendation

We now have sufficient evidence to say that Blue has made a successful strategy. Blue has increased both profits and revenue through four rounds and also dominated more market share because of our innovative strategies and effective responses to market change. By using modern formulation and introducing popular features into our products, we have gained more customers and generated more profits. Blue's distribution of both media and trade channel budgets also reflects our consistent focus on selected target segmentation.

Recommendation 1: Focus on target segment by observing segmented data.
In order to improve Blue's data based decision making, we believe continuing to focus on a data-based, target segment is essential. Focusing on our target customer would allow us to progressively capture nearly the total portion of a specific market segment and thus enhance our market share.

For example, in 2018 we realised that younger and bigger households would be keen on the development of our new quality and reasonably priced product (using data explorer). However, in 2020, we got trapped in the "mass opinion" and changed our media channel strategy. This decision resulted in lowering our revenues. From this mistake we understood how crucial it is to be focused on our target customers as "they" are our buyers at the end of the day. Targeting the mass market results in wrongly allocated budgets and may be complicated to overcome.

Since then, we were more focused than ever on our target market, however, we realised we needed more information about both our customers and our competitors to conduct a stronger strategy. We would need to know more about the production levels of our competitors, the social media sentiment of our competitors, the states where competition was the strongest, the attributes of competing brands, the reasons behind the attribute preferences, the specific effect of our change in media channels. Moreover, we have achieved high operating profits and revenue but our market share remains slightly above average. We believe that more information and a stronger focus on our target would allow us to capture their whole share (improving thus our market share).

Recommendation 2: Make quick responses to the market change by constantly reviewing and analysing data.

We recommend that Blue get more immediate access to their own marketing mix and sales data and data regarding the detergent market to analyse and respond rapidly to the market change.

We noticed that when we started to shift Blue's strategy in 2019, all the competitors kept their market positioning without noticing the threat of our brand. Blue hence achieved the highest brand demand growth rate (49.5%) in the entire four decision rounds. We consider the immediacy of market data as one of the key factors for success. That is to say, the marketing data should be analysed on a monthly basis or even more frequently so that marketers can spot the changes of the market, learn from competitors and make adjustments in time.

Blue should also monitor the data of its own, including financial performances and social performances more often. Given that the brand frequently launches new marketing campaigns and changes its price and production, it is necessary for Blue to review related data whenever necessary to ensure that the brand is on the right track and is making continuous improvement.

Recommendation 3: Use different analytical methods to make better decisions.

Different methodologies should be applied to conduct data analysis and a variety of data analysis tools can offer multiple options to make the most suitable decisions in different stages. In the simulation, we did suffer from data insufficiency; however, in reality, the company needs to collect as much valid data as possible and take advantage of it.

In the long term, we recommend that Blue keeps improving its analytics department in three ways. First, although the simulation system only provides limited variables, the reality can be more complex. Other useful variables such as customer's education degree and media platform preference can be added to Blue's database. Second, based on data sufficiency, Blue can apply various models such as decision tree and discriminant analysis to help acquire better recognition of the changing market. Some cutting edge machine learning methods are also helpful; for example, Back Propagation Neural Network can be applied to analyze customer behaviour. Third, it is also necessary to evaluate Blue's competitors' actions in the future. Therefore, we can then further introduce some game theory models to optimize our pricing strategy. It is recommended that Blue run a series of different models for more effective decision making. Although machine learning provides better predictive accuracy, statistical modelling can provide better explanations in terms of the understanding of marketing mix models. In this simulation, we ran the model based largely on price due to its strong impact on demand. However, in reality, other marketing tools like advertising do have a lot of sales contributions. We advise Blue to run elasticity analysis of advertising elements as well as the impact of different media channels to understand better how to allocate its budgets.

To sum up, this simulation was crucial in understanding the importance of data to target potential customers and thus roll up a strategy. It also emphasises on the fact that data is an uncontestable lever of market share, profit and revenue. We have achieved in 2022 to Bring blue to nearly the highest cumulative operating profit (314,6M $) and cumulative revenue (2,041M $). To improve our positioning we would suggest focusing even more on the target customer and having more information available, responding quicker to market changes and using different methodologies to analyse data.

[redacted]

Decision outcome summary

The Shift - From “stuck in the middle” to turning the market arround

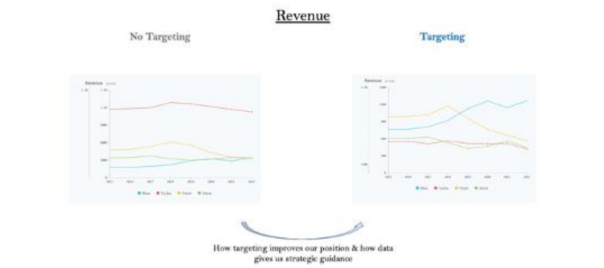
	2018 - STATUS QUO	2019 - DECISION 1	2020 - DECISION 2	2021 - DECISION 3	2022 - DECISION 4
	32M	41,9M	75M	35M	55M
	Powder	Pods	Pods	Pods	Pods
	7€	7€	6,5€	6,5€	5,5€
	Cold Water	Odor Elimination	Odor Elimination	Odor Elimination	Odor Elimination
	All	Club & Convenience Mass & Grocery	Club & Convenience Mass & Grocery	Convenience Grocery	Convenience Grocery
	All	Digital ads Print	Digital ads Print	Digital ads Radio	Digital ads Print
	Revenue 225,3M MS 11% Profit 37,8M	Revenue 293,3M MS 14,5% Profit 67,5M	Revenue 326,8M MS 16,9% Profit 69,5M	Revenue 287,7M MS 14,8% Profit 39,2M	Revenue 353M MS 21,3% Profit 63M

<u>Appendix</u>

Appendix 1

***No targeting = no filter

Targeting = apply our segmentation filter



[redacted]

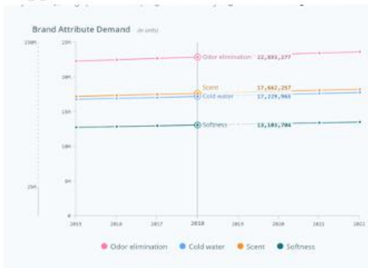
Revenue (in US$)				
Year	**Turbo**	**Fresh**	**Store**	**Blue**
2015	1,175,444,712	482,627,256	342,874,610	178,246,859
2016	1,185,222,060	486,641,752	345,726,640	179,729,515
2017	1,199,667,730	532,914,928	375,226,420	196,743,568
2018	1,289,049,770	614,056,904	325,783,866	225,282,694
2019	1,266,338,940	558,112,816	300,260,874	293,300,000
2020	1,221,161,724	429,779,108	317,610,269	326,812,610
2021	1,169,682,272	353,677,419	352,455,809	287,708,824
2022	1,130,393,610	339,864,957	334,967,139	353,020,580

Profitability (in US$)				
Year	**Turbo**	**Fresh**	**Store**	**Blue**
2015	114,549,550	66,208,535	21,342,387	7,772,801
2016	121,882,561	69,018,682	23,338,808	9,110,661
2017	162,708,507	101,409,906	43,988,654	20,720,498
2018	231,979,588	158,209,289	25,668,060	37,797,886
2019	171,693,754	93,939,899	-4,733,968	67,511,499
2020	103,043,743	18,596,759	-5,417,232	69,489,155
2021	46,583,241	-26,414,201	-1,322,092	39,213,934
2022	38,371,461	-35,990,841	-12,106,772	63,012,452

Appendix 2

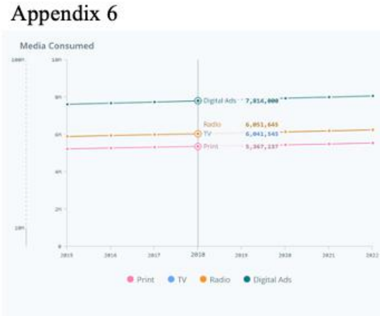
Appendix 3

Appendix 4

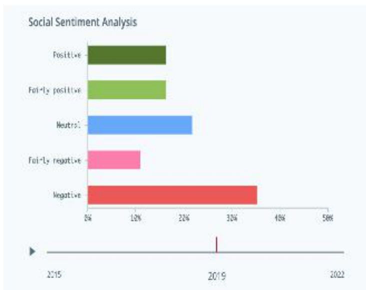


Appendix 5

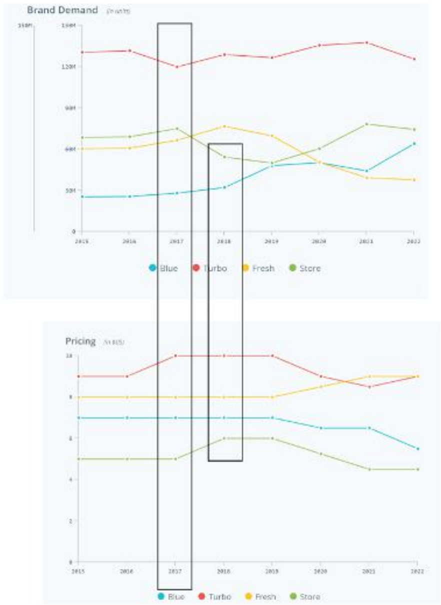
Appendix 6



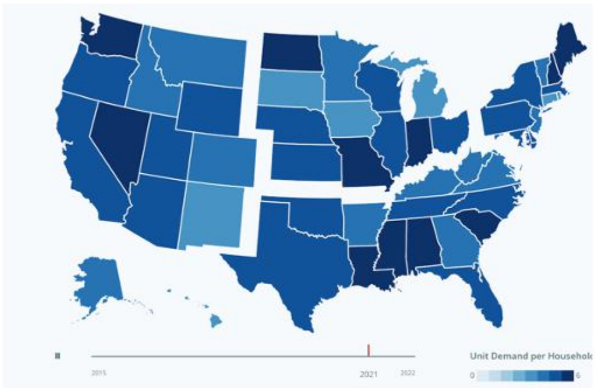
Appendix 7



Appendix 8



Appendix 9



Appendix 10

$$Demand_t = \beta_0 + \beta_1 * Period_t + \beta_2 * Stgy + \beta_3 * MktShare_t$$

Demand: demand of Blue's product in million units

Period: period of time from 1 to 5 representing 2015 to 2019

Stgy: if marketing strategies change, =1; if not, =0

MktShare: Blue's market share (%) in each period

By using previous data, we can run the regression and get the intercept and coefficients for each variables.

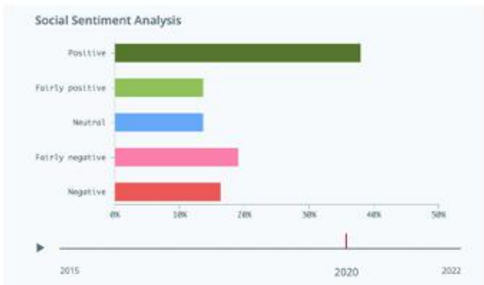
Intercept	β(Period)	β(Stgy)	β(Mktshare)
-1.0962998	0.1539461	5.4251874	2.9676815

We can then predict the demand value in 2020 as we also expect the market share in 2020 will be 19%.

Year	Demand	Period	Stgy	MktShare
2015	25.4600	1	0	8.90
2016	25.6600	2	0	8.90
2017	28.1100	3	0	9.70
2018	32.1800	4	0	11.00
2019	48.1300	5	1	14.50
2020	61.6385	6	1	19.0

According to the table above, 61.6385 million units may be Blue's demand in 2020.

Appendix 11



[redacted]

Appendix 12

Demand: demand of Blue's product in million units
Stgy: if marketing strategies change, =1; if not, =0
BlueP: Blue's price ($US) in each year
TurboP: Turbo's price ($US) in each year
StoreP: Store's price ($US) in each year

By using previous data, we can run the regression and get the intercept and coefficients for each variable.

	Estimate	P-value
Intercept ( )	90.7950	0.02057 *
Stgy ( )	15.9500	0.00798 **
BlueP ( )	-15.5050	0.02052 *
TurboP ( )	2.5500	0.04318 *
StoreP ( )	4.0700	0.03126 *
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1		

For example, if Blue's price in 2021 is $6.00 while Turbo decreases its price to $8.00 and Store's price is $5.00, then the expected demand of Blue will be **54.465** million units.

Appendix 13

Results of linear regression in R are shown in the table below.

	Coefficient	P-value
Intercept	141.5700	0.03721 *
Stgy	15.9500	0.00798 **
BlueP	-18.8900	0.02406 *
TurboP	2.5500	0.04318 *
StoreP	4.0700	0.03126 *
FreshP	-3.3850	0.08765 .
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1		
Residual standard error: 0.1414 on 1 degrees of freedom		
Multiple R-squared: 1, Adjusted R-squared: 0.9998		
F-statistic: 7135 on 5 and 1 DF, p-value: 0.008988		

$$Demand_i = 141.57 + 15.95 * Stgy_i - 18.89 * BlueP_i + 2.55 * TurboP_i + 4.07 * StoreP_i - 3.385 * FreshP_i$$

Estimations of demand in 2022 are shown in the table below.

Year	Demand	Fitted Value	Stgy	BlueP	TurboP	StoreP	FreshP
2015	25.46	25.56	0	7.00	9.00	5.00	8.00
2016	25.66	25.56	0	7.00	9.00	5.00	8.00
2017	28.11	28.11	0	7.00	10.00	5.00	8.00
2018	32.18	32.18	0	7.00	10.00	6.00	8.00
2019	48.13	48.13	1	7.00	10.00	6.00	8.00
2020	50.28	50.28	1	6.50	9.00	5.25	8.50
2021	44.26	44.26	1	6.50	8.50	4.50	9.00
2022	64.19	63.15	1	5.50	8.50	4.50	9.00