SHOPPERS CLUB

# A SCALABLE RATING SYSTEM FOR VARIOUS USE CASES VPU

By Adjmal Dreepaul, XTM

## STRENGTH IN NUMBERS!

***Adjmal Dreepaul**, XTM*

# SHOPPERS CLUB

A SCALABLE RATING SYSTEM
FOR VARIOUS USE CASES

# TABLE OF CONTENTS

# A SCALABLE RATING SYSTEM FOR VARIOUS USE CASES

*By **Adjmal Dreepaul**, XTM*

This document describes the process of a gamified rating system for use in determining consumer honesty and engagement. Although this system focuses predominantly on the retail consumer products industry, several other embodiments of the same process may apply to other industries.

For this paper, we have applied this process to the Shoppers Club venture by Ducorp.

## (1) PROBLEM ANALYSIS

There exists a large number of small stores that are finding it hard to compete with big superstores. These stores do not sell domestic products (e.g., tissue paper, cleaning, and laundry detergents, and the like), and if they do, it is so over-priced that the better choice is to buy at supermarkets.

Large stores offer choice, cheaper pricing as they benefit from better rates due to bulk buying. The business model of retail stores relies on their ability to keep the attention of shoppers and repeat engagement. They are in the business of attention that is commoditized as leverage to demand benefits from manufacturers and wholesalers.

One of the disadvantages of the large superstores is that it may be far for people without transportation in low-income economies. It adds additional time and cost to people's already busy lives.

Another is that they absorb their significant infrastructure cost (people, IT systems, transport, real estate, advertising, loyalty program) into their unit cost of the product they sell. They also regularly require payment of advertising from manufacturers that place their products with them, which then tends to drive the unit cost of a product to the end consumer.

Conversely, the problem of the small stores is that while they have probably closer to small communities, they can't compete on the economies of scale and have less reach.

In conclusion, the supermarket's business model is, therefore, to grab the maximum amount of consumer attention towards itself so that more people buy from them, which increases their demand and subsequently provide better wholesale prices.

In this case, there are only three options left to the consumers:

(A) Buy the products at local stores, but at high prices and limited choice;
(B) Trade travel time for choice and price;
(C) Buy Online and deal with delivery systems.

Meanwhile, the stagnation and death of the small stores are probable.

## (2) POSSIBLE SOLUTION: SHOPPERS CLUB

The Internet is changing these dynamics with the ability to leverage small stores as delivery points and retaining centralized consumer attention online. Shoppers Club designed a system that eliminates a significant portion of the infrastructure costs. It does so by creating a gamified attention space for consumers to band together to obtain wholesale prices and pick up the items at the small stores.

More, its system does not require online payment.

The result is lower prices than in the superstores, closer pick up points to the consumer's home and less time wastage. It also reintroduces traffic to the small stores for cross-selling.

With Shoppers Club, the community has at its disposition a salesperson. They vote on the products in a specific category they want to buy. The salesperson deals with the person on their behalf with the wholesalers or manufacturers. Salespeople make video reports to the community daily. They then download a voucher, giving them the ability to pick it up at a store closest to them. Consumers are rated. If they download a voucher and don't show up in the allocated number of days, their ratings go down and they a more unfavorable deal the next time around. They pay in person.

This allows Shoppers Club to identify brand power in the marketplace against price points. This data could be beneficial to the manufacturers, wholesalers, and retail industry: i.e., at which price point, do your consumers start considering other products.

In addition, a well-developed distribution system can help the e-commerce industry in small localities by solving the last mile problem with a near enough, good enough solution.

## (3) INSTALLING THE SHELVES/LOCKERS

Lockers are planned to be placed at the stores, to retrieve their products, the customers only need to scan their vouchers to get the locker number and the password to open the specific locker. The use of the locker may also depend on the level of confidentiality that the product requires.

## (4) HOW DOES IT WORK?

On Shoppers' club, the user selects all the products that he/she wants, and each product generates a voucher that is tagged with a QR code. These QR codes are used to redeem the vouchers at the local store so that the retail person can confirm the authenticity of the customer. The consumer only needs to redeem their vouchers in time to be able to retrieve the products ordered.

## (5) GAMIFYING THE PRODUCT

A gamified loyalty system works by rating the user based on their honesty and the length of time of their membership.

The gamified part of the system is the use of vouchers. For each product that is ordered, a voucher is created with a timestamp. The user need only redeem the voucher during this specific time-period to increase their rating.

The users are rated on a discrete scale of 5 Stars and the rating system need to be fair for the customers. At the start of the membership, all users are given a 5-Star Rating, but each mistake generates a loss and each time a voucher is redeemed, the rating goes back up. To do so, several factors have been considered that are defined as follows:

To do so, several factors have been considered which are defined as follows:

| | | |
|---|---|---|
| Time in Membership | : | $T_M$ |
| Number of downloaded vouchers | : | $N_D$ |
| Number of vouchers redeemed | : | $N_R$ |
| Customer Honesty | : | $H_C$ |

The user honesty is measured using the Customer Honesty which is defined as follows:

$$H_C = \frac{N_R}{N_D}$$

It is the ratio of the number of times a voucher is redeemed over the number of vouchers downloaded.

- The Customer Honesty is used to compute the loss in the rating based on the number of mistakes done.
- The Time in membership is used on the process of rehabilitating from the loss incurred due to their mistakes.

## (6) DESIGNING THE LOSS, ΔL

The customer rating decreases with the number of mistakes he/she does.

- A mistake is defined as a downloaded voucher which has not been redeemed in the required time period.

To design the losing system, we need to properly format our input customer metrics and find a suitable function using these values to find the rate at which the user loses his/her rating.

Here, we have only two input variables, which is the number of consecutive mistakes, $N_M$, done by the user and the aforementioned Customer Honesty, $H_C$.

To decrease the granularity of the Customer Honesty, we use a mapping system which is described in the table below to obtain the mapped Honesty Ratio.

| $H_C$ | $H_R$ |
|---|---|
| $0.875 < H_C \leq 1$ | 1 |
| $0.675 < H_C \leq 0.875$ | 0.75 |
| $0.5 < H_C \leq 0.675$ | 0.6 |
| $0.3 < H_C \leq 0.5$ | 0.4 |
| $0 < H_C \leq 0.3$ | 0.2 |

*Table 1: $H_R$-Table - Customer Honesty to Honesty Ratio*

The next step is now to obtain a function which can use both $H_R$ and $N_M$ as variable to calculate the decrease in the rating.

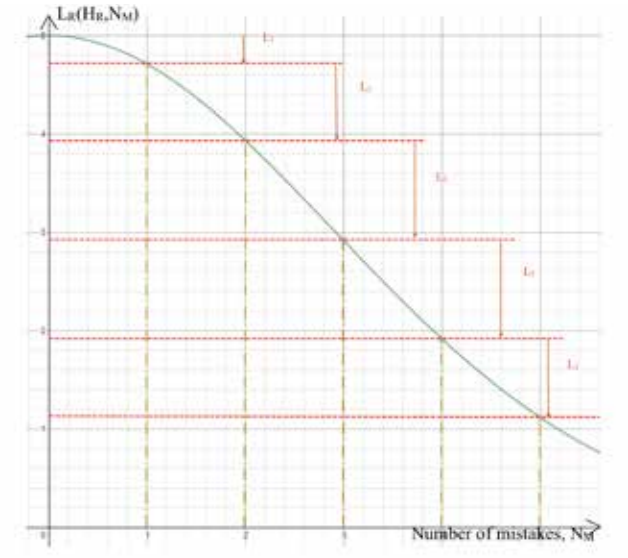


*Figure 2: Rate of Decrease for $H_R$ = 0.6 with the number of Mistakes, $N_M$*

For 5 consecutive mistakes, the loss, $\Delta L_{N_M}$ is derived from the function illustrated in the graph. But as soon as the customer makes more than 5 mistakes, $\Delta L_{N_M}$ will be equal to $\Delta L_5$.

This is summarized through the equation for below:

$$\Delta L_{N_M} = \begin{cases} L_R(H_R, N_M - 1) - L_R(H_R, N_M), N_M \leq 5 \\ L_R(H_R, 5 - 1) - L_R(H_R, 5), N_M > 5 \end{cases}$$

It has been pointed out that this equation holds for only consecutive mistakes. If a person redeems one voucher, $N_M$ resets back to 0 until another mistake is done.

The losing system can be simply put as follows:

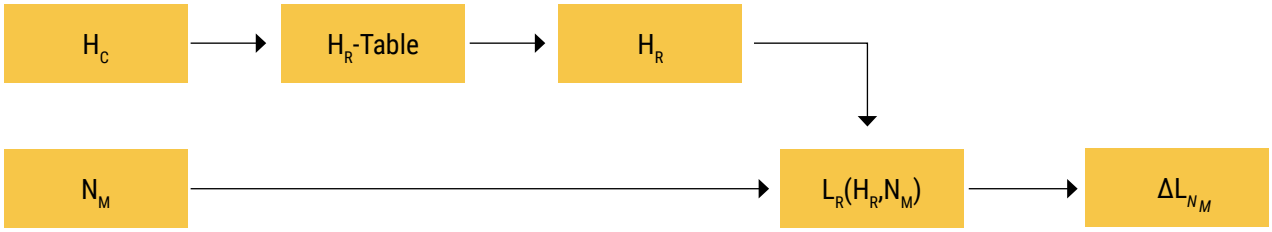


Figure 3: Losing System

## (7) DESIGNING THE GAIN, ΔG

As mentioned above, the time in membership determines the Gain Factor, $G_{F,}$ of the customer based on their Time in Membership, $T_M$.

The characteristic of the gain factor over time that was required is as follows:

- New customers should quickly gain a good gain factor over the course of the first few months of membership.
- New customers should have start with a small gain factor which increases with time.
- The Gain factor should increase slowly at 2 to 3 years of membership.
- At 3 to 5 years $G_F$ should increase sharply to reach a maximum value.
- This maximum gain is kept constant after 5 years of membership.

The maximum gain factor of the customer maps to a maximum Rating Gain, $G_R$, of 0.5 stars. This ensures that this type of customer has the potential to "rehabilitate" faster than the new ones.

Thus, from these set of requirements, several functions of the Gain Factor versus Time in Membership were designed and tested thoroughly through simulations.

Finally, we arrived at a suitable function of time, $G_F(t)$, which is governed by the equation below:

$$G_F(t) = \begin{cases} \frac{11}{16} + \frac{16}{5}(t-0.5)^3 - 3(t-0.5)^4, 0 \le t < 1.3 \\ 1.097, t \ge 1.3 \end{cases}$$

This function yields the graph illustrated in **Figure 4**.

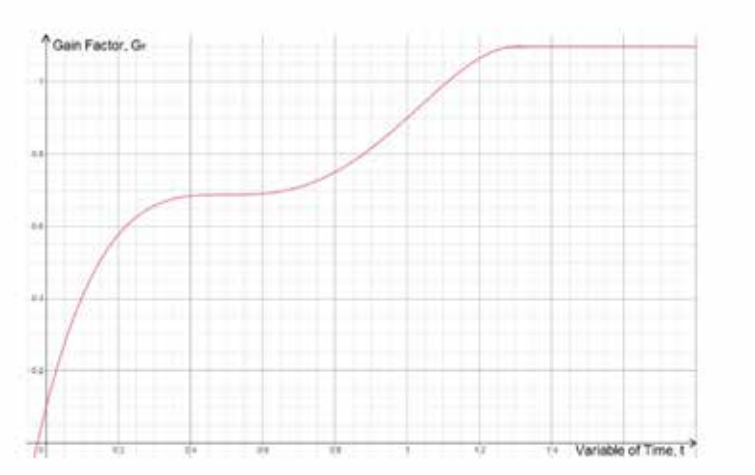


*Figure 4: Gain Factor characteristics over time*

Now that we have the gain factor characteristics, we need to map its values in terms of real weights to obtain the final Rating Gain, $G_R$.

Firstly, there is the time in membership, $T_M$:

$$T_M \rightarrow t$$

$$T_M = k_1 t$$

Where $k_1$ is a constant relating $T_M$ and the variable of time, t.
We know that t = 1.3 represents a time period of 5 years (60 months). Therefore,

$$60 months = k_1 x 1.3$$

$$k_1 = \frac{1.3}{60} = \frac{13}{600}$$

Secondly, we have the following relationship between the Rating Gain and the Gain Factor:

$$G_R \rightarrow G_F$$

$$G_R(G_F) = k_2 G_F$$

Where $k_2$ is the relationship between the 2 variables.

Since we have decided that after 5 years, the customer has a maximum Rating Gain of 0.5 stars, and the function yields a value of $G_F = 1.097$ at this point,

$$0.5\ stars = k_2 x 1.097$$

$$k_2 \approx \frac{5}{11}$$

We can now visualize the earning system of the customer as in the following figure:


Figure 5: Earning System

Therefore, the overall Gain, ΔG, at one point in time for a voucher redeemed is summarized as:

$$\Delta G = G_R(G_F)$$

**(8) CALCULATING THE NET CUSTOMER RATING**

Now that we have a good design for calculating the Gain, ΔG, and the Loss, $\Delta L_{N_M}$ , of the customer based on appropriate metrics, we can reduce the overall Customer Rating, $R_C$, as follows:

$$R_C = 5 + \sum \Delta G + \sum \Delta L_{N_M}$$

To increase the practicality of the equation above, we decrease the granularity of the Customer Rating by using range of values of $R_C$ to map it to specific discrete ratings, R, according to the following table:

| $R_C$ | R |
|---|---|
| $4 < R_C \leq 5$ | 5 |
| $3.25 < R_C \leq 4$ | 4 |
| $2 < R_C \leq 3.25$ | 3 |
| $1 < R_C \leq 2$ | 2 |
| $0 < R_C \leq 1$ | 1 |

*Table 2: R-Table - Customer Rating to mapped Rating*

Throughout the lifetime of the customer, the two variables $H_C$ and $R_C$ are stored as their true continuous values even if they are mapped to $H_R$ and R respectively. But to do so, we need to pose some constraints to $H_C$ and $R_C$ at the extreme ends of the range of values. The constraints are as follows:

If after computations,

$H_C$ is:

- Less than 0.1, $H_C$ is kept at 0.1.

$R_C$ is:

- Greater than 5, $R_C$ is kept at 5.
- Less than 0.5, $R_C$ is kept at 0.5.

**(9) Discount Factor based on the Rating**

Now that we have a final value for the Rating in terms of discrete number of Stars, we can use the Discount Factor table to determine the discount a customer receives on each product.

We define a value for the Maximum Discount, $M_D$.

*Table 3: $D_F$-Table*

| R | $D_F$ |
|---|---|
| 5 | 1 |
| 4 | 0.6 |
| 3 | 0.4 |
| 2 | 0.3 |
| 1 | 0.2 |

Based on this table, the final discount that is offered to the customer is calculated from the following equation:

$$FinalDiscount = D_F x M_D$$

This makes sure that the customer with the highest rating has the best price as compared to those with lower ratings. But on the other side, the customer with the lowest rating is still winning as compared to the customers which don't use the service.

## (10) Conclusion

One of the main objectives of Shoppers' Club is to eliminate the infrastructure overhead imposed by the big supermarkets by digitalizing the process of buying the products while also reducing the overall physical displacement of the customer. The second objective is to drive traffic back to the smaller store on a predictive basis. To increase customer engagement, we have designed a gamified rating system based on honesty metrics and the user time in membership. The biggest advantage to the customers is that no matter how good their rating is, they are always buying these products at lower prices than at a supermarket.

The aim of gamifying the product has been designed to obtain the retention of the customers while at the same time, providing fairness towards the customers. The only goal of the customer while playing the "game," is to redeem a downloaded voucher within a specific time period. The designing of the process of rating a customer is effectively broken down into two parts, the Losing System and the Earning System.

The Losing System is simply based on a function that considers a ratio measuring the customer honesty and the number of consecutive unredeemed vouchers by this particular customer. To decrease the complexity of the computations, the honesty factor was mapped to specific values by using specific predefined ranges. Simply put, the Losing System ensures that a dishonest customer loses as compared to those customers who maintain a good rating. This is aimed at pushing the user to conform more to the rules of Shoppers' Club which in turn will make our service a profitable one.

The Earning System takes as input the time in membership of the customer to decide the customer's gain at a specific point in time for a successful transaction. The longer a customer uses the product, the more the customer gains during a transaction. A successful transaction is basically just a voucher that has been redeemed during the specified time period.

Appropriate constraints have also been posed to both systems in order to increase its practicality when it will be widely deployed on the market.

This game design cannot be considered as final. As soon as customers will start using the service, our duty is to listen to their feedbacks so that we can build a good understanding of the market's demand. As we retrieve these data, we will be able to adjust to these new requirements dynamically so that our service can always stay at the top of the market's competition.


# A SCALABLE RATING SYSTEM FOR VARIOUS USE CASES

By Adjmal Dreepaul, XTM