Rotman

RSM-8423 – Optimizing Supply Chain Management and Logistics

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The Ninja Crush Saga

A Case Study in Game Pricing

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Introduction

Monteviu develops and publishes the popular app *Ninja Crush Saga*, a mobile game where the player first cuts falling fruits with a ninja sword, and then attempts to match three or more identical fruit pieces to earn points. Ninja Crush Saga reeled in more than 2 billion dollars last year, which is just a few million-dollar below what its competitors, such as *King*, owned in 2021 across all its products.

As usual in this business model, Ninja Crush Saga is free to download with in-game purchases, including new sword skins, fruits that lead to higher scores, and boosters that add bonus points. The challenge that Monteviu faces is maintaining customer engagement while also pricing the in-app products optimally to improve revenue.

Your team was hired to establish pricing strategies for its yet-to-be-released **ninja booster pack**, which increases the sword's number of fruits, cut speed rate, and adds fruits with bonus points. Monteviu also expects your methodology to be applied to other new packs that the company plans to offer to its 2,000,000 player base.

Part I – Prescribing Prices

To understand player elasticity to prices, the data science team at Monteviu ran an initial sampling experiment with 10,000 players selected uniformly at random from their total player base. All players in this list were offered similar (i.e., substitutable) booster packs to the new one proposed here during their various gaming sessions, each at different prices.

The file **player_sample.csv** reports the largest price each player paid across all substitutable booster packs (empty if they have not made any purchases). The data also includes three pieces of information that Monteviu records about each player: their current age and the number of in-app purchases since they joined the app. We are interested in the following questions, which assume that the boost price package must be at least $2 and no more than $100.

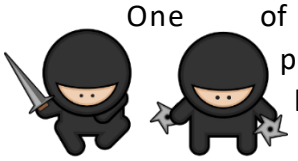
1. Suppose that Monteviu wishes to offer a **single price** for all players. Based on the data and the prescriptive analytics tools that we saw in class, propose a price that maximizes the expected revenue considering the total player base (i.e., 2,000,000).

2. Suppose now that Monteviu can offer **a different price per player**. While a player is in-game, Monteviu observes the player demographics and can select a personalized price they will experience accordingly. Based on your predictive and prescriptive knowledge from the MMA courses and supply chain optimization, develop an efficient mechanism

for personalized pricing that maximizes revenue. What insights do you obtain in this mechanism, i.e., can prices change significantly per person? Moreover, what is the increase in expected revenue compared to the single-price option?

Note also that there is no notion of scarcity in this setting, and you can assume that players are always disincentivized to buy if prices increase.

Part II – Discounting



One of the tradeoffs of personalized pricing is customer dissatisfaction. Many players either live in the same household (e.g., parents playing with their kids) or share their scores with friends, and might feel uncomfortable to learn that they paid more to obtain the same number of points as their family member/friend.

A common strategy to address this challenge is through discounting and seasonal sales. Monteviu is planning a special two-day event, the *Ninja Crush Week*, where the publisher will send a positive message to the player ("your participation warrants a big deal!") during a gaming session and offer the pack with a personalized discount ("have a 15% discount for your success!") that matches the customer's sensitivity to prices. It is expected that 10% of the players will subscribe to the event, distributed equally per demographics. Furthermore, the player will not be able to acquire the package separately from the offer.

Based on your insights and results from Part I, prescribe **(a)** the booster pack base price for the duration of the event; and **(b)** the personalized discount to be offered to each player to maximize expected revenues.

Monteviu wishes to limit the number of accepted offers to 10,000 per day for Finance purposes, but requested that every player must receive the discount offer exactly once during the event. Finally, discounts should also be multiples of five (5%, 10%, 15%, …).

1. Discuss your strategy and solution in detail, justifying your assumptions and reporting insights and quantitative findings.
2. How does your strategy compare to using a unique discount (i.e., single-price strategy) for the duration of the event, both in terms of revenue and realized demand?

Deliverables

The deliverable for this case study are:

- The source code in Python that you used for your models and analysis. It must be clearly organized so that we can replicate your results exactly.
- The solution must also include models an executive summary and a clear suggestion of your solutions, tradeoffs, and total revenues.

Evaluation

Your report will be given a raw score out of 100 points using the following scheme:

- *Models* and *analysis* [70 points]: If the pricing strategies you designed are sound and adequate to the problem, clearly present all tradeoffs and assumptions, and address the questions posed by the company. Notice that, since the model is inherently connected to the analysis, they will be considered together in this case.
- *Implementation* [30 points]: If the implementation of your models is correct and free of errors or bugs. It must also be well organized and readable.

You will also receive a letter grade associated with your raw score, alongside an explanation of your mark. The letter grade is used for your final mark calculation based on the weights specified in the syllabus.