

Managerial Report on SuperStar Children's Clothing

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Introduction

SuperStar Children's Clothing is a prominent retailer specializing in high-end toddler clothing in the North California region. In response to the evolving landscape of the industry, there is a strategic imperative to bolster Internet sales. This directive comes from Walker, the Vice President of the e-commerce division, who recognizes the potential of leveraging Internet ads on news websites. Initial findings indicate that Internet customers exposed to these ads tend to spend more compared to those customers who were not exposed to these ads.

This revelation triggers an exploration into effectively reaching untapped Internet customers. One intriguing strategy involves targeted ad placements on news websites, particularly during the holiday season. To ascertain the optimal sites for advertising, Walker conducted a follow-up study which involved surveying a sample of 1200 current Internet customers about their regular visits to 30 different news websites. The underlying hypothesis is that news websites with higher customer engagement could serve as a rich source of potential SuperStar product customers.

However, this endeavor comes with complexities. The challenge is not merely identifying websites, but rather accounting for multiple customer exposures. To avoid bias, a customer was counted as "reached" only if they encounter SuperStar ads on at least one website, regardless of the number of visits.

As part of this effort, a prototype model was developed using data from 53 returned surveys, focusing on the first 10 news sites, and adhering to a \$10,000 weekly budget. Each survey response is represented by a binary matrix, with 'ones' indicating regular visits and 'zeros' denoting otherwise.

The managerial report is presented in three parts as per the Vice President's request. First, we detail the development of an R-based model aimed at maximizing customer reach within the \$10,000 budget constraint. Second, we present the results of the model, highlighting the maximum number of customers reached under the specified budget. Lastly, we conduct a sensitivity analysis across various budget allocations, visualizing the relationship between percentage reach and budget increments.

This report holds the key to optimizing SuperStar Children's Clothing's digital advertising strategy, aligning with Walker's vision to harness the potential of Internet sales while ensuring efficient resource utilization.

Part 1: Developing the Optimization Model

This section takes you through the process of creating the optimization model that will help SuperStar Children's Clothing attract more interest in their high-quality children's clothing through targeted ads. We have harnessed the power of the 'R' programming language, which is exceptionally effective for developing such models.

To begin, we used the survey results of 53 customers, focusing on the first 10 websites. Our goal was to determine how to strategically allocate ads while adhering to Walker's budget of \$10,000.

We introduced decision variables and constraints that align with Walker's requirements. We denoted Y_i $i = 1, 2, 3, \dots, 53$ to represent customers reaching websites. When $y_i = 1$, it signifies that customer i visited the website, and when $y_i = 0$, it means they did not. Similarly, we used $x_i = 1, 2, 3, \dots, 10$ to symbolize websites where $x_i = 1$ indicates the placement of an ad.

Our objective was to maximize the equation $y_1 + y_2 + y_3 + \dots + y_{53} + 0x_1 + 0x_2 + \dots + 0x_{10}$. You can find the entire equation and constraints in the accompanying R code.

The model was constructed using the R programming language, utilizing the `lpsolve` package. This package employs linear programming concepts to solve the model, providing us with valuable insights on maximizing customer reach within the \$10,000 budget for a week-long promotion.

Refer to the Appendix for detailed information about the R code used in this process.

Part 2: Maximizing Customer Reach and Optimal Solution

In this segment, we delve into the results of our optimization model to uncover the maximum number of customers that can be reached within the fixed budget of \$10,000 for a one-week promotional campaign.

Upon implementing the model using the 'R' programming language and leveraging the `lpsolve` package, we arrived at an optimal solution. This solution indicates that by strategically placing ads on news websites, SuperStar Children's Clothing can achieve a significant outreach. The maximum number of customers that can be reached under the given budget constraint is 23 suggesting placing ads on certain websites including 6, 9, 10 and more. Hence with a budget of \$10,000 we can reach at least 23 customers, which denotes 43% of the current customer base based on sample size of 53.

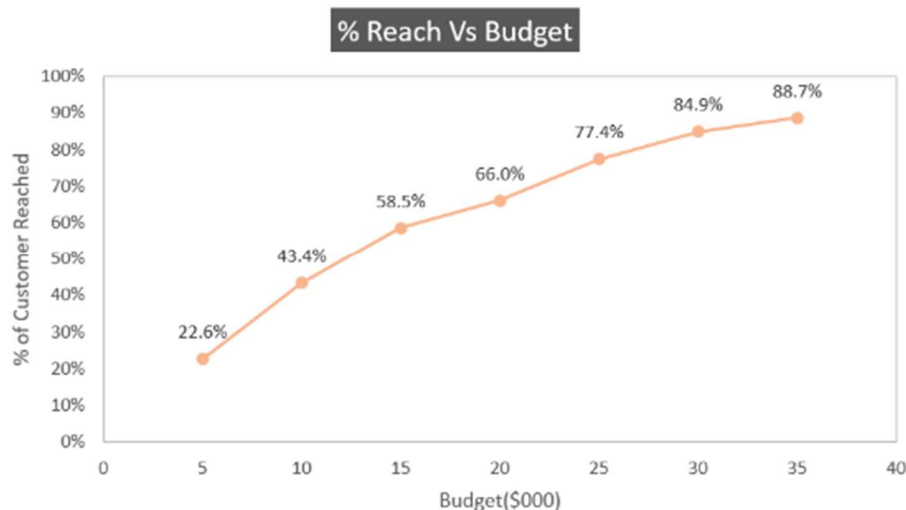
This implies that by selecting the appropriate combination of news websites for advertising, SuperStar can effectively engage with a substantial audience within the allocated budget. These results are not only valuable for maximizing customer reach but also for informing SuperStar's decision-making process.

With this vital information in hand, we proceed to the subsequent section, where we will delve into the implications of these findings and provide further insights into the optimization process.

Part 3: Sensitivity Analysis and Budget Optimization

In this section, we delve into a sensitivity analysis aimed at optimizing SuperStar Children's Clothing's budget allocation for the promotional campaign. By exploring how different budget levels affect customer reach, we can determine the most effective way to allocate resources while maximizing the impact of the campaign. We systematically varied the budget from \$5,000 to \$35,000 in increments and recorded the corresponding customer reach. The results are summarized in the table below:

Sensitivity Analysis Summary			
Budget(\$000)	Cust. Reach	% Cust. Reach	% Growth by Budj Increase
5	12	22.64%	
10	23	43.40%	20.75%
15	31	58.49%	15.09%
20	35	66.04%	7.55%
25	41	77.36%	11.32%
30	45	84.91%	7.55%
35	47	88.68%	3.77%



Our analysis reveals that as the budget increases, the customer reach also rises as it goes up to 88.7% with a budget of \$35,000. However, the rate of growth in customer reach diminishes with each budget increment, which may cause a decrease in return of investment. This finding underscores the importance of prudent budget allocation. While a larger budget yields more significant customer engagement, there is a point of diminishing returns where additional investment yields diminishing benefits. Striking a balance between budget and reach is vital. Considering the outcomes of our sensitivity analysis, we propose a budget allocation of \$15,000 to begin with and gradually adjust based on the results with a larger sample size. As we hope this amount does optimally combine substantial customer reach with efficient resource utilization. This recommendation should empower SuperStar Children's Clothing to make strategic decisions, ensuring their promotional campaign's success and maximizing potential customer engagement. Wishing for SuperStar Children's immense growth and success.

