

## **OPTIMIZING SMALL GROUP PURCHASE WITH VOLUME DISCOUNT**

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*Smart Shopping (SS) is a small consulting firm which helps clients discover new products, shops, and promotions based on their interests and budget. SS can help their clients particularly in the dilemma that individual shoppers sometimes cannot participate in “buy more save more” promotions due to limited shopping budget and needs. SS collects clients’ orders in an Access database. To consolidate the orders, Julie Jones, the senior analyst at SS, imports data from the database and builds an optimization model to maximize savings for each client when volume discount is offered. This case shows the students how to solve an optimization problem using Excel. Analyzing real-world data collected from Internet enriches student knowledge and experiences on business decision making and critical thinking.*

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### **INTRODUCTION**

The Internet increasingly changes the way we shop for any type of product and service. A recent study by Pew Research Center shows that seventy-nine percent of Americans have purchased online, and sixty-five percent of online shoppers compare prices online and then make the purchase where the best deal is offered. Although selling price becomes more transparent online, individual shoppers are still struggling with pricing.

Smart Shopping<sup>1</sup> (SS) is a small consulting firm that provides services in personal shopping, long-distance shopping, fashion and beauty advising, etc. The mission of SS is to help clients discover new products, shops, and promotions that match with their interest, style, and budget. To find the best deals possible for clients, SS collaborates with a variety of vendors such as Macy’s and Neiman Marcus to get volume discounts and special promotions. Once a client places an order through SS, vendors will pay commissions to SS based on the net sales, but the client does not need to pay for the services provided by SS. In another word, SS offers free shopping services to attract more clients.

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<sup>1</sup> The real business name is disguised according to the company’s privacy policy.

## **BACKGROUND**

As a start-up company, SS is in the dilemma whether to implement enterprise-level analytics software such as SAS and SPSS or develop its own system to collect and process orders. Due to tight budget constraints, the CEO has decided to adopt the second option for the time being. Because SS cannot afford hiring an IT company to develop a customized analytics system, Microsoft Office becomes the only option for SS to handle client and order data. Therefore, Julie Jones is hired as a senior analyst to lead this project. She has over five years of experience in business analytics and has received outstanding reviews from clients and her previous company. She is specialized in building databases in Access, analyzing data in Excel, writing SQL, and preparing reports. Her job becomes more critical during a promotion period when there are more orders received.

One of her job responsibilities is to design a database in Access to collect orders from clients. She starts the database with four tables: Client, Vendor, Promotion, and Order. In Client table, a unique ID is assigned to each client. Client's first name, last name, address, phone number, and email are stored. In Vendor table, each vendor has a unique ID. Vendor's name and contact information are stored. In Promotion table, each promotion is assigned a unique ID, promotion type and details are stored. In Order table, each order is assigned a unique ID. Brand, product name, quantity, and price are stored. As a relational database as EXHIBIT A shows, Order table is identified to have relationships with Client table, Vendor table, and Promotion table.

In this database, Julie can write queries, generate forms and reports. For example, she designs a form for each table so that she can review, input, and revise the contents of all the tables conveniently. According to management team's requests, she also designs queries to identify most popular products/promotion types/vendors and creates reports to show orders by brand, orders by quantity, etc.

## **PROMOTIONS**

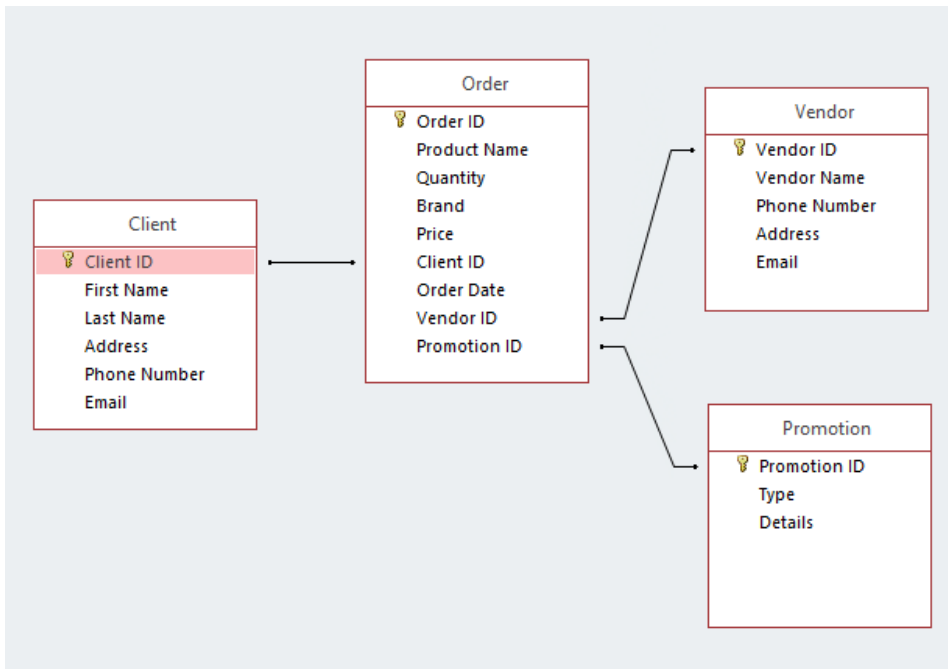
Vendors offer different promotions to SS all year round. Some common types of promotions are straightforward, such as direct discount, free shipping, free gift with purchase, flash sale, etc. SS just needs to notify clients of the ongoing promotions and input customer orders in the Access database during the specific promotion period. The orders are purely based on individual client's purchase decision.

While there is a different type of popular promotion, "buy more save more", which attracts a lot of attention, clients may not take full advantage of volume discount due to limited shopping budget and needs. In case of getting \$200 off \$1,000 beauty purchase offered by Neiman Marcus (NM), any client will ideally get a 20% off if she/he spends \$1,000 on beauty products. However, most clients only need one or

two beauty items worth of dozens of dollars at this moment, so they cannot enjoy the promotion directly unless Julie consolidates all the client needs and group some orders together to reach the promotional threshold.

At the end of this promotion period, Julie has imported all the orders from Access database listed in Table 1 at the end of the case.

**EXHIBIT A:**  
**Relationships in the Database**



**GOALS**

Julie’s mission is to create a detailed order plan which will be submitted to the management team to make final purchase decisions. In this plan, she should

- build an optimization model with binary constraints using Solver tool in Excel to maximize savings for each client. The model should be flexible to adapt changes, such as changing an existing order. The model should use descriptive names which are easier to understand and use.
- create a series of itemized orders to accommodate each client’s shopping goals. If not all the goals are met, make a recommendation to the management team based on the feasibility report generated by Solver.

**TABLE 1:**  
**Summary of Client Orders**

<b>Client Name</b>	<b>Brand Name</b>	<b>Product Name</b>	<b>Price</b>
Jane	La Mer	Creme de la Mer, 2oz	\$310.00
Mary	La Mer	The Eye Concentrate, 0.5 oz.	\$195.00
Mary	La Mer	The Eye Concentrate, 0.5 oz.	\$195.00
Mary	La Mer	Creme de la Mer, 2oz	\$310.00
Mary	Kiehl's	Creamy Eye Treatment with Avocado, Large, 0.95 oz	\$48.00
Lisa	Jo Malone	Velvet Rose & Oud Cologne Intense, 3.4 oz	\$170.00
Lisa	Jo Malone	Dark Amber & Ginger Lily Cologne Intense , 3.4 oz	\$170.00
Lisa	La Prairie	White Caviar Illuminating Moisturizing Cream, 1.7 oz.	\$495.00
Lisa	La Prairie	White Caviar Illuminating Eye Cream, 20 mL	\$370.00
Lisa	Jo Malone	English Pear & Freesia Body & Hand Wash, 250ml	\$40.00
Lisa	Jo Malone	English Pear & Freesia Body & Hand Wash, 250ml	\$40.00
Lisa	Estee Lauder	Auto Brow Pencil	\$27.00
Lisa	Estee Lauder	Automatic Brow Pencil Duo Refill	\$16.00
Lisa	Clinique	Skinny Stick, Black	\$16.50
Karen	La Mer	Creme de la Mer, 2oz	\$310.00
Karen	Estee Lauder	Re-Nutriv Intensive Age-Renewal Eye Crème, 0.5 oz.	\$130.00
Karen	Estee Lauder	Perfecting Loose Powder 3.4 oz. , color: light	\$40.00
Karen	Clinique	Chubby Stick (color: Woppin' Watermelon)	\$17.00
Karen	Clinique	Chubby Stick (color: Super Strawberry)	\$17.00
Karen	Clinique	Chubby Stick (color: Oversized Orange)	\$17.00
Emma	Kiehl's	Ultra Facial Cream, 4.2 oz	\$47.50
Linda	Kiehl's	Ultra Facial Cleanser, 5.0 fl. oz.	\$19.50

Data in this table came from Neiman Marcus retrieved October 2017.