Optimizing Multichannel Promotional Budget Allocation

Abstract

Optimal resource allocation has been neglected in multichannel customer management research. The multimedia promotion mix should not be considered as an arbitrary expenditure. This paper introduces a model to maximize catalog income from promotion media. Income is apportioned to media driving buyers to online and print catalogs. Media lift is calculated through a Markov network, and budgeting is performed in a linear programing model.

Keywords: catalog, multichannel, optimization, linear programming.

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Introduction

Accountability is marketing’s Achilles heel. It has long been ignored and led many companies to view marketing as an expenditure that can be cut in difficult economic times (Briggs, Krishnan, and Borin, 2004). Direct marketers and retailers communicate with consumers using a mix of media and sell through a variety of channels. Maximizing promotion budgets can become a real challenge. For example, Hampton Direct’s tracks consumer queries from a number of channels relying on trial and error, AB testing, 800 numbers for television, and expected ratios for phone to web orders (Ryan, 2012). Brookstones, a specialty retailer that sells through stores, catalogs, emails and affiliates (such as Amazon), apportions media spending by fractional source allocation, assigning a fraction to all the touch points that lead to a sale (Parry, 2007).

Most of the extent literature on multichannel marketing is done at the customer level and focuses on customer management: channel switching, satisfaction, and loyalty. This paper takes another direction. It proposes a model to optimize promotional resource allocation in a multichannel environment, namely online and printed catalogs. Close to 95 percent of catalogs are now available both in print and electronically (DMA, 2013). The model uses a Markov network to track multichannel promotional trigger points and sales, and linear programing for resource optimization. The conceptual model is kept simple and could expand to cover more touch points. A numerical example is also provided, and an Excel spreadsheet is also available.
Multichannel Customer Management

Multichannel marketing includes brick and mortar retail stores, the web, catalogs, sales force, third party agencies, call centers, and new retail formats that come along (Neslin and Venkatesh, 2009). The research stream in multichannel marketing follows the evolution of the internet, e-stores, m-commerce, and social media. Because this field is fairly young, there has been an emphasis on conceptual models exploring the impact of interactive technologies (e.g. Varadarajan, Srinivasan, Vadakkepatt, Yadav, Pavlou, Krishnamurthy & Krause, 2011), retail strategies (e.g. Zhang, Farris, Irvin, Kushwaha, Steenburgh & Weitz, 2010), and future research directions (e.g. Neslin, Grewal, Leghorn, Shankar, Teerling, Thomas, & Verhoef, 2006; Neslin & Shankar, 2009). Research mostly focuses on consumer behavior in interaction between brick and mortar stores and other forms of retailing.

Research about multichannel and multimedia retail environment remains scarce (Dholakia, Kahn, Reeves, Rindfleisch, Stewart, and Taylor, 2010). The multichannel customer management model borrowed from Neslin et al. (2006) identifies some key issues: 1) data integration, 2) understanding consumer behavior, 3) channel evaluation, 4) allocation of resources across channels, and 5) coordination of channel strategies (Figure 1).

Dimensions of multichannel customer management have not received equal attention. Consumer behavior emerges as the primary research topic, while channel
evaluation and strategies receive less attention. Finally, allocation of resources across channels has been neglected.

CONSUMER BEHAVIOR

With emerging alternate channels for information search and retail shopping, firms are increasingly interested in understanding factors influencing and driving customer retention (Boehm, 2008). Retailers want to identify and understand perceptual cues by which shoppers judge product attributes, service quality, and value (Swaid and Samar, 2012).

Multichannel retailing inducing switching patterns and migrations also modifies shoppers’ behavior. Ansari, Mela, and Neslin (2008) observed that web purchasing is associated with lower subsequent purchase volumes than when buying from other outlets, and negative interactions between similar and different types of communications. They also noted that after a number of years, web-oriented migration segments emerged with higher sales volumes. Competitive pressures force retailers to multiply retail channels. Switching and migration patterns, say from traditional catalogs to internet shopping, impact shoppers’ loyalty, order size and merchandise returns (Dholakia, Zhao, and Dholakia, 2005).

CHANNEL EVALUATION

Channels do not necessarily compete with each other. Jin, Park, and Kim (2010) noticed channel synergy between online and offline operations. They found that e-satisfaction is formed by a varying influence of online and offline factors such as
merchandising, firm’s reputation, customer offline satisfaction that increases e-loyalty. Findings show that offline loyalty did not transfer to online loyalty.

Information search is another form of potential channel synergy. Joo and Park (2008) studied whether information-search channels become purchase channels and whether purchase-channel choices are influenced by other information-search channels. As a channel is selected for information search, the possibility that the same channel is chosen for purchase will increase. The authors did not find any synergy between information search and purchase across channels. Understanding multichannel information-search media helps managers coordinate and integrate their communications and build their customer relationships (Joo and Park, 2008).

**Retail Strategy**

Because of competitive trends and the emergence of new channels, retailers have little choice except to adjust, follow with new retail formats, and expand channels. New retail stores can either help or hurt sales in existing direct channels (Zhang et al. 2010). Avery, Steenburgh, Deighton, and Caravella (2012) examined patterns of cross-channel, cannibalization and synergy. They found that presence of a retail store decreases sales in the catalog but not the internet channel. After the store opening, more first-time customers begin purchasing in the direct channels. The authors conclude that the addition of a new retail store to direct channels produces different outcome than adding an online channel to a brick and mortar store.
Although internet-only retailers can prosper, multichannel retailing offers an attractive and complementary blend of existing and new formats. McGoldrick and Collins (2007) identified four channel choice components influencing utilization and attitudes toward retail stores, catalogs and the internet: risk reduction, product value, ease of shopping and the shopping experience. The authors have identified true multichannel shopper segments, based on preferences and behavior.

RESOURCE ALLOCATION

Research priorities addressed by Neslin et al. (2006) identify the allocation of resources across channels. Yet, optimal cross-channel resource allocation has not received the interest it deserved. The impact of each channel must be evaluated in order to optimize the channel mix. Managers would certainly like to know how much should be invested in promotional activities across channels. In a study about the launch of the 2004 Ford F-150, Briggs, Krishnan, and Borin (2005) compared interactive and traditional media results to improve resource allocation and maximize productivity from media expenditures. They looked at multimedia (TV, magazine roadblock and online advertising) across specific marketing communication tasks (advertising recall, familiarity, purchase consideration, shopping, and purchase intention). They evaluated the communication return on marketing objective (ROMO).

In the case of direct selling or catalogs, the promotional mix is data-driven, trying to optimizing sales and profit. Firms with empirical data on hand can assess the performance of their promotional mix and allocated media investment on a fractional basis (Parry, 2007).
Model Building

This study was initially prompted by non-profit organizations raising funds through print and an online Christmas gift catalogs. The term “gift catalog” on Google generates some 474,000 references, the vast majority of which being from non-profit or charitable organizations. Donors buy symbolic “tangible” gifts supporting the work charities in the name of relatives or friends. Non-profit send notes or cards to individuals in whose name the gift was made.

Non-profits promote seasonal gift catalogs through traditional media advertising, direct mail, online advertising, and by mailing the print catalog to existing supporters on file or from lists. The Red Cross gift catalog, for example, is sustained by TV and radio ad campaigns, online search marketing, emails and social media (Hoffman, 2012). The WWF uses traditional mailings to promote its electronic annual gift catalog that includes symbolic species adoptions (Charski, 2011). According to HJC, a Toronto-based consultant in fundraising, charities that have online programs supported through direct mail make more money both online and in total.

Promotion material invites current and potential supporters to go to the online catalog or ask for a copy of the printed version. After choosing their gift from the electronic or print catalog, customers can either place their order online, by mail or by telephone.
Promotional budgeting is a serious managerial issue. The issue of resource allocation is not limited to non-profits and charities, and can be generalized to other sectors. Marketing managers from various departments (TV advertising, direct mail, space ads, etc.) often operate in silos. They are given sales performance objectives and their marketing budget depends on “customer ownership”. Managers compete within each other for a greater slice of the media pie. Upper management hesitates to optimize media investments because of managerial inertia, organization culture, and because they do not have the proper decision support tools.

The proposed model can and should be generalized to other catalog and multichannel retailing environments. The campaign specific promotional budget is operationalized in four steps: 1) identifying promotion sources triggering purchases, 2) allocating sales income to each touch point, 3) estimating ROI or income to cost ratios for each media, and 4) optimizing the model based on investment returns and decision rules. The model is described in Figure 2. It illustrates the logical communication/sales process, from left to right. Promotional budgets are apportioned to various media channels. Potential customers exposed to a given media select either the print or electronic catalog for browsing or shopping around. Once they have chosen their gifts, customers place their order either online, by mail or by telephone. Effective media budget allocation process is done upstream, from right to left.

**Figure 2 about here**
Despite the availability of recognized catalog marketing techniques for tracking catalogue ordering and sources of web traffic, managers do not always have the expertise or state-of-the-art traceability tools.

The right to left paths in the model (Figure 2) begins by tracking fulfillment channels and moving upstream:

\[
C_i$ = \sum (C_i \% \times I$): \quad \text{Income generated by each fulfillment channel.}
\]
\[
K_j$ = \sum (K_jC_j \% \times C_i$): \quad \text{Income generated by each catalog version.}
\]
\[
P_k$ = \sum (P_kK_j \% \times K_i): \quad \text{Income allocated to each promotional media}
\]
\[
P_lB$ = \sum (P_lB \% \times B$): \quad \text{Budget for each promotional media}
\]
\[
I_k:C_1 = P_k$/P_lB$: \quad \text{Income to cost ratio for each promotional media}
\]

Where:

- I$: Total dollar income.
- C%: Percentage of income from each purchasing channel (C).
- C$: Dollar income generated from each channel (C).
- KC%: Percentage of channel (C) income from each catalog version (K).
- K$: Dollar income generated by each catalog (K) version.
- PK%: Percentage of catalog (K) income apportioned to promotional (P) media.
- P$: Dollar income allocated to each promotional (P) media.
- BS: Promotional budget to be allocated to each media (P).
- PB%: Percentage of promotional budget (B) allocated to each media (P).
- PB$: Dollar value of promotion budget allocated to media (P)
- I:C: Income-to-cost ratio.
- i, j, k, l: Indices for purchase channels, catalogs, income allocated to media and media budgets

Promotional resources allocation can be optimized through linear programming and sensitivity analysis:

\[
\sum (I_k:C_1 \times P_k$) = \text{Max Income: Maximising income based on media I:C leverage}
\]

under constraint:

- B$ >= \text{Maximum available budget.}
- P_lB$ >= Media budget lower limit.
- P_lB$ <= Media budget upper limit.
- … Other constraints added as needed.
**Numerical Example**

A numerical example has been built around the following assumptions. For the sake of illustration, the income generated by the seasonal catalogs (I$) is $5,000,000. Customers can complete their transaction through more than one channel. Some 50 percent of the catalog income is channeled online, 15 percent from the phone center (800-number), and 35 percent from mail orders. Catalog income from fulfillment channels are posted in Table 1.

**TABLE 1 ABOUT HERE**

The organization should not have any problem determining the percentage of income from each sales channel. Service representatives from the phone center ask customers from which catalog they have chosen their gift. Mail orders are most likely generated from the print catalog. Tracing online orders requires more footwork. To facilitate source tracking, items from each catalog version should carry different identification prefixes and different order forms.

In this example, about 75 percent of all online orders are triggered by the web catalog, and 25 percent from the print catalog. Some 20 percent of the telephone orders originate from the web and 80 percent from the print catalog. Mail orders are 100 percent apportioned to the print catalog. Table 2 outlines the income attributed to each catalog version.

**TABLE 2 ABOUT HERE**
Income generated by catalogs must be traced back to promotional media. Web administrators should be able to identify shoppers’ origin from web logs, keyword search, and distinct URL for different promotional sources. Approximately, 55 percent of e-catalog users are attracted from web advertising (links, banners, and pop-ups). Other online catalog customers are drawn by mass advertising (20 percent), direct mail (20 percent) and pre-mailed catalogs (5 percent). Directing customers to different URL and domain names is highly recommended.

Users of the print catalog are either previous customers who were sent the catalog by mail or individuals who specifically request a print version from various 800-numbers or emails. They are acquired from the web (5 percent), mass advertising (25 percent), direct mail (20 percent), and mailed-out catalogs (55 percent). Table 3 displays the proportion and the dollar value of income credited to promotional media. All customers who receive direct mail and print catalogs, even though they might fulfill online, are flagged in the database.

**Table 3 about here**

Let’s assume that the organization has a promotion budget of $1,200,000 and currently allocates it to web advertising (35 percent), mass advertising (20 percent), direct mail (20 percent), and pre-mailed catalogs (25 percent). Having the estimated income triggered by promotion media, managers can estimate income to cost ratios. I:C ratios are easier to introduce in a model than ROI, and can be easily converted back in ROI.
For example, an I:C ratio of 2 is equivalent to a 100 percent ROI. Table 4 draws promotional budget and media I:C ratios. The entire model is summarized in Figure 3.

**Table 4 About Here**

**Figure 3 About Here**

Historical media I:C ratios are used to optimize income derived from the promotion mix. In this numerical example, the Excel Solver is used for linear programing. Constraints are introduced to avoid extreme solutions. The promotion budget is limited to $1,200,000. There are lower and upper limits for each media type, in this case, set arbitrarily at 10 and 40 percent of the overall budget:

<table>
<thead>
<tr>
<th>Web Advertising</th>
<th>DM</th>
<th>Mailed Cat</th>
<th>Max I($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.01 x P1B$ +</td>
<td>4.17 x P2B$ +</td>
<td>4.17 x P3B$ +</td>
<td>5.79 x P4B$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1B$ or P2B$ or P3B$ or P4B$</td>
<td>$120,000 or 10%</td>
</tr>
<tr>
<td>P1B$ or P2B$ or P3B$ or P4B$</td>
<td>$480,000 or 40%</td>
</tr>
</tbody>
</table>

The linear programing solution raises income from 5 to almost 5.6 million dollars, by almost 13 percent (Table 5). The promotion budget is reallocated from 35 to 10 percent for web advertising, from 20 to 40 percent for advertising, from 20 to 10 percent for direct mail, and from 25 to 40 percent for the mailed catalog. Results are discussed below.
Discussion

The simulation outcome is somewhat surprising. Looking at starting values, online fulfillment dominates, with 50 percent of all order placements. The web manager is obviously happy, claiming 50 percent of customer ownership, and likely to request a 50 percent share of the promotion budget. A deeper examination outlines that traditional media advertising and mailed catalogs drive more income than web advertising (hyperlinks, banners and pop-ups). Customers are not likely to go on the web on their own and type the URL automatically. In this simulation, customers must be directed from other sources. Here, web advertising with its many forms is not the prime driver.

The key issue to promotion channel optimization lies with the tracking of print and electronic catalog media sources. Many direct marketers are reluctant to invest in rigorous tracing measures. Ad hoc surveys to determine the customer migration are far from being ideal. Web mining techniques require some expertise and take time to implement. Tracking metrics must be planned ahead of time, and cannot be introduced at the last minute, as is often the case. Finally, many managers are reluctant to use multiple domains and URL because of their afraid to hurt their “brand”.

The model introduced in this paper could be more elaborate. For example, the optimization process is done on the combined catalogs rather than maximized from each version. It was found however, that when each catalog is optimized independently, the overall income is not as high as under a single optimization process. The model also stresses revenue instead of net income (after fixed and production costs). For simplicity,
media elasticity has not been factored. Sensitivity analysis should be conducted extensively, and managerial decision rules should be carefully thought.

Traditionally, resource allocation has been the poor cousin of multichannel customer management research. In this era of marketing metrics, the multimedia promotion mix should not be considered as a fuzzy expenditure, but as a measurable management decision.
References


Charski, Mindy (2011), World Wildlife Fund Roars as the King of the Direct Marketing Jungle, Deliver Magazine, USPS,


Gray, Terry, Variation on the “but we don’t know which half” line,


Parry, Tim (2007), I don't know, you tell me, Multichannel Merchant; 3 (8): 37-38.


Figure 1: Multichannel Customer Management Research

Blattberg, Kim, and Neslin, 2006
Figure 2: Catalog Promotional Resources Allocation Model

The model illustrates the logical decision flow (from left to right). Promotional budgets are allocated upstream to various media channels (from right to left). Potential buyers exposed to a given media select either the print or electronic catalog version. Once they have chosen their gift, they place their order online, by mail or by telephone.
Figure 3: Catalog Sales and Promotional Budgets

Generated income (rounded in $000) is in bold face and promotional expenses ($000) are in italic.
Table 1: Catalog income from Fulfillment Channels

<table>
<thead>
<tr>
<th>Channel (C)</th>
<th>C_i%</th>
<th>C_i$ = C_i% × I$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>50%</td>
<td>$2,500,000</td>
</tr>
<tr>
<td>Phone</td>
<td>15%</td>
<td>$750,000</td>
</tr>
<tr>
<td>Mail</td>
<td>35%</td>
<td>$1,750,000</td>
</tr>
<tr>
<td>Total Income (I$)</td>
<td>100%</td>
<td>$5,000,000</td>
</tr>
</tbody>
</table>

Table 2: Income Attributed to Catalogs

<table>
<thead>
<tr>
<th>Catalog (K_i)</th>
<th>eCat</th>
<th>PrintCat</th>
<th>K_jC_i%</th>
<th>K_j$ = ∑K_jC_i% × C_i$</th>
<th>C_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online</td>
<td>75%</td>
<td>25%</td>
<td>$1,875,000</td>
<td>$625,000</td>
<td>$2,500,000</td>
</tr>
<tr>
<td>Phone</td>
<td>20%</td>
<td>80%</td>
<td>$150,000</td>
<td>$600,000</td>
<td>$750,000</td>
</tr>
<tr>
<td>Mail</td>
<td>0%</td>
<td>100%</td>
<td>-</td>
<td>$1,750,000</td>
<td>$1,750,000</td>
</tr>
<tr>
<td>Total Income(I$)</td>
<td></td>
<td></td>
<td>$2,025,000</td>
<td>$2,975,000</td>
<td>$5,000,000</td>
</tr>
</tbody>
</table>

Table 3: Income Elicited by Promotional Media

<table>
<thead>
<tr>
<th>Promo (P_i)</th>
<th>Catalog (K_j)</th>
<th>Income by Media</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>eCat</td>
<td>PrintCat</td>
<td>P_k%K_j% × K_j$</td>
</tr>
<tr>
<td>Web</td>
<td>55%</td>
<td>5%</td>
<td>$1,113,750</td>
</tr>
<tr>
<td>Advertising</td>
<td>20%</td>
<td>20%</td>
<td>$405,000</td>
</tr>
<tr>
<td>DM</td>
<td>20%</td>
<td>20%</td>
<td>$405,000</td>
</tr>
<tr>
<td>Mailed Cat</td>
<td>5%</td>
<td>55%</td>
<td>$101,250</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td>$2,025,000</td>
</tr>
</tbody>
</table>

Table 4: Current Promotion Budget and I/C Ratios

<table>
<thead>
<tr>
<th>Promo (P_i)</th>
<th>Budget %</th>
<th>Budget $</th>
<th>Income per Media</th>
<th>I/C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P_iB%</td>
<td>P_iB$ = P_iB% × B$</td>
<td>P_i$</td>
<td>I_k/C_i = P_i$/P_iB$</td>
</tr>
<tr>
<td>Web</td>
<td>35%</td>
<td>$420,000</td>
<td>$1,262,500</td>
<td>3.01</td>
</tr>
<tr>
<td>Advertising</td>
<td>20%</td>
<td>$240,000</td>
<td>$1,000,000</td>
<td>4.17</td>
</tr>
<tr>
<td>DM</td>
<td>20%</td>
<td>$240,000</td>
<td>$1,000,000</td>
<td>4.17</td>
</tr>
<tr>
<td>Mailed Cat</td>
<td>25%</td>
<td>$300,000</td>
<td>$1,737,500</td>
<td>5.79</td>
</tr>
<tr>
<td>Budget (B$)</td>
<td>100%</td>
<td>$1,200,000</td>
<td>$5,000,000</td>
<td>4.17</td>
</tr>
<tr>
<td>Media (P)</td>
<td>Web</td>
<td>Advertising</td>
<td>DM</td>
<td>Print Cat</td>
</tr>
<tr>
<td>----------</td>
<td>-----</td>
<td>-------------</td>
<td>----</td>
<td>-----------</td>
</tr>
<tr>
<td>I:C ratios</td>
<td>3.01</td>
<td>4.17</td>
<td>4.17</td>
<td>5.79</td>
</tr>
<tr>
<td>Opt. Budget $</td>
<td>$120,000</td>
<td>$480,000</td>
<td>$120,000</td>
<td>$480,000</td>
</tr>
<tr>
<td>Opt. Budget %</td>
<td>10%</td>
<td>40%</td>
<td>10%</td>
<td>40%</td>
</tr>
<tr>
<td>Max Income $</td>
<td>$360,714</td>
<td>$2,000,000</td>
<td>$500,000</td>
<td>$2,780,000</td>
</tr>
<tr>
<td>Max Income %</td>
<td>6%</td>
<td>35%</td>
<td>8%</td>
<td>47%</td>
</tr>
</tbody>
</table>