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Sales Promotions on the Internet

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Abstract

We describe a sales promotion application for distributing and redeeming coupons on the Internet during online shopping. Various types of sales promotions and coupons, and the methods used to target coupons to select potential buyers are reviewed. Security mechanisms needed to prevent alterations, duplication, and trading of coupons by customers, and fraudulent use of manufacturer's coupons by retailers are identified. An implementation of electronic coupons is described. The impact of coupon trading and duplication, facilitated by the Internet, on the effectiveness of sales promotion campaigns is discussed.

1. Introduction

Sales promotions are important marketing tools in today's businesses. They command a greater portion of the marketing budget than advertisements [1] (in consumer-packaged-goods business). However, while advertisements are quite popular and a big business on the Internet, sales promotions on the Internet have not caught on yet. Part of the reason is that an advertisement is purely informational with no exchange value. It is broadcast to the largest possible segment of population possible within a budget. On the other hand, coupons, the primary vehicle for sales promotion, have an exchange value and are intended for a select section of the population. The digital nature (ability to make perfect copies inexpensively), easy access, and low overhead for distributing information on the Internet is a boon to advertising, but a problem for sales promotions.

In this paper we discuss the use of the Internet for distributing coupons. We describe the software needed to issue and redeem coupons on the Internet. The three attributes of the Internet we focus on are: 1) the ability to monitor the user's online shopping behavior (click stream analysis) to issue coupons; 2) mechanisms for embedding coupons in advertisements and publications and potential for fraud due to uncontrolled duplication and distribution of coupons; and 3) ease in capturing the coupons and redeeming them which will result in e-coupons being used by buyers who previously did not have sufficient incentive to cut the coupon and remember to carry it to the store.

We begin this paper by discussing different types of paper coupons in use today and draw the distinction between manufacturer's coupons and store coupons. Store coupons are issued by a merchant to attract shoppers in his local area to his store. Store coupons are primarily used to: 1) manage (reduce) inventory; 2) reward customer loyalty; and 3) attract buyers to the physical store by discounting select few products. Manufacturer's coupons are typically issued by manufactures of national brands. They are used to: 1) gain market share by switching buyers from competing brands, especially for newly introduced brands; 2) match competitors coupon campaign; 3) and increase repurchase rates among occasional users of a brand. *The common theme linking all of the above business objectives is the requirement to reduce prices temporarily.* Most marketing text books have extensive coverage of various sales promotions methods, [1] being one of them.

Next we focus on preventing the duplication and trading of coupons. The Internet allows buyers possessing digital coupons to duplicate them arbitrarily many times, and to distribute the copies effortlessly around the globe. This not only defeats the manufacturer's objective of targeting the coupons, but also renders him incapable of estimating how many

coupons will be redeemed and thus preventing him from budgeting for a coupon campaign. Retailers can also get hold of one manufacturer coupon, make unlimited copies of them, and either pass them to buyers not targeted by the manufacturer (to improve their sales and profits), or worse, redeem the coupon on behalf of the buyers and pocket the difference. We discuss methods to prevent and control such fraud.

Then we describe the software required to issue and redeem coupons on the Internet. In section 5 we describe the components of an electronic coupon. Then in section 6 we describe the implementation of a store coupon application. We have prototyped the mechanisms to display coupons to the buyers, and the mechanisms to store coupons and redeem them at the time of purchase. In the last section we discuss the impact of duplication and trading of electronic coupons (facilitated greatly by the Internet) on the effectiveness of a sales promotion campaign.

Electronic coupons are already offered on the Internet. In most cases, the coupon is an image that can be printed to create a paper coupon which is then taken to the store. In some cases, only a bar code is printed at the shopper's terminal which is scanned at a kiosk at the store to print the corresponding coupon. Finally, at cash registers in many grocery stores, the purchase order is analyzed at checkout to determine the coupons to be offered for future shopping visits, and these coupons are printed at the cash register. Third party intermediaries are also emerging as coupon distributors. They promote a site where shoppers can come and collect coupons from various manufacturers and stores.

2. Different types of traditional coupons and e-coupons

There are many different kinds of coupons. A *typical coupon* is a piece of paper or electronic document, which is either distributed widely in a certain geographic area (mass mailing), or mailed to selected shoppers in a area (direct mailing). In the next section we will discuss how individuals are chosen in a geographic area for sending coupons. These coupons typically have an expiry date of a few weeks to a few months associated with them.

Loyalty awards are essentially points given on purchase of some thing, which can later be redeemed for some merchandise. Frequent flyer miles is a good

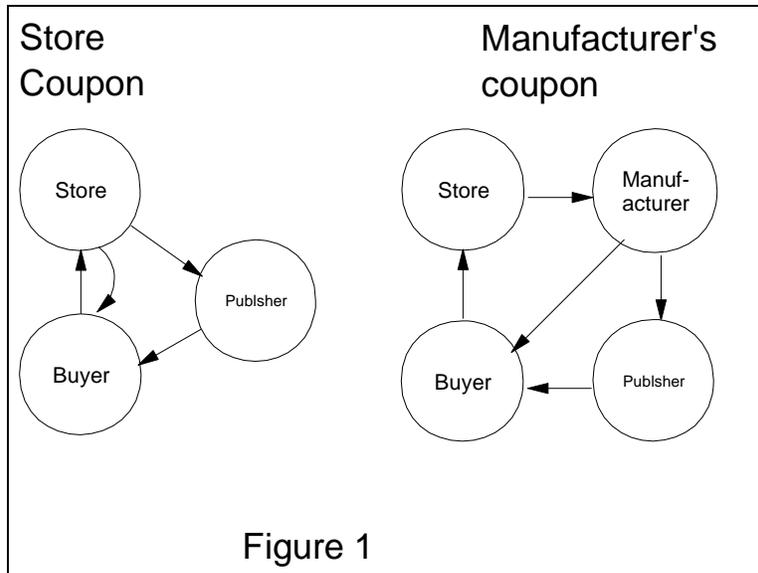
example. Coupons are used to handout loyalty points which can later be redeemed for merchandise. Coupons can also be used to carry out 'two for the price for one' deals. These deals are partly loyalty award and partly an incentive to increase consumption of the product being promoted.

Gift certificates can also be viewed in the framework of coupons. Gift certificate is essentially a coupon issued by a store which has minimal restrictions on what merchandise can be purchased at that store, and is paid for by a shopper wishing to buy a gift rather than from the stores marketing budget. It would use much of the same technology to control duplication and fraud as regular store coupons.

Electronic version of the above mentioned type of coupons can be implemented for use on the Internet. Additionally, a new type of coupon, which has no analog in the paper coupon world and can be offered only on the Internet, is the *instant rebate*. This coupon is issued to a shopper who is vacillating about a purchase. The purpose of the coupon is to induce the shopper to buy the merchandise immediately. For example, an item can be discounted for a short time if the buyer stays on the page for a long time or returns to it often. This kind of coupon is usually good for a few minutes or hours. In this mode the use of a e-coupons is similar to price negotiation or haggling between a buyer and a seller in real world situations.

Instant rebate coupons can also be use to mark down the price of a commodity for a short period of time to create a 'daily-special' or fifteen minute special. In the latter case the instant rebate coupons will be shown indiscriminately to all shoppers rather than only the shoppers who have shown vacillation This is very similar to the price mark downs on TV home shopping channels. This differs from the haggling mentioned in the previous paragraph. Here the discounting is not based on direct observation of a buyers reluctance to buy.

As mentioned earlier, traditional coupons can be classified as *store coupons* and *manufacturer's coupons*. E-coupons will also come in both varieties. Store coupons entail a two or three party transaction as shown in Figure 1. The store either prints the coupons and directly distributes it to the buyers, or has the coupons printed in a local magazine. Buyers clip the coupon from the printed material received from the store or from the magazine and redeem the coupon at the issuing store. Manufacturers coupons are distributed to buyers either directly through mail or as inserts in products, or through publications in national



or regional magazines. Buyers redeem the coupons at the store and the store in turn is reimbursed by the manufacturer for the coupons it accepts.

3. Distributing coupons to select shoppers

Currently store coupons are generally mailed indiscriminately to local geographic area (mass mailing). They are also targeted to buyers with specific buying pattern or past purchase history at the store (direct mailing). For example, coupons for charcoal may be sent to people who bought a grill at the store, or charcoal at the store in the recent past. Manufacturer's coupons are invariably targeted either geographically or guided by buyer segmentation (by income, profession, etc.). Choosing where to publish the coupons (if they are not mailed directly) helps create this segmentation. Manufacturer's coupons are also dispensed at the point of sale, attached to the merchandise (for cross sales, up sales and immediate discounts), or presented with the product as mail in rebate.

Mechanisms to estimate a buyer's or buyer group's inclination to buy various products based on his purchase history are numerous and well known and currently used to target advertising and coupons. Cross selling and up selling are other important uses of traditional coupons. In cross selling, the purchase of some product, say dress shirt, creates the knowledge that the buyer is possibly also well disposed to buying ties, and he can be encouraged to buy ties at a later date

by sending him a coupon for a tie. In upselling incentives are given at the time of purchase of a product to buy upgrades or accessories to that product. For example, the purchase of a personal computer and not a printer may suggest that the coupon for discount on printers should be sent to the buyer.

The Internet improves the effectiveness of targeting coupons to buyers who would have otherwise not bought the product being discounted. An essential component for effective targeting is the software to make decisions on which coupons (if any) to show to a particular buyer and when. Buyers should be given coupons for products that are just below their buying threshold. The up sales coupons and cross sales also can be made more effective by using instant rebates instead of the traditional mailed coupons.

Maintaining a profile of buyers interests, likes and dislikes is another way to determine which products fall just under each buyer's buying threshold. These profiles will be populated by: 1) summarization and analysis of buyer's past purchasing behavior, 2) information obtained from external sources such as county records, department of motor vehicles, local schools etc., and 3) Information provided voluntarily by the buyer through interactive dialogues, sweepstakes, and games. The external sources mentioned earlier tell a seller what kind of car does the buyer drive, how many children he has and of what ages, what type of house does he live in. This can be used to formulate rules for what products should be promoted to a buyer.

Click stream analysis allows a merchant to instantaneously gauge the interest of a web site visitor

on different products and product categories. He can then use this information to generate instant rebate coupons on the fly. This can not be done with paper coupons. For example, if a buyer scans several brands of some product and then switches to scanning a different product without selecting the first one for purchase, it may be an opportunity to give a buying incentive for the first product through an e-coupon. Similarly, if the buyer revisits a high priced product several times without buying it, or spends a long time on details of a product, the product may be ripe for instant rebate. Click stream analysis coupled with information from the buyers profile will make couponing on the Internet extremely effective.

It is important that the rules for issuing coupons and instant rebates not be obvious to the buyers. Otherwise the buyers can simply exhibit the appropriate behavior to get the rebates even if they would have otherwise bought the product at its regular price. This situation is similar to the current situation of buyers waiting for after Christmas sales.

Based on the preceding discussion we can classify coupons by two attributes, *targeting* and *distribution*, as shown in Figure 2. The targeting attribute is a measure of sophistication used in selecting the buyers who will receive the coupons. The distribution attribute is a measure of control exercised in restricting the number of coupons distributed. As we will see in the next section, the security features needed to implement coupons are dictated by the need to preserve these two attributes.

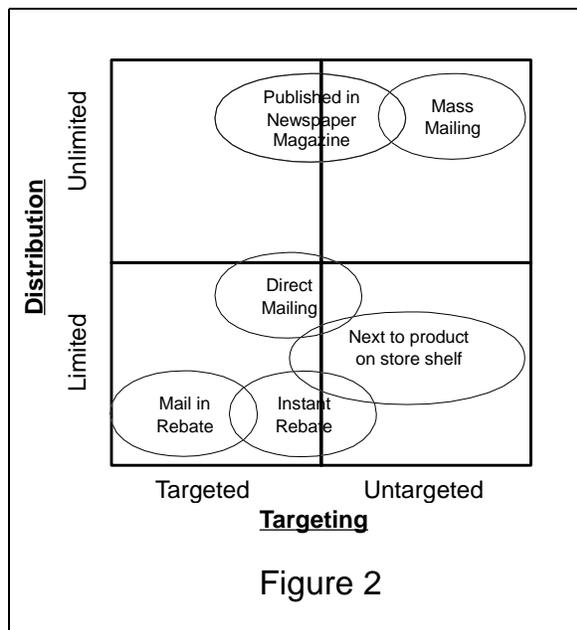


Figure 2

To simplify discussion we will deal with four types of coupons, untargeted and unlimited distribution, untargeted and limited distribution, targeted and unlimited distribution, targeted and limited distribution, corresponding to the four boxes in Figure 2. The distinction between adjacent boxes is fuzzy. We can have a mixture of the two. Targeting can be based on geography, demographics, etc., and we can be selective about the dimensions on which the coupon is targeted. In other words targeting can be for very large groups (nations or continents), or very small groups down to the level of individual. Targeting alludes to the manufacturers desire to choose who gets the coupons.

Distribution is never truly unlimited because it is limited by the distribution mechanism itself. Even with mass mailing one can only access people who can be reached by bulk rate US postage. Here we are basically alluding to the manufacturer's desire to limit the number of coupons distributed regardless of whom the coupon is distributed to.

4. Security issues in E-Coupons

Various digital cash schemes provide a good starting point to control fraud in e-coupons. However, duplicate spending by the digital cash holder can be prevented only by online verification, an expensive proposition for manufacturer coupons of small denominations. If online verification is not used, the bank can at best determine whether the buyer carried out the duplication or the seller did it [2]. Anonymity is often not a big concern in e-coupons, and hence the known digital cash algorithms can be simplified. Finally, digital cash algorithms assume that if the attempt to defraud is detected with sufficiently high probability, though not with certainty, sufficiently stiff penalties can be used to deter fraud. Though applicable in the world of finance, this may not hold true in the world of e-coupons. It will be difficult for Proctor and Gamble to prosecute grandma for reusing an already used coupon. In this section we discuss the security measures required to preserve the targeting and limited distribution of coupons.

Capturing coupon on the client side:

In the electronic world, coupons will be published in a publicly accessible magazine on the Internet or on a web site. If the coupons are embedded as a gif file, plugins will be required for the browser to

capture the coupon. The plug in could print the coupon directly on a printer, requiring the buyer to take the paper coupon to the store. However, the preferable method would be to capture the coupon on the buyer's system using client-side coupon application called a coupon wallet. The coupon wallet would allow the buyers to organize and search for the electronic coupons or e-coupons. When shopping in an electronic store on the Internet, the e-coupons can be redeemed directly from the coupon wallet. However, if they have to be redeemed at a physical store, they will have to be transported on a physical medium such as smart card.

Digitally signing the coupon:

At the minimum, every manufacturer's coupon will be digitally signed by the issuer. This is needed to ensure that the three key fields of a coupon, 1) the product, or product group, to which it applies, 2) coupon value; and 3) the expiry dates are not tampered with by either the consumer or the retailer. This is also needed to prevent pranksters from introducing spurious coupons. For the latter reason store coupons must also be signed.

The above would suffice for unlimited distribution coupons. Such coupons can simply be downloaded from the site where they are offered. However, for limited distribution untargeted coupons, each coupon will also include a unique serial number, and for targeted coupons the digital identity of the coupon recipient. The digital identity could be recipients name and address, or some other equivalent identification such as digital certificate or e-mail address.

Both the serial number and digital identity, if present, will also be signed along with the item, value and expiry date fields. Now the coupon can no longer be simply downloaded from the publishers web site. A coupon-server web-application has to be invoked either at the publishers site, or the coupon issuer's site, to assign the unique serial number and incorporate the recipient's identity. Identity of the recipient could be provided to the coupon-server application by the client coupon-wallet application.

Preventing unauthorized coupon duplication:

When coupons are valid only at a single store, the coupon sequence number solves the problem of unauthorized duplication of limited distribution coupons. The store will simply maintain a list of all redeemed coupons and thus a duplicate coupon will not

be honored. If store-issued coupons can be redeemed at multiple branches of the store the list of redeemed coupons will have to be kept at a centralized redemption server serving all stores or be replicated at redemption servers distributed across stores. This approach of requiring each coupon to be screened for potential duplication would also work for manufacturers coupons. However, it is more expensive because third party Internet service providers have to be used to handle the coupon validation traffic over a large geographic area. For manufacturer coupons this approach can be used for coupons of large value, several dollars at today's Internet transaction costs.

An alternative way to avoid duplication of manufacturer's coupons is to restrict the redemption of the coupon to a particular store when the coupon is issued, and require the store to maintain the list of redeemed coupons and screen coupons for duplication before redeeming them. When a buyer wishes to receive a coupon, he is asked about which store he will go to redeem the coupon, and the store's address field is included in the coupon before the coupon issuer signs it. This assumption appears to be reasonable and is advocated also in the Millicent protocol [3].

Preventing unauthorized coupon exchanges:

A 10% off coupon on a big appliance can be of substantial value. Unless coupon trading is curbed, coupon exchanges will surely emerge on the Internet. In the real world it is difficult for a shopper planning a purchase to locate another person who has a coupon for that purchase but does not intend to use it. Even if the person with a spare coupon can be located, the exchange of coupons is inconvenient and time consuming. Internet makes the search for spare coupon much easier, and they can be exchanged simply by e-mail. Chat rooms and coupon trading sites will surely emerge to trade coupons.

To prevent undesirable exchanging of coupons, especially the limited targeted coupons, each coupon is stamped with the digital identity of the buyer or buyer group to whom the coupon is issued, as mentioned in a previous section. This information should be verifiable at the store at the time of coupon redemption. This is easy for coupons of large monetary value which are used for large purchases such as TV's and big appliances. Stores routinely ask for this information at the time of purchase of large monetary value such a large appliances, and this information can be compared with the information contained in the coupon.

Retailer fraud:

The most obvious form of retailer fraud is for retailers to collect a large number of coupons from a web site that is publishing the coupons. Of course, the retailers would have to obtain those coupons through a phony set of names and addresses. Then these coupons can be redeemed by the retailer to either reward his customers or he can somehow redeem these captured coupons and pocket the proceeds. This type of fraud can be controlled by ensuring that obtaining large number of phony identities is difficult.

A practical way to handle this situation currently is to require that coupons be published at sites that require users to register before they get access to the site. News media and magazines and Internet service providers (ISP) will meet this criterion. When a buyer clicks on a coupon to capture it, the publishing site will provide the registration information about the user such as his name, address and telephone number to the coupon server. This information will be encoded in the issued coupon, as is done to prevent coupon trading. Now to capture a large number of coupons from the coupon site the retailer will have to keep either multiple subscriptions to newspapers/magazines or maintain multiple accounts with an ISP, both of which are economically unattractive. News media and ISPs would probably be willing to provide this service because it makes couponing on the Internet practical and provides coupon publishing revenue to them.

A second kind of retailer fraud is possible where a retailer makes multiple copies of a coupon he receives from some shopper. Even if retailers are required to maintain a record of the coupons redeemed at their store and prevent duplicate redemption, they can exchange lists of coupons with other retailers. In both cases the retailers will blame the duplication on shoppers. We are looking into off-line digital cash mechanisms and other approaches for solutions to this problem.

5. Structure of E-Coupons

An electronic coupon will contain the description of the product/package to which the coupon applies, its value, restriction on its use, and several other fields which are described next.

The description of the product or package:

Figure 3 illustrates the implementation of product/package and coupon value. Package is essentially a list of references to products (particular brand name or model number), or product categories (all Sony TVs, all 25" TVs, or all electronic appliances). For each item in the list, an amount is specified. Amount can be count, weight, or value of purchase. Package specifies the list of products and their quantities that a shopper is required to have in order for the coupon to be applicable. Thus, a package can specify multiple items of a kind, like 5 shirts, or bundle of different products like combination of shirts and ties. Information referenced through the product field in the package might include a text description of the product, a UPC bar code for the product or package, or a store's SKU number (for store coupons).

Coupon value:

The value of a coupon, as illustrated in Figure 3, is specified as a combination of one or more of the following components:

1. Discount on items in the package. Discount can be specified for all items, some items, or even no items if not both of the next two value components are null.
2. Discount on the items in the shopping basket (purchase order), which are not part of the coupon package. These are represented as optional purchases table in Figure 3.

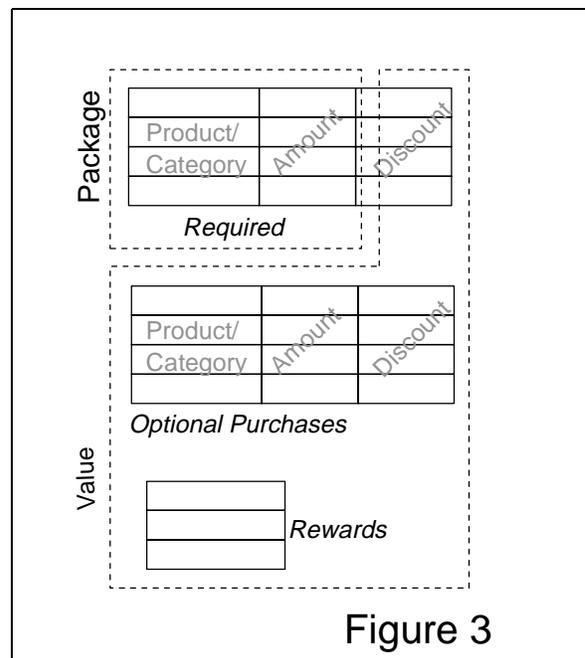


Figure 3

3. Rewards other than discount on products being purchased such as bonus points or frequent flyer miles, free fitting on clothing, or free tickets to a concert or game, or coupons for a future purchase.

The discount for required and optional purchases can be a fixed dollar amount, or a percentage of the price of the product to which the coupon is applicable. The discount could also be a function of the amount of purchase.

For simple coupons this list will have only one row in the package list and no optional purchases or rewards. Same is true for “buy one get one free” or “buy n items get m free items” type of coupons. The discount function can handle such coupons. Coupons such as “50% off on the price of shirt when you buy a pant”, or “shirt free with pants” can be handled by having two rows in the package list. Coupons like “Take 20% off on up to 5 ties when you buy a suit” is handled by putting ties in the optional purchase table. The discounts can be made much more complex by employing all the three value components with multiple entries in each of the corresponding lists (if the objective is to confuse the buyer).

Restrictions:

Restrictions specify the expiry dates of coupons and geographic areas where the coupons are valid or not valid. Store coupons may also include specify days of the week or time periods during a day in which coupons will be valid or not valid.

Display support:

Coupons are displayed to buyers at several occasions:

1. Offer to the buyer to capture the coupon.
2. Coupon displayed when buyer initiates a search or scans his coupon wallet.
3. To remind the buyer of a coupon in his wallet at an opportune time, i.e., to lock in a sale, or to create a cross sale.
4. At the time of redemption.

In an object oriented implementation, a coupon object would provide multiple display methods to handle the different display situations. Different graphics could be used with these different display methods. An elaborate display will be used to present the coupon at the publishers site to attract potential buyers’ attention and encourage them to capture the coupon. This display method is part of the coupon

template discussed in the next section, but not a part of each coupon. The rest would be simpler by comparison. Simplicity is required here for an added reason, to keep the size of the coupon files stored at the client side small. Information can be added in the coupon to specify the conditions under which the coupon wallet will generate reminders.

Coupon serial number and buyer and store identity:

The purpose of these fields was discussed earlier in the section on security issues.

6. Software for store-coupons

In this section we describe the software for handling store coupons. A complete store coupon application consists of the following key steps:

- Targeting the coupon to a segment of potential customers.
- Delivering the coupon to the targeted potential customers
- Providing the mechanisms for the customers to store and search for coupons
- Helping users redeem coupons that are applicable to their purchases

Figure 4 shows the steps of coupon cycle from the decision by store to issue the coupon to its redemption at the store. A store coupon application would work in conjunction with any of the commonly available Internet storefront products such as IBM’s Net.Commerce. These products use relational databases that can be extended to support couponing functions. The first such extension required is to create a coupon wallet for each shopper which contains all the coupons issued to the shoppers. Wallets for all shoppers are maintained in the store application. In our current implementations, buyers do not have a coupon wallet on their personal computer to capture the coupons published by the store in a magazine.

The coupons in the coupon wallet have a link to product’s description. Coupons redeemed by the shopper are retained in this file for a certain period specified by the store, but are checked off to prevent repeat redemption. This allows the store to analyze shoppers’ coupon redemption behavior. The different

steps of the electronic coupon application are described next.

Seller’s coupon management system:

Tools are provided for the store manager to create coupon templates. To issue coupons to buyers, the store manager selects one of the several lists or groups of shoppers and a coupon template. A coupon created from that template is generated for each shopper. Shoppers can be notified by mail, or via other online mechanisms that they have received a coupon. Coupons are also acquired by the shopper directly from various pages of the store’s web site, or on buying selected products (cross-sales and up-sales). Tools are also provided to create daily specials, instant rebate, and cross-sales and up-sales coupons.

The coupon template contains information common to all coupons issued in a campaign and generates analysis data to observe the success/progress of the campaign. That would include all information specified in the previous section except the serial number, and identification of buyer and the store where the coupon will be redeemed. In addition to this information the template would specify the maximum number of coupons to be distributed, the number of coupons actually distributed and the number of coupons redeemed. Each of these numbers could be further

broken down by time periods and geographic areas. As mentioned earlier, the template also has a high quality display of the coupon.

Coupon presentation and capture:

Once the seller decides to issue a coupon to a set of buyers, he can place the coupon directly in the buyers’ coupon wallet. The buyers are also allowed to set up filters to restrict the kind of coupons (products and brands) they receive in their coupon files. However, a preferred alternative would be to present the coupons to a buyer when he first connects to the seller’s site and let the buyer select which coupons he wants to accept in his wallet. Filters can still be used to restrict the coupons that are presented to the buyer.

Coupon search and report:

When a buyer is viewing an item in a catalog, for which he has a coupon in his wallet, he can be prompted with this coupon. He will also be prompted with instant rebate coupons which are maintained at the seller’s site, rather than in his wallet.

Coupon search and report:

Buyers can create a preference profile to indicate preferred products and product categories. Coupons displayed to a user are ordered by this preference. Search metaphors are provided to allow the buyers to search for coupons in the coupon file, and from these coupons hot links are provided to the detailed description of the product featured in the coupon. Buyers can be presented with a report on how much money they saved with coupons over some preceding time interval. This report may be requested by the buyer or presented to him voluntarily at some opportune time. Finally, when viewing available coupons, the buyers can delete the ones they no longer care for.

Coupon redemption:

At the time of finalizing their purchase, users are presented with the applicable coupons in their coupon file and given an opportunity to redeem the coupons they choose. Since many coupons may be applicable to the same purchase, when a coupon is selected for redemption, several other coupons will become inapplicable and will be removed from display. An alternative would be select the set of coupons which results in maximum reward for the user and give the user the opportunity to accept or modify this selection.

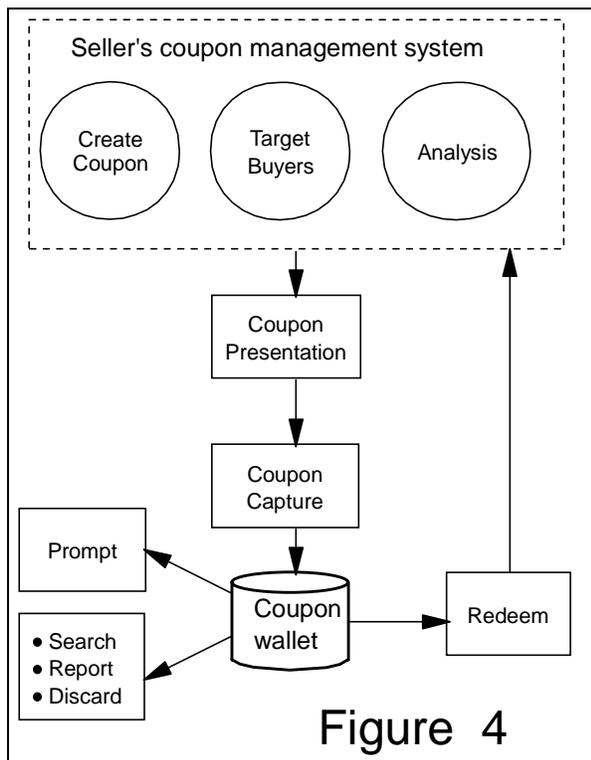


Figure 4

Cross-sales and up-sales coupons are also presented to the shopper when purchases are being finalized. Finally, a user could select a coupon for which he does not have the complete set of items specified in the optional purchase part of coupon value. In this case he can be reminded about the discounts available on the items in the optional purchase set which are not in his shopping basket.

We believe that from the seller's perspective it is important to require a conscious attempt on part of a buyer to redeem a coupon. The objective of a couponing campaign is to provide incentive to buyers who would have otherwise not purchased the product featured in the coupon. If the coupons are redeemed automatically, they would also be redeemed for people who would have bought the product without the coupon. This essentially is lost profit for the seller.

7. Discussion

In the preceding sections we made several assumptions about handling coupons on the Internet. For example, we said that trading and duplication of coupons would hinder forecast of redemption rates, and that duplication and trading would have to be prevented. In this section we preset our rationale behind these assumptions.

Do coupon duplication and trading impact forecasting of redemption rates ?

The number of paper coupons published in a magazine that will be redeemed can be calculated because the circulation of the magazine in which they are published is known and relatively stable, and past redemption rate can be used to predict the future redemption. However, with duplication, a person or family that redeemed a paper coupon once, will now redeem an electronic coupon on unpredictable number of occasions, especially trying to stock up for future.

Trading of coupons transfers the coupons to people whose characteristics, like demographics, will be completely different from the ones to whom the coupons were initially targeted. Hence the ability to predict redemption rates, even in the absence of coupon duplication, is severely diminished. In subscription based magazines, hyper linking of the content within a site as opposed to linear organization of paper magazines, will complicate the ability to use the number of subscriber log-ins to estimate the number of times a coupon is viewed.

Is it necessary to prevent coupon duplication and trading ?

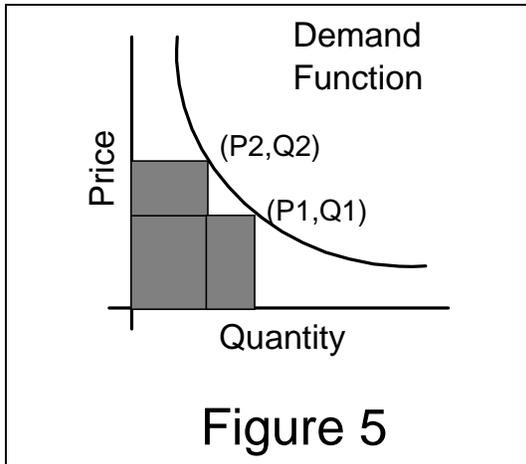
In some cases duplication and trading of a coupon are not an issue. If coupons are being used to publicize price reduction for the purpose of liquidating excess inventory, duplication and trading would be even desirable. However, if the coupons are being targeted to nonusers of a brand, trading will divert it to the users of the brand. For example, if Joe always buys brand A of coffee and Joe gets a one dollar coupon for brand B, Joe may be quite willing to sell it to a brand B user for seventy five cents, defeating the goal of brand B's manufacture.

Should coupons be easy or difficult to use ?

Good programming instinct tells us that coupons should be extremely easy to find and use. One would even be inclined to devise programs which can automatically find coupons of products defined as desirable by a consumer, and automatically redeem them. However, stores and manufacturers will have a different point of view, especially for unlimited distribution untargeted coupons.

Using paper coupons has some degree of difficulty. The shopper has to remember to clip them, take them to the store, and then redeem them. Therefore, only a few people use them. (The redemption rate of grocery coupons is around 2 to 3 percent.) Thus, the degree of difficulty in using the coupon divides shoppers into two groups, one willing to endure the difficulty to get a lower price, and the other willing to pay the higher price to avoid the inconvenience of redeeming the coupon.

Figure 5 shows an hypothetical aggregate demand curve for a product. If no coupons are used, quantity Q2 is sold at full price P2, shown as the hashed area in Figure 5. If coupons are used automatically and thereby everybody uses them, quantity Q1 is sold as discounted price P1 resulting in revenue P1 times Q1. However, if using coupons is sufficiently difficult to prevent the buyers willing to pay the price P2 from using the coupon, but not to discourage the buyers who can afford only P1, added revenue indicated by the dotted area can be obtained. Paper coupons create this selective usage of coupons by making them somewhat cumbersome to use. Similarly, E-coupons should also require involvement on the part of the buyers, so that those willing to pay the higher price continue to do so while new buyers are attracted by the coupon.



The above discussion also explains the fact that coupons valued at multiple dollars are in form of mail-in rebates. Redeeming them is more difficult than just clipping it off a magazine. Applying for mail-in rebates becomes very easy on the Internet, and therefore we expect that either they will be used sparingly on the Internet, or they will be turned into a more complicated process.

8. Summary and future work

In this paper we discussed the basic mechanisms needed to issue and redeem coupons on the Internet. We alluded to but did not cover the details of click-stream analysis and user profile, and how the two are used to effectively target potential buyers. These are integral components of a couponing application and we will be looking at them in future.

The fraud control mechanisms discussed in this paper relied on an online server to check against duplication of coupons. Off-line techniques to detect duplication is important because online techniques are invariably more expensive, and are probably not economically feasible for coupons of low monetary value. We discussed the implementation of a store coupon system. We will be extending it to support manufacturer's coupons which would require the design of client side coupon wallets, and implementation of fraud control techniques alluded to in this paper.

According to trade magazines, the coupon issuers are issuing fewer coupons compared to early nineties, and consumers are redeeming a lower percentage of them. This is attributed to the good economy, which reduces the importance of the discount offered in the coupon. Also, there is a clear shift

towards issuing coupons of higher value to more narrowly targeted set of consumers.

Acknowledgment

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References:

- [1] Philip Kotler, "Marketing Management - Analysis, Planning, Implementation, & Control," seventh edition, 1991, Prentice Hall, ISBN 0-13-552480-6, pp. 631-639.
- [2] Bruce Schneier, "Applied Cryptography," second edition, 1996, John Wiley & Sons Inc., ISBN-0-471-11709-9, pp. 139-147.
- [3] M.S. Manasse, "The Millicent protocols for electronic commerce," First USENIX workshop on Electronic Commerce, July 11-12 1995, pp. 117-123.