

# MOBILE ADVERTISING ENGINE FOR CENTRALIZED MOBILE COUPON DELIVERY

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## ABSTRACT

*During the past decade, the preferred medium for advertising has seen a dramatic shift away from print media and other traditional means of distribution. In 2009 alone, it is estimated that advertising spending dropped by between 10 and 20 percent for newspapers, consumer magazines, radio, and television while increasing an estimated 9.2 and 18.1 percent in Internet and mobile advertising respectively. Driven by the high cost of print media, lower redemption rates on print coupons, and correspondingly higher redemption rates for mobile and Internet coupons, companies are beginning to adopt and develop mobile campaign management strategies to adapt to the changing market. However, presently the majority of mobile and Internet campaign management platforms are developed on a merchant-by-merchant basis. Customers must either download a separate mobile phone app or visit and register at a different web site for each merchant to obtain their coupons. In this paper, we present a more centralized coupon distribution approach using a Mobile Advertising Engine that aggregates coupons from multiple corporations, tracks point of sales redemption, and reports campaign effectiveness using a mobile marketing and reporting platform.*

**JEL:** M3; O3

**KEYWORDS:** Marketing, technologies

## INTRODUCTION

We are living in an increasingly “smarter” mobile world. As will be shown in the next section, recent trends indicate that smartphone sales are on the rise, traditional forms of media (e.g. newspaper, magazines, and radio) are on the decline, users are becoming increasingly comfortable with accessing information and making purchases with their smartphones, and most major brands are moving towards mobile marketing. If the projected growth in mobile smartphone adoption and usage is realized, along with the expected increase in mobile marketing by businesses, care must be taken to provide customers with a superior user experience. With respect to mobile coupon delivery, which is the focus of this paper, providing the most appropriate coupons at the most appropriate times, and only in the quantity desired by the consumer, is vital to achieving this goal.

As more businesses move toward mobile marketing and couponing on a per-brand basis, a major issue arises; for consumers to take advantage of each brand’s coupons and offers, they must access each via a separate mobile web site or mobile application (or app). The users’ experiences are tarnished as they log on and register for each different site or download yet another app onto their phones, completing yet another registration in doing so. Likewise, each time they wish to search for coupons, compare offers, or redeem a coupon, they must access separate sites or apps to do so for different brands or merchants. Instead, should many brands and merchant coupons be accessible via a single app or mobile site at times when the users need them, consumer satisfaction should increase. Also, marketing programs must be able to target individualized preferences and behaviors and be able to measure the return on investment (ROI). With traditional marketing, companies target their advertising to broad geographic areas with a wide variety of demographics. There is no way of determining the effectiveness of the specific advertisement on a specific demographic.

In this paper, we present a framework that provides an effective solution for both the consumer and businesses. The Mobile Advertising Engine (MAE) integrates real-time campaign management, location intelligence, redemption and reporting into a web service that businesses can use to acquire new customers and increase overall customer loyalty. One of the primary qualities that separates this mobile advertising engine from other advertising methods is the MAE's collective nature, namely that it aggregates all participating businesses and their coupons in one system. This attribute not only provides businesses the ability to obtain an accurate understanding of their customers' purchasing patterns and the ability to target different audiences based upon their location and redemption history, it implicitly provides a new channel for helping customers find merchants when they are most in need of their products and services. Another critical component to the MAE framework is that it provides customers with the ability to opt-in only to the brands of their choice and to opt-out of any or all brands should they choose to.

In the next section, we provide a literature review detailing why the present trends indicate a robust environment for mobile marketing and coupon delivery. In the subsequent section, we describe the MAE framework and its interfaces to the consumer and merchants. In the final section, we conclude by outlining the limitations of the present work and provide suggestions for future research.

## LITERATURE REVIEW

In its annual report on mobile phone and smartphone market shares, the Garter Group estimated that last year 172 million smartphones were sold worldwide, up 24 percent over 2008, while total mobile phone sales were flat at 1.2 billion (Schonfeld, 2010a). By April 2010, 85 percent of all mobile web traffic in the U.S. was delivered to and from Apple and Google Android smartphones (Wimberly, 2010), and Coda Research Consultancy projects that mobile data traffic is expected to rise 40-fold between now and 2015 (Schonfeld, 2010b). Banking on a surge in mobile advertising via smartphones, this year Google acquired AdMob for \$750 million (Shields, 2010) and Apple acquired Quattro Wireless for \$275 million (Kincaid, 2010), the two leading mobile advertising companies in the U.S. Also, CTIA, the International Association for the Wireless Telecommunications, released the results of its semi-annual survey on the wireless industry (CTIA, 2010). Some results from this survey included: more than 1.5 trillion SMS text messages were sent in 2009 compared to 363 billion in 2007, a four-fold increase; more than 24.2 billion MMS messages were reported in the last half of 2009, more than double the 9.3 billion sent in the last half of 2008.

Research also indicates that consumers appear to be becoming more comfortable with using smartphones for on-line banking and purchasing. According to a study conducted by the market research firm Data Innovation Inc., from a survey of 246 smartphone users, nearly 70 percent of those respondents used mobile banking and/or payment service in the previous three months (Butcher, 2010). Presenting the results of its quarterly Smartphone Intelligence survey, Compete, a Kantar Media company, found that customers are relatively comfortable with m-commerce, with 37 percent purchasing non-mobile items, 19 percent purchasing music, and 41 percent of iPhone and 43 percent of Android phone users checking sale prices at alternative locations from their handset during the previous six months (Compete, 2009).

At the same time, our access to some traditional media, such as newspapers and radio, is sharply declining (Perez-Pena, 2008; Fisher, 2008). Likewise, advertising spending as a whole is on the decline, down an estimated 7.6 percent in 2009 and anticipated to be another 1 percent drop in 2010 (Clifford, 2009), and those budgets are shifting away from traditional channels. As shown in Table 1, in 2009 the sharpest decreases in advertising budgets were in the traditional advertising segments: newspapers, consumer magazines, radio, and broadcast television. During the same period, however, correspondingly sharp increases in advertising budgets were found in the mobile and Internet segments. In 2006, the Mobile Marketing Association (MMA) published statistics indicating that 89% of major brands were planning to

market their goods via mobile phones by 2008 (MMA, 2006). In 2008, Juniper Research estimated that almost 3 billion mobile coupons will be issued to mobile phone users by 2011 with almost \$7 billion of discounts redeemed (JR, 2008), and by 2014, the mobile retail market will exceed \$12 billion (JR, 2010). While clearly in absolute dollars total advertising budgets in the traditional segments are still considerably larger than for mobile and the Internet, the trend towards more advertising in these latter segments is apparent. Also, while the intention of this paper is not to address where on the simplified S-curve mobile SMS or application adoption rests (Rogers, 1962), nor to predict future trends of such a diffusion model, it does assume that the present trend is more likely than not to continue, with greater adoption of mobile applications and mobile web applications inevitable.

Table 1: Advertising Budgets 2009

Segment	Percent Change '08 to '09	Total Budget 2009 (in billions)
Newspapers	-18.7	\$35.5
Consumer Magazines	-14.8	11
Radio	-11.7	15.8
Broadcast Television	-10.1	43.0
Mobile	+18.1	1.3
Internet	+9.2	23.8

*Predictions in the Communications Industry Forecast from private equity firm Veronis Suhler Stevenson (Clifford, 2009)*

This dramatic change in advertising and mobile and smartphone usage provides merchants with new opportunities to reach out to new and existing customers in innovative ways, via SMS messaging, mobile applications, and mobile web sites. For example, mobile coupon redemption rates, which can reach levels as high as 20 percent, are also considerably higher than corresponding redemption rates for traditional paper coupons, which typically are between 1 and 2 percent, and even for those obtained via the Internet (Holmen, 2009; Lavallee, 2009). However, in the Data Innovation Inc. survey, it was also found that poor mobile site functionality often led mobile users to abandon a mobile purchase, with 45 percent abandoning the process due to the site not loading and 38 percent doing so because the site was not developed for smartphone users (Butcher, 2010). Also, issues of privacy and consumer interest in receiving mobile advertisement, both solicited and non-solicited, must be addressed. Some of these concerns have been extensively examined, and the Mobile Marketing Association has published its "Code of Conduct" that mobile marketers are expected to adhere to (MMA, 2008). However, well-designed and easy to use mobile web applications are still not pervasive. Businesses expecting to attract mobile users will need to cater to their expectations for application layout and design and ease of use if they intend to retain them as long-term clients.

Also of importance for mobile marketers is the relevancy and timeliness of their advertisements (Gray, 2009). In particular, if customers opt-in to receive coupons, the likelihood of those coupons being relevant increases, and they are timely in that they are available when the customer needs them. This is especially true as more and more mobile phones become GPS-enabled and therefore location aware, allowing the consumer to find offers where they are when ready to use them. In such a dynamic environment, a major challenge for mobile marketers is to provide the most appropriate advertisements, coupons, or offers that their clients would find useful. Chiou-Wei and Inman (2008) investigated the drivers for electronic coupon redemption for five product categories during the period 2003-2005 and found that an increased distance between the customer and redemption location had a strong negative effect on redemption while expiration date did not. They also found that education and employment significantly influenced redemption rates for electronic coupons. These findings are consistent with those previously found by Steenkamp and Baumgartner (1992), namely that individuals who are highly educated and have higher income levels tend to engage in more exploratory information search behavior. Examining an extensive amount of consumer data over an extended period, Meyers and Litt (2008) found what they called the "sweet spot" in coupon redemption, namely when the coupon value and expiration

length criteria sync, that drives higher coupon redemption rates. Also, from one of its studies, ABI Research found that 70 percent of mobile coupon redemptions came from the tech savvy 18 – 34 age demographic (Gray, 2009).

## MAE FRAMEWORK

The MAE framework is comprised of five separate components: a web and mobile application for the consumer to access coupons from the content delivery system both from a web page and from a mobile phone; a web application for merchants to administer the campaign management system (CMS); a point-of-sales (POS) component to allow redemption of coupons at the merchants' physical locations; a central administration web application used to control all aspects of the MAE, including adding, removing, and managing merchant and consumer accounts; and a back-end analytics and reporting engine to learn user patterns and provide coupon recommendations to consumers on a personalized basis. The server framework was developed using a middleware paradigm, with the fundamental middleware service of the MAE being the Core Services (CS). While other add-ons may be incorporated into the MAE, the fundamental services for the MAE system are: Location Based Services (LBS), Real-Time Redemption Services (RTS), and Reporting Services (RS). The MAE prototype we developed was implemented using Ruby On Rails for the server and consumer's web interface, MySQL for the database, and the W3C Geolocation API specification (Popescu, 2008) for the mobile solution. While in general, the MAE framework can support various forms of content, for example Voting, Calls to Action, and Surveys, our prototype presently only supports coupons. As such, we will focus on coupon offers for the remainder of this paper.

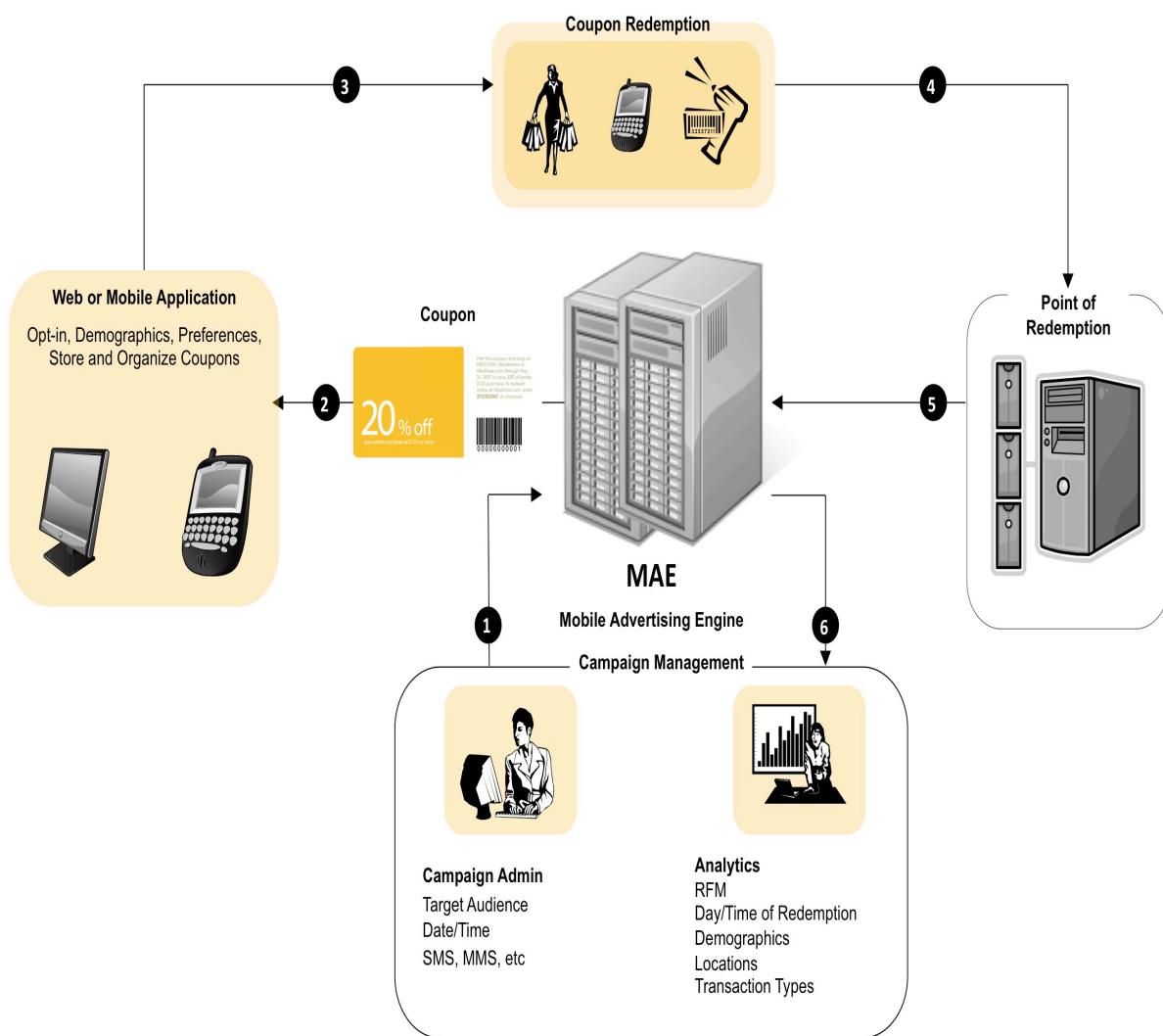
The MAE workflow is provided in Figure 1. The process begins (Step 1) with a merchant developing a campaign for providing coupons to a targeted audience. All members of that audience have opted-in for the particular merchant developing the campaign, as merchants do not have access to accounts for consumers who have not opted in with them. The campaign is bounded by a start and stop date and time, and all coupons entered into the system for the campaign are stamped with expiration dates corresponding to the stop time for the campaign. The merchant also selects a means of delivery for the campaign, namely SMS, MMS, or simply as coupons available to users via their web and mobile interfaces. The MAE launches the campaign (Step 2) at the start time provided by the merchant, at which time the coupons become available to users of the system; if SMS or MMS are chosen as the means of delivery, those messages are sent to the opted-in audience. In Step 3, the customers administer their own accounts. They may register on the MAE system, opt-in for merchants of their choice, set their account preferences such as categories of interest or password changes, or simply browse through available coupons from merchants they both have and have not opted-in for. They may save coupons of interest so that they are readily available when they need them, or they may search specifically for coupons that are available within a given distance (e.g. 5 miles) from their present location should they have GPS-enabled smartphones.

Steps 4 and 5 only take place for those users who redeem coupons. In Step 4, users have an option for redeeming their coupon(s). One option is that the users may present their SMS or MMS messages and their corresponding coupon activation codes or barcodes to the merchant for redemption. For an activation code, the merchant must key it into the POS system, while for a barcode, the merchant may either scan or key it in. Another option for the users is for them to print the coupons, for example from a home computer, from the web interface available to them. The printed coupons may be presented directly to the merchants. This latter option exists primarily for those customers who do not own mobile phones.

An example of the search and activate process for a mobile user is illustrated in Figure 2. In Figure 2(a), the mobile user is presented with all merchants within a given distance of the location determined by the MAE Location Based Services (LBS). The latitude and longitude of the user's location is displayed by

the prototype, though this data would not be displayed for a production application. Here, the user is presented with two merchants with offerings, namely *ABC Grill – Deland* and *Big-Box Mart*. Upon selecting *ABC Grill – Deland*, in Figure 2(b), the user is provided the address and an option to view the merchant's location on a map, as well as all of the offers available from that merchant. Other information could be provided here, such as phone number, hours of operation, or other merchant-specified details. Selecting one of the coupon choices in Figure 2(b) guides the user to a coupon detail screen as shown in Figure 2(c). By selecting the coupon, the user has “activated” the coupon, generating a unique coupon activation number specific to that user for the particular coupon.

Figure 1: Mobile Advertising Engine (MAE) Workflow



The MAE workflow process involves the following steps: 1.) merchant develops campaign for targeted audience, 2.) merchant launches campaign, sending SMS coupons to targeted audience while making coupons available to all users, 3.) customers manage their accounts, saving coupons of interest, 4.) customers redeem coupons, 5.) POS communicates with MAE server during coupon redemption, 6.) analytics engine processes data to determine better campaign strategies.

Figure 2: Sample Mobile User Search and Activate Process



An example of a mobile user searching for and activating a coupon to be redeemed at a POS: (a) user is provided with all merchants in area; (b) all coupons for a merchant are displayed; (c) a coupon detail view of a particular coupon with activation code is presented to the user.

Step 5 illustrates the communication between the POS and the MAE system. Complications due to hardware and infrastructure compatibility at the point of redemption presently make this a difficult problem to solve. While countries like Japan and Korea have more readily installed specialized mobile device readers at the POS, the U.S. and European countries have been much slower in doing so (Holmen, 2009). While image scanners that work at the pixel level are capable of scanning 1-D and 2-D bar codes off of phone screens, infrared scanners do not because the screens absorb too much light to effectively allow the black-white contrast to be picked up (Reedy, 2009). Also, even if image scanners exist at the POS, many POS systems, especially for larger brands, have software that is custom written. Therefore, integration with the particular software installed on the POS system must presently be done on a case-by-case basis.

For POS systems capable of interfacing with the MAE system, the redemption process provides tracking of which customers redeem which coupons. When a campaign is created, each coupon loaded into the system is provided with a unique coupon ID. As each customer also has a unique customer ID, and each merchant has a unique merchant ID, the MAE system records which coupons each customer at a given merchant redeems at a given time. When an activation code is keyed or scanned in, the POS system communicates with the MAE to validate the coupon. If the coupon is valid, the MAE sends a response code indicating so, along with the information needed for the POS to issue the discount. Therefore, not only is the discount provided to the customer, the MAE system stores that information as well. By recording consumer redemption patterns and utilizing the MAE server's Reporting Services (RS), targeted recommendations for other coupons that the user may be interested in are possible, as is campaign reporting and customization that will lead to more tailored campaign creation (Step 6).

In Figure 3, sample web pages for an existing campaign are illustrated. In Figure 3(a), a quick view of a campaign that is either in progress or completed is displayed. As campaigns progress the merchant is able to monitor its redemption rate of specific offers and change or end them if interested in doing so (in Figure 3(c).) A merchant is also able to view, add, or remove different locations under its purview. While not the most ideal means of redeeming coupons at the POS, Figure 3(d) provides a quick and easy prototype approach to redeeming coupons. The merchant at the POS only need enter the activation code and submit the request to allow a coupon to be redeemed. Other more effective approaches include either installing a redemption terminal or an image scanner. For the latter case, activation codes would have a corresponding bar code displayed in the mobile user's handset display or for printing on the web interface.

Figure 3: Sample Merchant Web Interface for Monitoring Campaigns

The figure consists of four screenshots labeled (a) through (d), each showing a different page of a merchant web interface. All screens feature a header with a large 'M' logo, the text 'Mobile Offerings', and a login status bar.

- (a) ABC Grill Merchant Dashboard:** Shows a summary table for offers. The table has columns: Offer Name, Total Coupons Saved(CS), Total Coupons Redeemed(CR), and Redemption Rate (CR/CS). Data rows show 'a hamburger' with 1 saved and 1 redeemed (100.0%) and 'drink' with 1 saved and 0 redeemed (0.0%).
- (b) ABC Grill Merchant Dashboard:** Shows a table of locations. One row is visible for 'ABC Grill - Deland' at 421 N. Woodland Blvd Deland 32720, with coordinates 29.0349, -81.3019. Buttons for Show, Edit, and Destroy are shown.
- (c) ABC Grill Merchant Dashboard:** Shows a table of merchant offers. The table includes columns: Offer name, Type, Value, Valid from, Valid till, and Activated. Two offers are listed: 'a hamburger' (Type 1.0, Valid from 2010-01-01 00:00:00 UTC, Valid till 2010-12-29 00:00:00 UTC, Activated true) and 'drink' (Type 100.0, Valid from 2010-01-01 00:00:00 UTC, Valid till 2010-12-29 00:00:00 UTC, Activated true).
- (d) ABC Grill Merchant Dashboard:** A prototype redemption page. It has a 'Redeem Coupon' button and a 'Submit' button below it. A copyright notice 'Copyright 2009' is at the bottom.

Sample pages for a merchant campaign: (a) a quick view of a campaign either in progress or after complete; (b) a listing of all locations a merchant manages campaigns for; (c) a listing of all offers and whether they are active; (d) prototype redemption page for merchant to key in coupons being redeemed at POS.

Keying in activation codes at the POS slows the redemption process down and leads to a less than optimal experience for both customers and clerks. Even scanning bar codes may be improved upon, particularly when a single customer is redeeming multiple coupons during one transaction. Near-field communication (NFC), a short-range communications technology with a maximum range of only 10 cm, provides a better solution not only for coupon redemption but also for mobile payments (NFC-Forum, 2010). While presently not widely used in the U.S., by waving a NFC-enabled mobile handset in front of a NFC receiving POS device, secure mobile banking and mobile payments to and from customer accounts is already possible (Talbot, 2009). Most mobile handsets, including iPhones and Blackberry phones, may be retrofitted with NFC hardware (Clark, 2009). However, as is the case with the lack of pervasively installed image scanners capable of reading bar codes, most POS systems presently are not capable of communicating with NFC-enabled mobile devices.

A major advantage of the MAE framework is that once a campaign is launched, while only opt-in customers are sent SMS or MMS messages, every consumer in the system can access the coupons via the web and mobile interfaces. When a consumer finds a coupon of interest, upon redeeming that coupon, the customer now is opted-in to that merchant. That new customer's information (e.g. email address, home zip code, interest category preferences) is now available to the merchant. Individual companies developing their own campaign management and mobile coupon delivery systems only have their own customers accessing their mobile coupons. To drive more consumers to their sites, merchants must either use more traditional media to do so, for example television, radio, or newspaper advertisements, or less traditional channels such as the Internet (including social networking). They also may receive new mobile or email customers by having them sign up when making a purchase on-line or in their stores. However, having many users conveniently accessing their coupons, for example, when those users are driving in the vicinity of the merchants' stores, provides merchants with a new channel for targeting consumers when they are closer to the point of sale at a time when they may need goods or services that are available by the merchant.

## CONCLUSIONS

In this paper, we presented a centralized coupon distribution framework using a Mobile Advertising Engine (MAE) which aggregates coupons from multiple corporations, tracks point of sale (POS) redemption, and reports campaign effectiveness using a mobile marketing and reporting platform. As advertising budgets continue to shrink, and as advertising effectiveness through traditional media continues to wane, advertising and customer loyalty building via the Internet and mobile handsets is becoming increasingly attractive to merchants. Mobile advertising is particularly interesting given that so many mobile devices are now location-aware (using GPS) and Internet connected (using wireless or 3G). These relevancy and timeliness determinants provide a means of driving both repeat and new customers, for example with mobile coupon offers, to merchant locations when customers are most likely to purchase. Merchants also are less likely to lose sales due to forgotten paper coupons or offers, as the pervasiveness of mobile handsets that consumers carry at all times provides a convenient storage mechanism for all offers of interest. Also, with mobile marketing, companies can develop targeted personalized campaigns that are more cost effective than traditional marketing campaigns. The Mobile Advertising Engine provides a simple, easy-to-use platform for marketers to develop and analyze their marketing campaigns.

While the prototype developed and reported on in this paper provides the structure for the inclusion of a reporting and analytics component, only basic reporting has presently been included. To achieve the goal of providing an exceptional customer experience, it is imperative that coupons presented to each individual customer be carefully selected for delivery as a production system may contain thousands of coupons, most of which will not be of interest to any given customer. Customers should be delivered coupons based on their interests, demographics and location via the use of an analytics engine that can automate the selection, and this is the subject of ongoing research. Also, a carefully designed search feature based on location, expiration date, category, and other coupon features must be provided to help the customer easily find coupons of interest.

A particularly difficult issue is that of handling coupon redemption at the point of sale (POS), as different POS systems have different interfaces, software, and implementation characteristics. For our prototype, we idealize this interface with a web application running from a browser, yet a production system should allow integrated coupon redemption at the POS. Presently, there is no easy solution to this problem. Either software must be written for each individual POS system or a specialized terminal must be used. While the latter is the easier of the two solutions, it entails additional costs for the merchant and does not guarantee integration with the POS, for example to allow coupon redemption to be recorded on the register receipt and automatically taken off of the bill. The best solution to this problem would be for a

Standards Board to be established to specify a standard interface that all POS providers must provide so that third parties may develop software and systems that integrate at the POS. Without this, tight integration with the POS will only be possible on a system-by-system basis.

Finally, with the explosion in social networking, many businesses are now establishing social networking presences (e.g. "Follow us on Twitter" or "Find us on Facebook".) Mobile social advertising is a relatively new phenomenon, and some efforts have been made to understand how users will accept it (Wais and Clemons, 2008.) Future versions of the MAE may allow integration with social networking sites should user attitudes of this practice be deemed acceptable.

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## **ACKNOWLEDGEMENT**

The authors wish to thank the anonymous reviewers for their comments and suggestions, all of which were very helpful in improving the quality of this paper.

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