Discount Coupons Dematerialization: a Comprehensive Literature Review

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***Abstract*— This article presents a comprehensive literature review regarding digital coupon processing in its various aspects: suppliers, retailers and customers. Current standards, solutions and platforms available in the market and proposed by the scientific community (research, patents, etc.) are presented. A brief summary of the major trends in digital coupon processing is also presented. By resuming the state of the art in digital coupon processing, the article may be useful both for researchers and practitioners interested in the topic.**

Keywords– Digital Coupons; Coupons Management; Redemption; Automatic Clearing; GS1; e-Commerce

I. INTRODUCTION

Typically, a coupon is a certificate that allows a consumer some sort of incentive to buy a product or service. Although the incentive is usually a reduction in price, coupons can also be used for reimbursements, combined offers, free samples, or other types of promotions (e.g., sweepstakes or contests) [1]. The economic and financial crisis has reinforced the concerns of consumers in relation to issues of savings, causing a change in their behavior, particularly in relation to the savings obtained via coupons. The market share of digital coupons is increasing. Given the pace of change in mobile communications, they present enormous opportunities for companies with strategic vision that can use them to attract and retain customers [2]. Online social coupons that offer daily deals are gaining relevance. On the one hand, due to the emergence of new distribution channels, such as email and mobile applications, but also because they are reaching new markets and products (e.g., luxury goods, medical and dental care, etc.). Revenue from discount sites like Groupon and Living Social reached the 2.67 billion US dollars in 2011, representing an increase of 138% over the previous year [3]. According to NCH, manufacturers of packaged products distributed over 311 billion dollars in coupons in 2009, and enabled consumers to obtain total savings of 3.5 billion [4].

The development of information technology and telecommunications generated a growing interest in mobile marketing. In the late nineties, market analysts projected a great future for marketing initiatives that used mobile devices [5]. Mobile coupons can be sensitive to time and/or location. Firms may use time sensitive coupons when sales are low due to the time of day or due to business seasonality. Often, companies have a deep knowledge of their customers, allowing them to create profiles of their tastes and needs, and use coupons to meet their specific needs [6].

For consumers, social coupons proved to be an excellent tool to support purchases. Besides offering great discounts, they allow consumers to have a first experience with various products at a lower price. Offering services that allow the use of online and/or mobile coupons has proved to be a

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profitable business model. However, the same is not necessarily true for those that offer the coupons themselves. In effect, big discounts, higher redemption rates when compared to traditional coupons, and payments to service providers makes it extremely difficult to achieve profitability in the short term. Even in long-term profitability is uncertain [7]. Given these concerns, companies hesitate to develop large-scale initiatives and are cautious about the potential of the coupons. Despite these fears, some prospect a promising future for these strategies, since both coupons technology and the propensity of consumers to use it are evolving [8].

The remaining of this article is organized as follows: in Section 2, existent standards are introduced; in Section 3, current platforms and solutions are resumed; in Section 4, patents are presented; and in Section 5, future trends are addressed.

II. STANDARDS

One of the reasons why paper based coupons persist to be the predominant solution for processing promotional offers is the fact that there are well-defined and accepted methodologies for their generation. Their processing can easily be integrated in both suppliers and retailers systems. When digital coupons are at stake, in particular when its distribution is made through mobile devices, no similar and standardized methods exist.

Interoperability issues between different technologies for processing digital coupons contribute to the lower redemption rates of this type of coupons when compared to the traditional ones in paper format. Most studies indicate that digital coupons redemptions account for only 2% of total redemption [9]. Points-Of-Sales (POS) are the main bottleneck, because of the heterogeneity of systems and versions and because most of them are unprepared to read bar codes from mobile devices. To overcome these obstacles, it is necessary to have standards that enable compatibility of various systems in the different stages digital coupons processing: from generation and communication to redemption and ransom and financial reconciliation.

The Mobile Marketing Association (MMA), the premier global non-profit association representing the various actors of the mobile marketing arena, seeks to define and establish standard languages and platforms for processing various types of promotional offers such as coupons, incentives, rewards, etc. It created the Mobile Coupon Ad Unit (MOCAUS) committee with this purpose. As the result of this effort, in [9] it is presented and described a processing platform that standardizes the various stages of the process (Figure 1). In [10], it is provided a set of diverse documents such as studies, reports, and guides to best practice in mobile marketing.

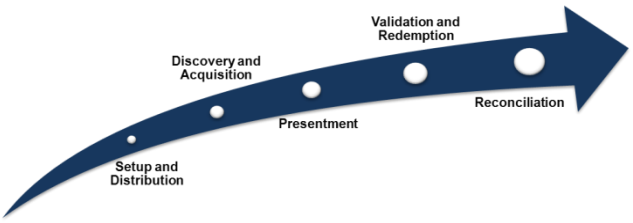

Figure 1. Platform for processing digital coupons proposed by MMA (adapted from [9])

Relating the standardization of business processes associated with the use and treatment of coupons, GS1 [11] is the main worldwide organization seeking to define and establish open standards for coding and managing the flow of goods, services and data through the value chain [12]. The set of open standards of the GS1 are recognized by the International Organization for Standardization (ISO) and allow the correct identification (national and international) of items (products and services), logistic units, and commercial actors across the value chain and activity sectors. The identifiers of the European Article Numbering-Uniform Code Council (EAN•UCC) can be represented by barcodes and consist of three elements: Global Trade Item Number (GTIN) -; Serial Shipping Container Code (SSCC) -; and Global Location Number (GLN). Apart from the unique identification, these codes enable the exchange of additional information such as expiration dates, serial numbers, lot numbers, etc. [13].

More specifically, with regard to the processing of digital coupons itself, the normative document [14] from GS1 establishes a set of specifications that define the first version of the 'Digital Coupon Management standard.' In [15], it is presented a first proposal for standardizing the digital coupons management process (Figure 2). This proposal specifies standards for the management process, the identification of objects and the data model.

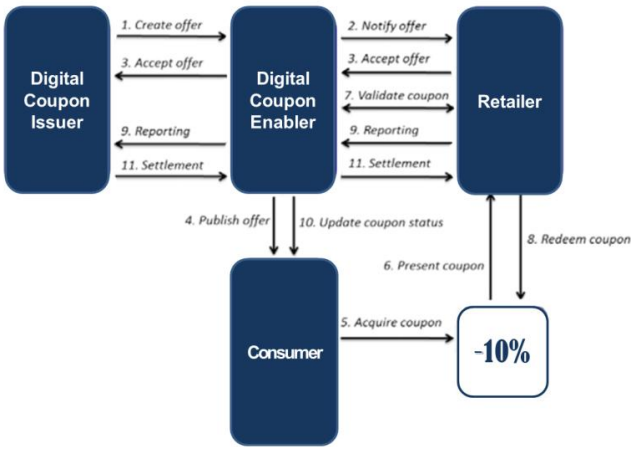

Figure 2. Process management of digital coupons as proposed by GS1 (adapted from [15])

Relating the standardization of data communication, GS1 Global Data Synchronization Network (GDSN) [16] defines a set of standards that specify the connection of the different

actors in the value chain with the GS1 Global Registry through a network of certified data repositories (GDSN-certified data pools) (Figure 3). In this network, all items are identified by a unique combination of GTIN and GLN identification codes.

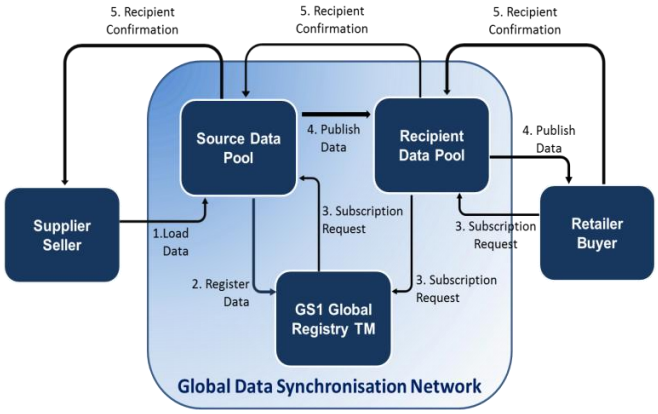

Figure 3. GS1 Global Data Synchronisation Network (adapted from [16])

Inefficiency and fraud rate related to coupon processing in paper format results mostly from the fact that many retailers fail to make a correct validation of coupons offers at the POS. Therefore, the most logical way to solve the problem is to block the redemption of invalid coupons when presented at the POS by consumers. This can be achieved through the combination of three factors [17]: the new GS1 Databar barcode; retailers' systems compatible with GS1 standards; and ultimately, a real-time validation service interconnecting POS systems and the data pool server(s) containing date information on coupons offers.

Despite GS1 being better known because of the barcodes used by companies to identify their products, their standards encompass other aspects than coding. In effect, the GS1 system of standards enables organizations to identify, extract and share information in the supply chain [18]. More information on the architecture of the GS1 standards system can be found in [19].

III. CURRENT PLATFORMS AND SOLUTIONS

The new digital communication channels are an excellent opportunity for the various stakeholders involved in the cycle of buying and selling products: suppliers, retailers and consumers. In particular, the use of coupons in digital form as well as its processing by electronic means offers the opportunity for suppliers and retailers to eliminate most of the problems associated with the traditional coupon processing cycle in paper. There are several companies that provide solutions for the different stages of digital coupons processing: issuance, distribution, validation, reconciliation and payment. However, these solutions often involve proprietary and local implementations based on non-standard protocols. They can be classified in two major types: global solutions; and partial solutions.

A. Global Solutions

In general, this type of platform relies in a base architecture that allows processing solutions for both digital and non-digital coupons, with a very similar flow of information. From the consumer's viewpoint, the available systems can be used to combine discounts from the supplier with the local retailers. To use the service consumers register on the platform and add their coupons to their account. The coupons can be added from a mobile device or from a site (site of the platform itself, retailers sites, coupon distributors sites, etc.), with a pre-defined limit. Customers must have a mobile number or one or more loyalty cards associated with your account. The mobile device number or any of the cards associated with the account can then be used to redeem the coupons for the purchase of products at the POS. For some platforms consumer may print the coupons on paper to present them in the POS. The management of loyalty cards and mobile phone numbers is performed by the customer himself. He may add, change or remove any of the items associated with its account. Coupons are automatically removed from the consumer list when they are used at the POS. Besides automatic removing, some platforms allow consumers to remove coupons themselves from their account. This option allows consumers to replace a coupon when they find a more advantageous discount voucher for a specific product, for example.

From the suppliers and retailers viewpoint, they offer coupons on the platform, which automatically updates the information in their website(s), twitter profiles, social networks and main search engines, thus informing consumers (through custom promotional marketing campaigns and taking into account the profile of the specific consumers). Concerning customized marketing, platforms provide some applications for mobile devices, which using geotagging technology enable consumers to receive alerts on the existence of offers of coupons when they are physically close to their favorite retail stores. In this case, both the activation of the alert service and its configuration (conditions and preferences) are made by consumers themselves. Whether distributed by the Web, email, newsletters, videos, social sharing, mobile devices, or in the retailer's stores (for example, by capturing 2D codes), all digital coupons offers are processed electronically at the time of submission by the consumer at the POS.

B. Partial Solutions

In addition to the global solutions that deal with the entire cycle of coupons processing, many other solutions seek to meet the needs of retailers in terms of promotional campaigns, including discount vouchers (coupons) associated to specific products and other types of promotions that entitle discounts on services, restaurants, bars, clothing and convenience stores, etc. Promotions are offered in a similar way to the global solutions platforms. For consumers who have mobile devices there are applications that allow downloading of digital promotions. For other consumers, promotions are sent via services like Short Message Service (SMS), Multimedia Messaging Service (MMS), etc. To benefit, consumers only have to show the coupon at the place

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of purchase of the product or service. Promotions are made available to consumers according to their consumption habits. Nevertheless, they always have control over the information they want to receive. Some of the systems available on the market also provide geolocation features that allow showing the consumer where he can benefit from promotions and witch places near its location provide those promotions.

Relating coupons processing in Portugal, PacSis (Systems Promotion and Marketing) [20] provides the service of managing discount vouchers. One of its newest marketing solutions is offering online coupons in partnership with Coupons.com Incorporated [21], also including mobile marketing and profiling targeting for brands. However, the solution does not currently include the integrated electronic processing of the different phases of digital coupons deployment. Digital coupons must be printed for later redemption at retailers.

The ability of real-time analysis of data on purchases and redemption of coupons is one of the increasingly important features for those responsible for the definition of promotional campaigns. Several companies seek to explore and develop platforms to provide this kind of analysis based on the buying cycle, allowing the recommendation of products and the customization of coupon offers to consumers.

In [22], it is presented a platform for implementing discount coupons which seeks to maximize both customer satisfaction and business profitability. The platform is based on three components: demand and recommendation of coupons; distribution of digital coupons; and multimodal redeem of coupons (1D barcode, 2D matrix codes, alphanumeric codes, and other visually represented codes).

C. Research Work

With respect to research-oriented view on the topic, the incorporation of Near Field Communication (NFC) technology in processing systems of digital coupons is currently a hot research topic. In [23] and [24], two different works present the WingBonus system, a solution used for dissemination, distribution, validation and management of vouchers, loyalty cards, and all kinds of coupons using NFC technology. The issues of security and usability are discussed in [25], where the authors suggest a vouchers management system that integrates NFC technology. A practical offline payment system based on digital vouchers using NFC in mobile phones is presented in [26], a project that assesses the feasibility of such a system, from a technical and security perspective, using tangible NFC devices.

Another important filed of research is related to security concerns where some interesting works are being developed ([26] is a good example]). In [27], the authors propose a chaotic maps-based authentication scheme for e-coupon systems that satisfies security and functionality requirements while preserving efficiency. A system of virtual coupons that is protected against illicit use is made in [28], where the authors provide a shortlist of possible attacks and describe the protocol to prevent them and the requirements for all major components. In [29], the authors propose a new efficient and secure micro-payment scheme, named e-coupons, which can provide the users the facility for delegating their spending capability to other users or their own devices.

Another important line of research is related to the utilization of mobile devices. In [30], a study is made on omnichannel commerce and on how mobile affects in-store traffic and sales, and in [31], a report makes an analysis on how coupons offers are reacting and adapting to mobile. A solution, called Mobeam, to overcome the problem of the inability of most barcode readers at retailers to reliably read a barcode displayed on phones, and through that to promote further utilization of mobile phone as a mean of coupon utilization [32].

With the increasing development of geolocation technologies, this field is becoming a central topic in digital coupons research. In [33], the authors made a study on location-based advertising on mobile devices and social networking that use local-tracking technology to target clients. A study on the e-coupons strategy problems in Location Based Advertising (LBA) using a full information model in a reduced optimization problem is made in [34].

IV. PATENTS

Various forms and solutions for processing digital coupons are available in the market. Many of them are proprietary solutions that do not comply to standards. Amongst them, several successful applications explore new technologies and tools available in the area of wireless communications. Moreover, the new standard for digital coupon - GS1 DataBar - fostered the development of solutions capable of overcoming issues related to interoperability between systems [17].

Over the past four years, with the advances in terms of mobile communications, many companies proposed and patented systems for the electronic treatment of different stages of digital coupons processing. In [35], Coupons.com Incorporated describes a set of techniques and mechanisms for generation, distribution, redemption, reconciliation and payment of coupons. In the proposed architecture, a distribution of coupons entity, allows that, through a server, a set of previously registered entities can generate promotional coupons offers. Through a network, the distributor server receives from retailers the information regarding retail coupons presented for redemption by consumers. In response, the server of the distributor determines their validity, checking not only the terms of the offer, but also if they have been previously redeemed in other retailer, thus eliminating possible frauds and errors. If coupons are valid, the server labels them as redeemed causing the retailer to be credited for the amount of the respective discount. This solution includes the possibility of having a server at the retailer, enabling that the generation of coupons for a particular offer available in the distributor's server be made during the checkout process at the retailer. The solution also enables consumers to add coupons to their account in the distributor's server or to print them in paper. Upon checkout, consumers can thus redeem coupons in various forms: in

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paper; on a mobile device; or by indicating the identifier of their account in the distributor platform

In [36], a solution similar to the above is presented. However, it does not include the possibility of generation coupons at the retailer side nor printing coupon in paper. The solution includes a component for managing the distribution, redemption, reconciliation and payment for retailers, and billing and payment to suppliers.

In systems in which the consumer must provide his mobile device so coupon codes can be read, several problems arise. Namely, the processing time required at the POS checkout. The method described in [37] allows that the distribution, redemption and reconciliation be made by transmitting data of the digital coupon directly to consumer's mobile devices via wireless communication. Similarly, it is detected directly from the consumer device the existence of coupons selected for redemption, the data being also received via wireless communication.

Another area of development is the distribution of coupons and other offerings through consumer devices in direct connection with products and services. In [38], it is presented a system and respective method for the selective distribution of digital coupons based on the consumer geographical position relative the location of the retailer's store.

Another example of solution for distributing coupons is the use of Radio Frequency Identification (RFID) tags at various locations inside the shops as a means of sharing information about products, and download of coupons and other incentives, serving also as a way to detect the presence of consumers in the shops and facilitate commercial transactions in the POS. Labels placed on placards and ads near the products, shops entrances or POS can be read by consumer's mobile devices using software for detection, reading and subsequent decoding of the information provided. Nokia Corporation [39] proposes a solution for processing promotional information using RFID tags. The proposed platform enables the capture of promotional information provided by the retailer, allowing the consumer to select coupons via the mobile device for later redemption. The platform then makes the validation of redeemed coupons, showing in the device information related to its validation that is used for confirmation by the retailer. A similar solution is described in [40] by Coupons.com Incorporated. The consumer has the opportunity to get promotional information not only through RFID tags but also using Quick Response (QR) codes.

Still concerning the distribution of coupons, Apple Incorporated presents in [41] a specific solution for storage, management and redemption of digital coupons through a mobile device. Storage can be done either in a server accessible from the mobile device as locally on the device itself. Consumers enter the identifying code of the coupon or read a QR code to store coupons in the mobile device. The solution allows the device to alert the consumer of redemption possibilities according to the coupons it stores. That is, when the consumer is near a store where coupons can be redeemed, by using geotagging mechanisms or when the expiration date approaches. Additionally, alerts can be generated whenever the device verifies that there are nearby products of the consumer purchase list for which it holds discount coupons. Checkout redemption can be made either by introducing the coupon code in the POS or automatically, if the mobile device can be used for payments using NFC.

Finally, regarding the generation of coupons and their identifications, most of the solutions that have been proposed implement coding schemes that lead to the standards proposed by GS1, particularly in regard to the designated 'mobile coupons', that follow the GS1 DataBar standard [42]. In [43], it is described a system for generating coupon offers and respective barcodes. It enables the user (supplier or retailer) to generate coupons by selecting the type of barcode. In response to this choice, he is presented with a specific interface through which he will provide the data needed to generate the coupon. In the range of possible types of coupons, the progressive discount coupons, whose value increases with the number of consumers that perform a certain action, or with approach of the expiration date, constitute an increasingly important option in terms of marketing campaigns, especially in social networks [44]. In [45], it is described a specific methodology for the generation of variable-value coupons. In this case, besides the expiration date, the coupon includes its own schema associated with data associated to its progressive value. Thus, this variable schema depends on the time interval between the generation date and the date of redemption of the coupon.

V. CONCLUSION

According to the statistics for the third quarter of 2012 presented by NCH, the issuance of food coupons decreased 3.5% when compared to 2011. However, during the same period, the coupons issued in products and services in healthcare and beauty increased significantly (10.4%). Regarding the type of emissions, the coupons are still mostly distributed in newspapers (89.7%). Digital formats represent only 2%. Lower than coupons distributed at stores (3.9%) and in magazines, mail or packaging (4.6%).

In the same report, the NCH states that "marketers have further suppressed the attractiveness of their coupon offers with less savings and less time." In fact, between 2011 and 2012 there was a decrease in the average discount and the expiration period, and an increase in coupons which required the purchase of more than one product. The attractiveness decrease "has significantly reduced the total number of coupons redeemed so far in 2012, halting a three-year growth trend." Between 2008 and 2011 the redemption of coupons grew 34.7%, but in 2012 the decrease was significant (17%). However, it is expected that in the future companies (re)start to be more aggressive in the use of coupons and in this context digital has a great room for growth, due to its current marginal share [46].

In a specific study on mobile coupons in 2013 [47], several experts predict that by 2016 consumers will redeem approximately $ 43,000 million US dollars worldwide, compared to 5,400 million in 2011. While most companies are still reluctant to adopt this strategy, mobile coupons will increasingly be an excellent way to implement advertising

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and customer loyalty campaigns without incurring in extensive advertising or other brand building methods costs.

In the same study, the main trends for the industry of mobile coupons are addressed:

- Location-based coupons - Walgreens can send coupons that apply to the store where the customer is, attracting him to a specific location.
- Barcode replacement by NFC - NFC is an intelligent technology far superior to existing methods and their application will be increasingly diverse. For example, integration with the "check-out" will allow customers to quickly pay, redeem coupons, etc.
- Dissemination of interest via social networks - It is rare to find someone who does not have a profile on a social network. By 'forcing' the publication of coupons in profiles, companies will be able to increase the interest in certain stores and products.
- Mobile Coupons as catalysts for online shopping - Customer interest in a specific product can be created by inducing him to search for it via online coupons. The placement of a link in the coupon can make the experience of purchasing online more friendly to the buyer, removing the inconvenience of looking for the article in the online store and increasing the propensity to buy immediately before the offer expires.

In its annual report, Inmar [48] considers that the decline in coupon redemption in 2012 is explained by the divergence between consumer preferences and offerings. However, consumer interest in coupons is extraordinarily high, especially among young men. These groups never sought so much for discounts, and the new tools they have at their disposal opens excellent prospects for the use of coupons.

Finally, Small Biz Trends [49] indicates that the main trends for the industry of the coupons will include the growth of localized offers, increase of online trading, more resources and tools for business users, and greater flexibility for consumers to personalize their offers.

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