

BULKER

A Mediator System Grounded on Social Networks for Online Trading of Batches of Products

Martín López-Nores, Yolanda Blanco-Fernández, José J. Pazos-Arias and Manuela I. Martín-Vicente
Department of Telematics Engineering, University of Vigo, Vigo, Spain

Keywords: E-commerce, Social Networks, Newsfeed.

Abstract: We present a system that mediates between consumers and providers for the trading of batches of products on the Internet, leaning on social networks as a vehicle for the distribution of publicity and the formation of groups of interest. The system enables new means for providers to reach groups of users potentially interested in their products, reducing the burden of specifying the characteristics of the target audience of each campaign. As regards the consumers, they are offered a convenient and reliable mechanism to purchase products at a lower price, with the additional advantage of a new form of targeted, trust-based advertising. In terms of exploitation, a clear business model arises, based on obtaining a profit margin from the discounts enjoyed by those who decide to participate in the purchase of a batch of products, as well as on the optimization of the distribution logistics in the case of material assets.

1 INTRODUCTION

The Internet has become a mainstream medium to deliver offers about many different types of products to a great number of users (potential customers) who navigate the web as a common practice in their daily lives. Among the most advanced initiatives to exploit this capability, we can highlight tools like *Google AdWords* and *Google AdSense*, which allow to buy and sell advertising space in the context of the results obtained in response to the users' searches in the web. On the one hand, *AdWords* allows the advertisers to classify their offerings as per a set of keywords and, thereafter, pay for the ads to appear next to the results given by *Google* to a search that includes some of those terms. On the other hand, *AdSense* provides a mechanism for web site owners to profit from their spaces by perceiving a fee in exchange for displaying advertisements.

The implantation of tools like the aforementioned ones soon revealed a number of limitations that hamper their goals to a significant degree (Research and Markets, 2007). These limitations have to do with (i) the difficulty to accurately define the keywords linked to each advertisement and (ii) the impossibility of displaying the ads out of the context of the users' searches. This way, we have witnessed a shift to a new paradigm of *social publicity*, promoted by the con-

solidation of the so-called Web 2.0 and characteristic communication media as blogs and, especially, social networks. These technologies enable a shared interactive space that bears much potential for the users, inasmuch as they can get to know the opinion of other individuals about the products in offer, to read messages written by experts (in principle) not biased by commercial interests, to gather information about the reputation of a given online shop, etc. All of that, with no need to explicitly declare interest in a given product of brand through a web search.

Web 2.0 technologies enjoy great popularity nowadays and their influence has grown rapidly, to the point that studies carried out by PriceMinister.es (PriceMinister, 2009) or Econsultancy.com (Econsultancy, 2010) in 2009 and 2010, respectively, place blogs and social networks as the second most influential sources of information among users when it comes to making up their minds about purchasing a given product, reaching 35% from the 8% estimated in 2008. Only the direct opinion of relatives and friends has greater influence. Encouraged by such studies, new solutions like *Facebook Ads* or *AdLemons* have come into scene, exploiting social networks and blogs, respectively, as advertising platforms:

- On the one hand, *Facebook Ads* allows the advertisers to manually create advertising campaigns

that will be visible within the context of the *Facebook* social network. This platform bases its business model around two main features: (i) the ability to segment the publicity by characterizing the target audiences as per the demographic information stored in the users' profiles (e.g. residence, age, gender or marital status) and (ii) the viral propagation of the products or brands by the users' themselves, grounded on the *newsfeed* mechanism. Because of *newsfeed*, every time a user expresses an opinion about an advertised product, it is automatically communicated to his/her contacts in the social network. The advertisers pay for each *newsfeed* message that carries their products or brands, while benefitting from an advertising model based on trust, in which their campaigns are more likely to catch on among the users for going along with the opinions of some people they know.

- On the other hand, *AdLemons* comes as a platform devised specifically to manage publicity in blogs. The idea is to enhance the targeting of advertising by taking advantage of (i) the usually high level of specialization of the contents appearing in blogs, and (ii) the consequent formation of communities of interest around them. The owners of the blogs benefit from the fees paid by the advertisers in exchange for offering space for brands and products in their pages.

In spite of their unnegligible advantages, the current models of social publicity do not fully exploit the potential of targeted advertising. In the case of *Facebook Ads*, for example, the advertisers can merely identify target audiences by their demographic data, obviating such relevant factors as the preferences and needs that could well be inferred from the users' activities in the social network. It is clear to us that, having knowledge about the users beyond their personal data, it would be possible to reach the people potentially most interested in each type of product in a more elegant and powerful manner.

Our proposal in this paper has been inspired by a less sophisticated approach to gather users with a purchase in mind over the Internet. For many years, people have resorted to online forums in order to get in touch with others who could be interested in buying a number of units of a given product, in order to get a better price per unit from some provider than proceeding individually. This approach has not been addressed in e-commerce research for two main reasons:

- First, forums merely provide a rendezvous to gather a number of purchasers, with neither a way to ensure that there will be providers in the

position to satisfy their demands, nor to assure the payment from each one who had in principle agreed to participate in the batch purchase. In the absence of such guarantees, it usually happens that there seems to be a sufficient number of users to make a purchase, but many of them disappear when it is finally time to transfer money. This way, forums turn out to be an unreliable medium for both consumers and providers.

- Secondly, it is clear that forums leave just too much work in the hands of the users, since they have to take the initiative to get together and manage the whole process of batch purchase (including the search for and communication with providers), interacting actively without any kind of assistance. Indeed, a similar shortcoming can be found in *AdLemons* and *Facebook Ads*, inasmuch as the advertisers have to define manually their campaigns by identifying the most suitable audience segments for each kind of product.

We present a system that addresses the aforementioned limitations by acting as a mediator between users and providers for the trading of batches of products over the Internet, taking advantage of the potential of social networks as a vehicle of trusted publicity and a means to gain customer loyalty. The system, called *Bulker*, gathers knowledge about the preferences and needs of the users through the different social networks in which they participate, in order to identify the products that best match their interests and to assist in the formation of groups. It also acts to locate providers able to offer batches of products in advantageous conditions for the users, as well as to control the propagation of publicity through networks of contacts. Finally, the system includes secure means of payment in order to guarantee the commitment to purchase from all the users interested in the batches in offer.

The overall design and the main features of the *Bulker* are described in Section 2. Next, Section 3 presents our plan of development and deployment. Finally, Section 4 provides a summary of conclusions, including an outline of the business model envisaged for commercial exploitation.

2 OVERALL DESIGN AND FUNCTIONALITIES

The *Bulker* appears as a mediator between consumers and providers for the trading of batches of products over the Internet, with a double objective:

- **To Search for Customers.** A provider registers

one offer involving a batch of a given product, indicating a *target price* subject to the selling of a certain number of units. The goal is to find a sufficient group of users interested in the purchase, each one committing to paying for one or several units.

- **To Search for Providers.** Having identified a group of users interested in purchasing a given product, the goal is to find the provider that offers the best price for a batch of it.

To fulfill these goals, the system relies internally on a database that stores information about registered providers and their offers, and about registered users and the groups of interest they form. In addition, it leans on social networks as the basic mechanism for the distribution of offers. Figure 1 shows a diagram of all the actors involved in the operation of the *Bulker*, whose interactions are described in the following subsections:

2.1 The System towards Product Providers

Product providers interact directly with the database of the system to register and, thereafter, to perform some of the following actions through dedicated web pages with *business-to-business* (B2B) orientation:

- To introduce a new offer (see Figure 2 for a snapshot of the interfaces), identifying the product in question and indicating the number of units that make up the batch to be sold, the price to be paid in case of achieving a sufficient number of purchasers, and the period of time during which the offer is valid.
- To consult the own offers or to browse those of other providers in an attempt to improve their conditions (by reducing the target price, the required number of purchasers and/or the validity deadline).
- To modify the own offers. It is possible to modify an offer in any way while no user has committed to it (we shall explain what this means next); otherwise, it is only possible to improve the original conditions. Such modifications can be motivated by warnings sent to the provider by the *Bulker* system itself, for example, because it has been able to gather a greater number of purchasers than required, or because it has gathered that number much sooner than the deadline.
- To remove own offers at any time, leaving the users who might have committed to them unattended and, thereby, assuming a risk of gaining bad reputation.

- To browse a list of groups of interest created by the users asking for products for which there are no registered offers in the system, just in case it were possible to introduce one. The system itself can send warnings to the providers in case it detects overlappings between their areas of activity or their catalog and the products requested by the users.

2.2 The System towards the Internet Users

The *Bulker* stores in its database information about the users, derived from their actions in social networks. Those actions are conveniently recorded by software applications named *client applications*, which take either the form of (i) classical applications of an operating system, or (ii) web applications residing in the development platforms provided by some social networks. In the first case, the client application itself can access several social networks in behalf of the users; in the second, each client application can work only with data from the corresponding social network. The users can access the system's functionalities in a transparent manner, regardless of whether they use a single client application or several ones.

The system gathers *knowledge* about a registered user in two ways: (i) explicitly, by means of forms in which the user introduces personal data and topics or products of his/her interest, and (ii) implicitly, by processing the information stored in his/her profiles in the social networks, as far as the permissions granted by the user allow the client application to go. This knowledge is processed in order to identify the most suitable users to warn about the registration of new offers (some details will be given in Section 2.4). The users will also be able to take the initiative to browse the list of available offers (using querying forms provided by the client applications) and to create or browse groups of interest created by others in order to purchase batches of products for which there are no registered offers yet.

When showing the user the details of an offer, the client applications will provide three possibilities:

1. To commit to the offer, which implies providing the system with the data needed to make the payment if the requested number of purchasers is finally achieved. As a core feature of the proposal, this decision triggers the dissemination mechanisms of the social networks (*newsfeed* and other variants available) to automatically communicate it to the user's contacts, in the shape of announcements with the following text:

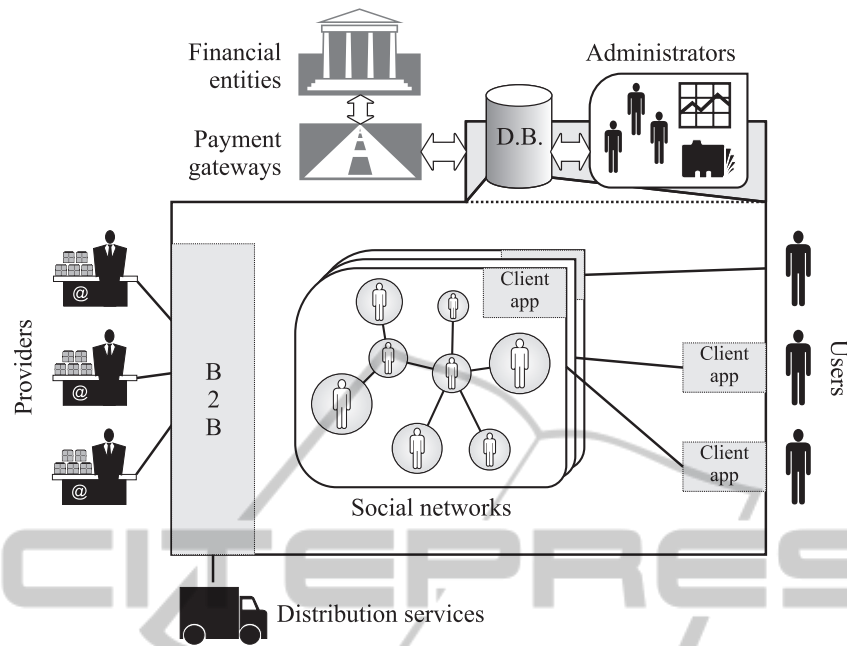


Figure 1: Diagram of the *Bulker* system.

"<USER> has committed to participate in the purchase of a batch of <PRODUCT> for <PRICE> euros per unit. Having gathered <NUMBER> purchasers thus far, <NUMBER> more are needed before <DEADLINE> to get the batch. Press [here](#) for more information."

2. To propagate the offer to contacts who may be interested, who will receive warnings with the following text:

"<USER> believes you could be interested in participating in the purchase of a batch of <PRODUCT> for <PRICE> euros per unit. Having gathered <NUMBER> purchasers thus far, <NUMBER> more are needed before <DEADLINE> to get the batch. Press [here](#) for more information."

3. To ignore the offer.

In the first two cases, the user will have left announcements in the social network that will serve to disseminate the registered offers among other users, registered or not in the system. If a non-registered user decides to take part in an offer, the client application faces him/her with the interfaces needed to register, to proceed normally thereafter with the commu-

nication of payment data and the dissemination of the decision.

In any case, the interactions of registered users with the offer announcements are recorded in the system's database, so as to ensure the *traceability* of the propagation. This information lets the system to augment the knowledge available about the users' preferences and to define metrics of their respective levels of activity and influence. It is possible to consider offering additional discounts, for example, to users who have participated in more batch purchases or who have intervened in the propagation of offers that ended up gathering a sufficient number of purchasers.

2.3 About Payment Gateways and Financial Entities

In order to reinforce the reliability of the system against improper use (remember the comments about forums in Section 1), the commitment of a user to an offer requires him/her to guarantee the payment of the price indicated in it. To this aim, the user has to provide the system with the data needed to charge that amount to his/her bank accounts, credit cards or any other means offered by the financial entities that ultimately manage his/her money. The execution of the payment will not be realized unless the system gathers, at least, the number of purchasers requested by the provider within the indicated deadline

Figure 2: Introducing a new offer.

—obviously, the amount to be charged will be that indicated in the offer at the moment, which could have been revised downwards since some users committed to them. Both the communication of data and the execution of the payment will be securely handled by payment gateways.

2.4 About the System's Administrators and its Internal Operation

The system's administrators can use a set of interfaces to manage the information stored in the database about providers, offers, users and groups of interest. Among other options, it is possible to supervise the selection of the most suitable users to notify about new offers, whose identification is based on both the knowledge available about them and estimations of the influence they might have among their contacts in the social networks. To this aim, the system considers internally such aspects as the following ones:

- Characteristics of the registered offers (product, target number of purchasers, price and period of validity), to be contrasted with the users' demographic information and preferences, as well as with information about their previous purchases.
- Information about the users who have checked the details of the offers (either to end up committing to, propagating or ignoring them) and metrics derived from the traceability of their propagation.
- Information about the groups of interest created by the users asking for products for which there

are no registered offers in the system (what products they refer to, how many users are involved, etc).

- Metrics of social influence over the networks of contacts of the users, including those presented in (Goh et al., 2003; Mason et al., 2007): degree, centrality, betweenness, etc.

The *Bulker* can automatically identify cases in which there exist two or more offers of batches of the same product but none has gathered a sufficient number of purchasers, even though it would be possible to fulfill the requirements of one by redistributing some of the purchasers. The administrators can decide whether to proceed with the redistribution and how to do it (in principle, favouring the best prices and the users who have participated in more offers or get more of their contacts to do so before). The system also provides mechanism to detect synergies among different groups of interest or between groups of interest and valid offers (e.g. for referring to very similar products). This logic is driven by a variation of the semantic reasoning mechanisms of the recommender system presented in (López-Nores et al., 2010), which deals with several ontologies that characterize and interrelate user preferences and products.

2.5 About Distribution Services

Inasmuch as the *Bulker* system works with batches of products, whenever these are material assets it is possible to optimize the distribution logistics as per the purchasers' addresses, in order to reduce the postage

and packing expenses. The system can interact with several providers of distribution services (again, using dedicated web pages with B2B orientation) in quest for the best options in each case, considering possibilities of aggregating several units (from the same batch or from different ones) along certain routes while bearing in mind questions of delivery times.

3 DEVELOPMENT AND DEPLOYMENT PLAN

The *Bulker* system is being implemented as part of the undergraduate thesis projects of several students from the Telecommunication Engineering School of the University of Vigo, providing client applications for the Facebook and LinkedIn social networks. The first operative version of the application is expected to be released by the second half of 2012, and we have reached agreements with online providers of different types of products (especially electronic devices, furniture and sports equipment) as well as with supermarket retailers working in our region. This deployment will serve to fine tune the internal processing of the system —especially the semantic reasoning mechanisms, which have been borrowed from a slightly different domain of application.

4 CONCLUSIONS

We have presented the main ideas behind a system designed to facilitate the trading of batches of products over the Internet, in advantageous conditions for both users and providers. The system enables a clear business model based on obtaining a profit margin from the discounts enjoyed by those who decide to participate in the purchase of a batch of products, as well as on the optimization of the distribution logistics in the case of material assets.

One of the main advantages with regard to previous solutions has to do with ensuring proper use of a rendezvous point by having each interested user commit to paying for the requested units of a product if it is possible to gather a sufficient number of purchasers during the period of validity of an offer. Besides, the system harnesses the power of social networks to enable a trust-based and non-invasive means of distributing publicity, which is the cornerstone of its twofold operation as a searcher of purchasers and a searcher of providers. The providers are freed from the task of characterizing the target audiences of each campaign, thanks to the implementation of reasoning

mechanisms to match users' demographic data and preferences with the details of each available offer.

ACKNOWLEDGEMENTS

This work has been partially funded by the Ministerio de Educación y Ciencia (Gobierno de España) research project TIN2010-20797 (partly financed with FEDER funds) and by the Consellería de Educación e Ordenación Universitaria (Xunta de Galicia) incentives file CN 2011/023 (partly financed with FEDER funds).

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