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Predicting online channel acceptance with social network data

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ABSTRACT

The goal of this paper is to identify a new way to predict whether a specific person believes buying online is appropriate for a specific product. By analyzing data that was gathered through a survey, we show that knowledge of a person's social network can be helpful to predict that person's e-commerce acceptance for different products. Our experimental setup is interesting for companies because (1) knowledge about only a small number of connections of potential customers is needed, (2) knowing the intensity of the relation is not necessary, and (3) data concerning variables such as age, gender and whether one likes working with the PC is not needed. Hence, companies can rely on publicly available data on their customers' social ties. Network-based classifiers tend to perform especially well for highly durable goods and for services for which few customers think it is appropriate to reserve them online.

1. Introduction

Online sales are on the rise. According to Forrester research [24], Americans spent more than $200 billion on online shopping in 2011 and this figure is expected to increase to $327 billion by 2016. Online sales still only make up less than 7% of overall retail sales. This implies that publicity for an online shop has only a low chance of being shown to a person who thinks that buying that product via an online channel is actually appropriate. The question arises on how companies can better target their efforts in order to reach the people who believe that buying a specific product online is appropriate. In fact, prior research (also in this journal [7]) already revealed the importance of being able to accurately predict a consumer's choice for buying via an online channel or a traditional channel.

The channel choice has been related to different elements perceived by consumers. Customers generally prefer traditional markets to web stores but the customer's acceptance of electronic channels depends on the products under consideration. Liang and Huang [20] tried to relate the acceptance of online buying to the consumer's perception of transaction-costs associated with shopping (which in turn is determined by uncertainty and asset specificity). Other research indicated that online experience is the dominant predictor of whether or not a respondent had ever bought anything online [2]. Kwak et al. [18] confirmed that experience with the Internet is an antecedent of Internet purchasing behavior and they showed that demographics, personality type and attitude towards the Internet are also relevant antecedents. The satisfaction with online shopping was shown to positively correlate with elements such as the consumer's perception of the convenience, product information and financial security of web stores compared to traditional stores [32]. Gupta et al. [12] showed that the loyalty to a channel (offline or online) depends on the risk-averseness of the person; while it is not necessary that risk-neutral' channel evaluation is linear compensatory. Chiang et al. [7] developed neural network models to model noncompensatory decision processes. They found that noncompensatory choice models using neural networks outperform compensatory logit choice models in predicting consumers' channel choice.

All of the studies above found relevant antecedents of channel choice, but it is often difficult for companies to get access to the data about these antecedents if they want to target potential customers. In contrast, information on a potential customer's social network is often publicly visible (e.g. via a Facebook account; lists with members of a sports team,) and the question arises whether companies could effectively leverage knowledge about people's social networks. Social networks have been shown to play a role in people's behavior. For example, Burt [4] showed that connections between physicians have an effect on the adoption of a new drug by the physicians. Sykes et al. [31] found that an employee's social network characteristics, capturing the employee's position in the network, help in understanding the use of a new company information system. Dierkes et al. [9] showed that word of mouth in social networks affects churn (i.e., the decision to leave a communication service provider). Goethals [11] found that knowledge of social links between students is valuable to identify which students will study an online theory video before next class. As a final example, Kiss and Bichler [17] showed that the choice of network centrality measure used to select an initial

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set of customers in a viral marketing campaign matters. All in all, we can say that knowledge about a person's social network has been shown to be valuable in several settings.

We are not aware of studies that used knowledge of the consumers' network to predict the consumer's choice of an offline or online channel. Our research takes a complementary approach to the research on e-commerce acceptance mentioned above by using knowledge about social networks in predicting what channel a consumer finds acceptable for the purchase of different products. More specifically, we suggest the use of network-based classifiers to predict consumers' choice for offline or online channels. Hence, this research addresses the following question: Can partial knowledge about a person's social ties help in predicting the person's perceived appropriateness of the online channel to buy different products and services? Rather than trying to investigate this immediately at the level of the entire Internet population, this paper tests the new approach in a subset of that population as a kind of proof-of-concept. There are several theories that explain the relevance of considering social networks in predicting people's behavior. People who are close to each other in a social network may behave similarly for several reasons. First, *social contagion* maycause people to choose engaging in similar behaviors. Second, *homophily* may cause people with the same behavior to stick together.

Social contagion arises when people in a social structure use one another to manage the uncertainty of innovation [4]. There are two main models explaining social contagion. First, the cohesion model focuses on the effects of frequent and empathetic communication between the parties. The parties are more likely to adopt the same practices because they come to a shared evaluation of the costs and benefits of adoption [4]. Second, the structural equivalence model shows that, even among people who are not directly connected but who are connected via a third party, there may be a similar behavior because of social contagion. This model accentuates the competition between individuals: if two individuals share more connections with other parties, there is a more intense feeling of competition between these individuals. If there is an innovation that could make one individual look more attractive than the other, he or she is likely to adopt it rapidly to prevent the other individual from appearing more attractive in the eyes of all shared connections. People then act as they believe people in their position should act [15]. Examining the importance of cohesion versus structural equivalence, one study found that the adoption of medication by doctors was strongly determined by structural equivalence, while it was virtually unaffected by cohesion [14]. Similarly, in their study of perceptions of journal significance among sociological methodologists, Burt and Doreian [5] found that while both cohesion and structural equivalence influenced expert perceptions of journal significance, the latter was a more accurate predictor. Other studies found that both exerted the same effects. Another study on the diffusion of construction technology suggests that the mechanism that is the most salient is actually contingent upon the diffusion phase [14]. The term homophily refers to the practice that generally contacts between similar people occur at a higher rate than among dissimilar people. Homophily theory [19,23] argues that individuals who are similar in terms of demographic and spatial attributes will also be similar in terms of beliefs and values. Homophily has been observed in many kinds of social networks [3,22,23].

To the best of our knowledge, this is the first study that uses social network classifiers to predict the channel choice of an individual. Hence the main contribution of this paper is that it tests the applicability of social network classification techniques to this particular prediction problem. This exploratory study shows that knowledge about the social network is valuable in this context and that the value depends on the product (group) under consideration. This study thus does not claim that this method outperforms all previous research models (although we did a benchmark, see Section 4). Rather, from a practical perspective, it recognizes that it is often easier for companies to get insight into a potential customer's social network (for example through Facebook pages, lists with members of local organizations), while it may be harder to get information on classic variables (e.g., frequency of Internet use, age, city size). The latter requires typically direct interaction with the potential customer.

In what follows, we first discuss the way this research was conducted. Next, we present a theory on social network classification in Section 3. Section 4 presents the data analysis approach. Subsequently, the results are discussed in Section 5 and conclusions are drawn in Section 6.

2. Research method

In this section we first justify the choice of our sample and we present respondent characteristics. We also justify the choice of different products that were used in the survey.

2.1. Survey procedure

As stated above, our research explores the usefulness of a new approach on one subset of the Internet population. More specifically, we relied primarily on a student sample, as is often done in exploratory Information Systems research. (In fact, 36% of the papers in ISR and MIS Quarterly over the period 1990–2010 that used samples of individuals, used student samples [8]). As the goal of our research is to analyze whether knowledge of the choice of a person's friends' channel allows one to predict that person's channel choice, we need to know about the channel choice of a number of interrelated people. As we did not know a priori how important it is to have knowledge on a big part of a person's network, we needed access to a network where a high response rate could be achieved. This is the case in our student population. (As it will be clear from the experimental setup in Section 4, this allows us to gradually drop information on network nodes in the tests).

Two surveys have been conducted in April 2011. The first survey was meant to gather information about the social network of the respondents. The survey was distributed to students in their third year at a management school. Students were asked to list their closest friends at the school. They also had to grade the intensity of the relation (A: we are together most of the day, B: we meet once a day for a short talk, C: we meet a few times every week, D: we meet once a week). This survey yields a social network indicating whether there is a link between two individuals, and how strong this link is.

The second survey concerned e-commerce adoption. The students involved in the first survey were explained in class the role of the Internet in doing business and were introduced to the survey. For a bonus mark, students were asked to fill out the survey themselves at home. They were also asked to invite both their parents to fill out the survey. In order to motivate students to collect data rigorously (and of course to have them learn about the issue), they received the additional task to write a paper, formulating findings based on an analysis of the data that was collected.

More specifically, the second survey asked respondents to reveal how appropriate they thought some medium was for buying different products (see Table 1 for the product list). They had to reply in line with how they purchased the product, or how they would purchase it if they had not purchased it before. For each product, the respondent had to give a value from one to five to reveal his opinion about the appropriateness of some medium that could be used to achieve the task. The value '1' was used to denote a medium that was considered 'very appropriate'; and the value '2' indicated 'appropriate, but less important', etc. Several mediums were included (e.g., the website of the seller; another website (e.g., e-bay), face-to-face contact and telephone) and an option 'other' was included as well. The option 'other' generally received a score of 5 from the respondents, implying that the mediums we mentioned seemed comprehensive.

This survey also asked about several variables that had been shown in prior research to be important antecedents of e-commerce acceptance. For example, Bellman et al. [2] revealed that online experience was the dominant predictor of whether or not a respondent had ever bought