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ABSTRACT

Although online targeted advertising, as a maturing research area in the discipline of information systems (IS), has great influence in practice, there have been few if any literature reviews on research in the area of online targeted advertising. This paper conducts a systematic analysis on 68 articles, to assess the state of research on online targeted advertising. This paper summarizes the methodologies employed in prior research studies and uses a concept matrix to categorize the literature into three main dimensions – focus on people (web users), focus on organizations (advertisers and ads brokers), and focus on technology (data mining etc.). Furthermore, this paper proposes a framework, through which important research themes and concepts are synthesized, to provide IS researchers with an overview of this research area and to identify those topics where much research has already been done and those topics where more research is needed.

Keywords

Online targeted advertising, review, state of research

INTRODUCTION

Online advertising, the growth of which is mainly driven by the increased number of web users, is increasing at a surging pace. At present the Internet has about 2.9 billion users worldwide, while 15 years ago there were only about 394 million. Although online advertising is increasing, the click through rates (CTR) of online advertisements have decreased to far less than 1% (Kazienko and Adamski, 2007). To improve the effectiveness of advertising, advertisers and advertising brokers are increasingly turning to the targeted advertising method, which is highly appreciated by web users. The targeted advertising techniques help to deliver individually catered advertisements based on web users' interests or intention, which can be predicted from the content of the website that the users are searching and reading, their location and browsing history, their user-profile, or any other available information (Farahat, Ayman, and Bailey, 2012). Targeted advertising promises improved effectiveness, not only by delivering the desired advertisement to appropriate users but also by benefiting advertisers or businesses performance through increasing CTR and sales conversions.
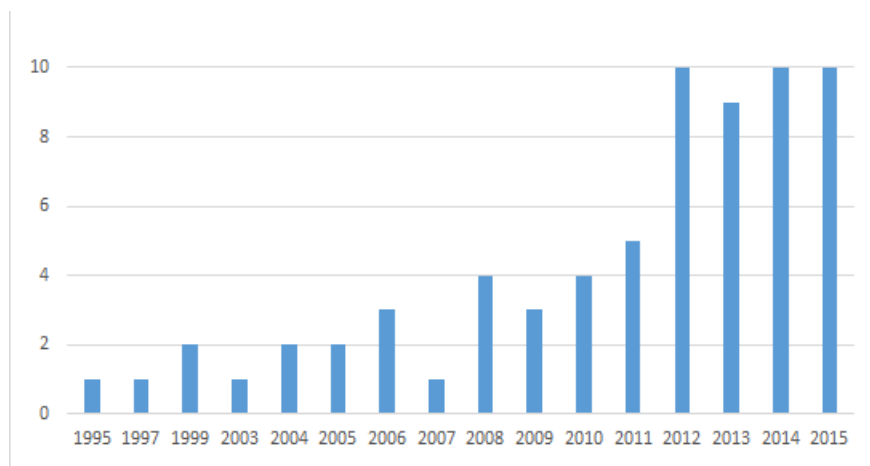
What is online targeted advertising? Online targeted advertising is also known as online personalized advertising or online conceptual advertising. Targeted advertising, as a technique, is an embodiment of data mining technology in web services. Online targeted advertising utilizes data mining technology to conduct data analysis on the vast amounts of network web users' data (from web users' online records, such as cookies, web blog, etc.), looking for valuable information, so as to provide them with the advertisements that meet their needs and expectations best. Online targeted advertising presents itself in various forms, one of the most common of which is banner advertising (Owens, Chaparro, and Palmer, 2011). Unlike traditional online advertising, targeted advertising combines various techniques of business intelligence and machine learning, focusing on the behaviors and conducts of targeted customers in a complex system framework consisting of web users, advertisers, and ads brokers.

Conventional wisdom has placed information systems research at the confluence of people, organizations, and technology (Lee, 1999; Hevner, March, Park, Ram, 2004). Online targeted advertising as a research area in information systems has also been studied in a wide range of topics. And research on online targeted advertising looks not only at technology but also at people and organizations. However, most research studies focus on only one aspect of the three dimensions: people, organizations, or technology. For example, Fan and Chang (2011) focus their effort mainly on the perspective of technologies involved in targeted advertising and present a contextual advertising framework which is blogger-centric, combining contextual matching technique with text mining to select advertisements based on web users' interests. Wattal, Telang, Mukhopadhyay and Boatwright (2012), from the perspective of customers' behavior, research on consumers' responses to firms' use of information. Zhao and Xue (2012) conduct research from the perspective of organizations, looking at advertising competition between two advertisers asymmetrically informed about the consumers. While much research effort has been employed in the area of online targeted advertising, there seems to be a need for a systematic literature review of online targeted advertising studies.

This paper presents a thorough literature review, in which the existing published studies on online targeted advertising are summarized in the three dimensions of the information systems realm – people (web users), organizations (advertisers and ads brokers), and technology (data mining, etc.). In addition, this paper proposes a framework in which important research themes and concepts are synthesized. Furthermore, the used methodologies in this research area are summarized. The rest of the paper is structured as follows: In the next section we describe how the papers included in our review were determined and what methodology we use to conduct the literature review. The following section then employs some statistical techniques to present the results of our review. Using a concept matrix (Watson, 2015), we summarize some of our results. Finally, in the last section we offer a discussion of our findings and present some conclusions on the literature review of online targeted advertising.

METHODOLOGY AND SOURCES IDENTIFICATION

Content analysis was conducted for this study, based on the articles selected. Articles published in leading MIS academic journals[1] were identified. Following the steps suggested by Watson (2015), we: (1) started with leading journals and proceedings of high quality conferences[2] by scanning the tables of contents; (2) went backward by reviewing the articles cited in the articles already identified in step 1; (3) went forward by searching within the Web of Science to identify articles citing the key articles that were identified in the previous steps; and (4) refined the collection of identified articles to make sure that they are indeed relevant to our topic and of high quality. As a result, we ended up with 68 articles in total.

Figure 1. Distribution of Articles by Year

The earliest literature on online targeted advertising appeared in 1995 (Dedrick, 1995), in alignment with the appearance of online advertising in 1994. After online advertising started, online user data collection techniques developed (Gallagher and Parsons, 1997), providing the conditions for online targeted advertising, and turning the attention of scholars to research on online targeted advertising.

Before 2004, studies on online targeted advertising were rather few, with most of them concentrating on online targeted advertising technology. Abe and Nakamura (1999) focused their efforts on optimally scheduling Internet banner advertisements. Also, there were attempts (Langheinrich, Nakamura, Abe, Kamba and Koseki, 1999) to research unintrusive customization techniques for online advertising.

After 2004, research on targeted advertising gradually increased, with researchers studying technology in more depth and width. Kim, Kang and Ieee (2011) employed ontology to study semantic relations between advertisement design and IPTV program and implemented a personalized advertisement system, in which ontology reasoning technique is developed, improving advertisement recommendation capability. Awad and Krishnan (2006) focused their efforts to enhance the awareness of a central paradox for firms, which invest in the personalization of advertising, and examined the relationship between information technology features (e.g. information transparency features) and the willingness of online customers to share individual information.

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[1] Based on Association for Information Systems journal rankings at https://aisnet.org/?JournalRankings
[2] HICSS, IEEE, ICML, International WWW Conference

Based on Palvia, Mao, Salam and Soliman (2003), the following method is employed in this paper to process each article in our selection. Each article, which may have multiple subjects and may employ multiple methodologies, is coded and abstracted with respect to up to four different concepts/subjects and up to two different research methodologies.

STATISTICAL RESULTS AND DISCUSSION

Table 1 summarizes the research methodologies used in the reviewed articles.

Rank	Methodology	Methodology Count	Methodology Count relative to Articles in Total	Methodology Count relative to Methodology Count in Total
1	Frameworks/Conceptual Models	59	85.51%	53.15%
2	Laboratory Experiment	21	30.88%	18.92%
3	Field Experiment	15	22.06%	13.51%
4	Library Research	9	13.24%	8.11%
5	Secondary data	3	4.41%	2.70%
6	Case study	3	4.41%	2.70%
7	Speculation/commentary	1	1.47%	0.90%
Total		104	161.98%	100.00%

Table 1. Rank of Research Methodologies Based on Count and Percentage

During the period and among the journals studied, the "frameworks/conceptual models" method was the most widely used research methodology (53.15%). Because information systems as a research area is relatively new compared to other disciplines, and there were fast new developments in technology (Palvia et al., 2003), researchers had relatively high enthusiasm to design new models and frameworks. The second and third most commonly used methodologies were laboratory experiment (18.92%) and field experiment (13.51%), both of which usually follow a framework or model in a specific article to conduct an evaluation on the framework. Library research was another preferred methodology by researchers, with 8.11%. Secondary data, case study and speculation/commentary, though less predominant, were also used.

Review Based on Concept Matrix

Through coding the main concepts/themes for each article, we arrive at the concept matrix represented in table 2, which is in alignment with conventional wisdom regarding IS research at the confluence of people, organizations, and technology (Lee, 1999; Hevner et al., 2004).

Table 2 illustrates the statistical distribution of the articles involved in the literature review from the perspective of the three IS dimensions. More than half of the articles (52.78%) were at the technical level, focusing on either matching ads with users or scheduling and distributing ads or other issues of online targeted advertising technology; the articles at the people level made up 27.78%, most of them focusing on user behavior patterns or user perception/acceptance or users' reaction on privacy issues; the remaining articles were from the perspective of organizations (19.44%), focusing on business models, payments/benefits, and marketing conditions.

	Article Count	Articles %	Articles
Technology	38	52.78%	Dedrick, 1995; Vrechopoulos et al, 2003; Howard and Kerin, 2004; Hua, 2010; Pak and Chung, 2010; Fan and Chang, 2011; Kim, Kang and Ieee, 2011; Lyer, Soberman, and Villas-Boas, 2005; Abe, Nakamura and Nakamura, 1999; Gallagher and Parsons, 1997; Langheinrich et al., 1999; Wang and Wei, 2004; Yang et al, 2006; Hwang and Yang, 2008; Kilic, 2008; Xu, Liao and Li, 2008; Yang and Dia, 2008; Mei, Hua and Li, 2009; Zhou, Liu and Leee, 2009; Mei and, 2011; Kodialam, Lakshman, et al, 2011; Anagnostopoulos, Broder, et al, 2012; Deane, 2012; Li and Du, 2012; Sahin and Erdogan, 2012; Xu, Chen and Whinston, 2012; Abrahams, Alan S., et al, 2013; Kristyan, Andi, and Dabarsyah. , 2013; Lee, Ha, et al, 2013; Vargiu, Giuliani and Armano, 2013; Yang, Wang, et al, 2013; Dave and Varma, 2014; Perlich, Dalessandro, et al, 2014; Ullah, Boreli, et al, 2014; Deza, Huang and Metel, 2015; Panwar, Onut and Miller, 2014; Li, Zhang and Tan, 2015; Xu, Wu, et al, 2015; Jiang, Jinghua, et al., 2015;
User Behavior	20	27.78%	Dedrick, 1995; Howard, Daniel J., and Kerin, 2004; Lyer, Soberman and Villas-Boas, 2005; Yang, 2010; Awad and Krishnan, 2006; Abrams and Vee, 2007; McCoy and Loiacono, 2009; Feng and Xie, 2012; Wattal, Telang, et al, 2012; Zhao and Xue, 2012; Sutanto, Palme et al, 2013; Ho and Bodoff, 2014; Chen and Stallaert, 2014; Lewis and Reiley, 2014; Schumann, Wangenheim and Groene, 2014; Tucker, 2014; Bleier and Eisenbeiss, 2015; Clemons and Wilson, 2015; Fang, Luo and Keith, 2015; Farahat and Ieee, 2013;
Organization	14	19.44%	Vrechopoulos, Adam P., et al, 2003; Wu, Cook and Strong, 2005; Chang, W. Oh and Kwon, 2010; Ben, Elhadj-Ben, et al, 2011; Asdemir, Kumar and Jacob, 2012; Liu, Kumar and Mookerjee, 2012; Selcuk and Ozluk, 2013; Zhang, Zhong and Mei, 2013; Hariharan, Talukdar and Kwon, 2015; Tam and Ho, 2006; Bergemann and Bonatti, 2011; Chandra and Kaiser, 2014; Anderson, Baik and Larson, 2015; Wang, Yang, et al, 2015;
Total	72	100.00%	

Table 2. Concept Matrix – Dimensions of Technology, User Behavior, and Organizations

In figure 2, a detailed concept framework is shown, illustrating the relevant concepts in the research area of online targeted advertising within the dimensions of technology, user behavior, and organization, as identified using the text mining tool Python. The bolded items are the concepts with high frequency of appearance – in other words, the bolded concepts have been more richly researched and may have a greater significance within the concept framework than the non-bolded items. Some elementary concepts may appear under more than one grouping; as for example "text mining" is listed both under "data mining " and under "ontology". Future improvements to this framework may better show these relationships.
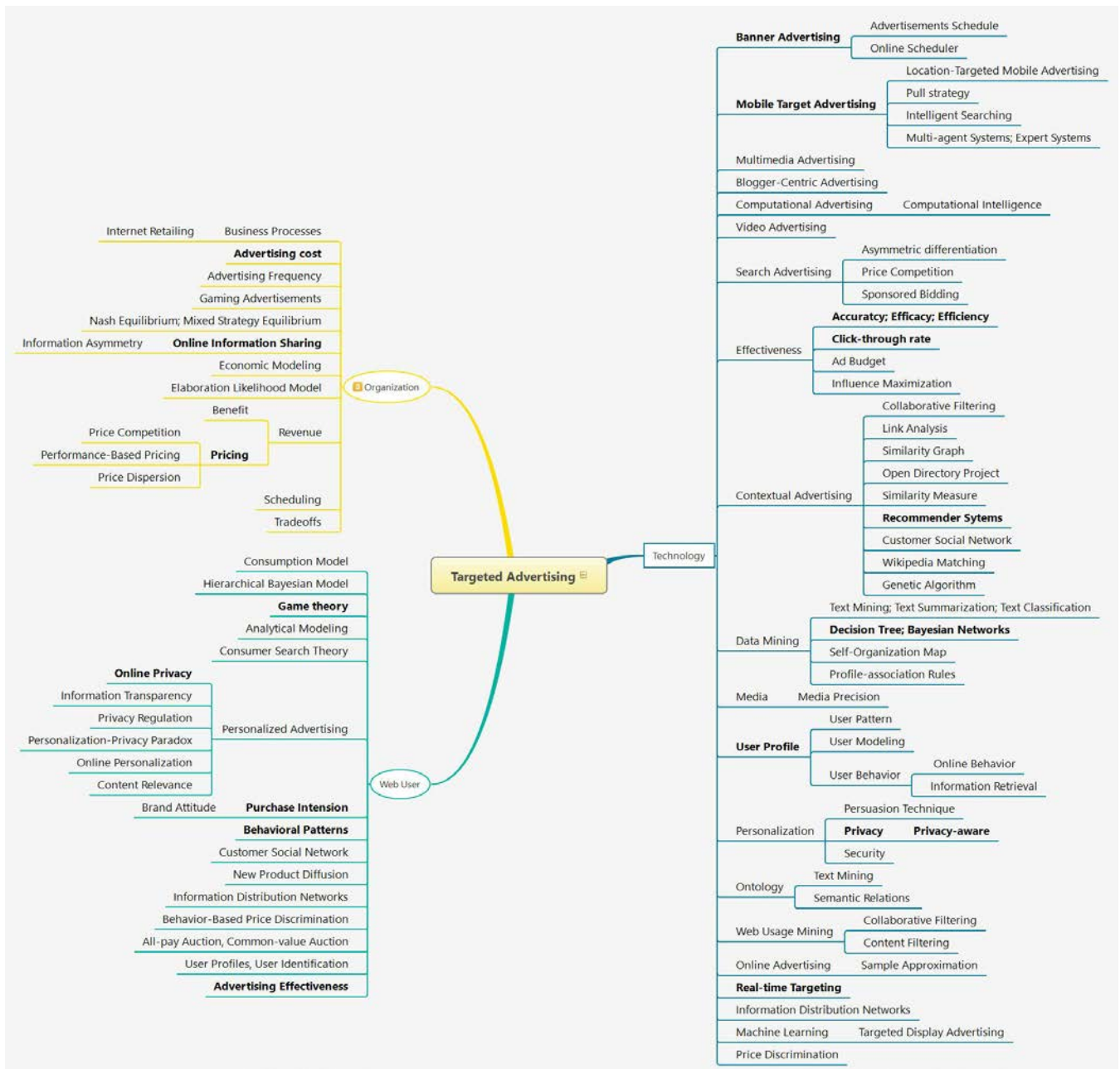
Figure 2. Concept Framework

CONCLUSION

One observation from our review is the increasing maturity of the research area of online targeted advertising with respect to all three main dimensions of information systems. Over the years, researchers have used a variety of research methodologies to investigate the diverse phenomena that have arisen due to developments in IT and the changing business environment. In this study we summarize the use of different methodologies for the 68 selected articles. Also, we categorize each article based on a concept matrix and we propose a detailed concept framework, synthesized from the reviewed research, which may help future researchers identify appropriate research topics and thereby extend the existing body of knowledge. One of our own intended further research work is to conduct a deeper analysis of the concepts in Figure 2, to design a new framework which shows not only each node as an important theme or topic, but also the associations between the nodes (themes). This may be achieved through text mining techniques to generate a relationship diagram. Furthermore, the frequency of occurrence of each concept in the literature may also be presented in the concept relationship diagram to better identify the under-researched areas.

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NOTE

The listing of the 68 reviewed articles is available from the authors upon request.