Pay-Per-Click Advertising: A Literature Review

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Abstract

Digital marketing is being widely employed to efficiently and effectively market products/services to achieve increased sales and generate higher revenues. It allows businesses to effectively communicate desired content to their consumers. Pay-per-click (PPC) is one such form of digital marketing. PPC is often acknowledged for the different advantages it offers, and at the same time, it is notably criticized for fraud and other issues associated with its use. The literature on this subject, although limited, has invested considerable efforts in unveiling the pros and cons of employing PPC as a marketing/advertising strategy. This paper reviews 50 publications on PPC advertising to synthesize their findings and arrive at a common ground for understanding the digital presence and impact of this form of marketing. Alongside discussing the findings, observed limitations and opportunities for future research have been identified and reported.

Keywords Advertising, Digital Marketing, Internet Marketing, Pay-Per-Click, Search Engine Marketing

Introduction

Effective execution of organizational marketing has often been critically acclaimed. Marketing, particularly in progressive organizations, is not employed only in costing, distribution, and communication, but is also strongly focused on recognizing the constantly reorienting consumer needs, and altering the existing organizational products/services, or even introducing newer ones, to meet those needs (Kotler and Levy, 1969). Since the millennium, marketing has been stepped up to go digital; with digital marketing, also called internet marketing, businesses utilising digital technologies to reach out to their consumers (Smith, 2012). Kennedy and Kennedy (2008) state that it is of critical importance for businesses, irrespective of their size/scale, to create and actively maintain an online presence. Display advertising, affiliate marketing, search engine marketing, email marketing, and social marketing are the prominent digital marketing channels of the present times (Ryan, 2014). These digital marketing channels have been briefly introduced in the succeeding paragraph.

Display advertising is where websites allow graphical advertisements to be published alongside their exclusive web page contents (Roels and Fridgeirsdottir, 2009). *Affiliate marketing* is where affiliates place advertisements on their own websites to market another organization/business's products/services; in return, that organization/business shares contractual revenues with the affiliates for the sales/profits made by the leads from affiliates' websites (Gregori et al., 2014). *Search engine marketing* covers the aspects of optimizing search engines, understanding key performance indicators, and using web analytics, aimed at redirecting apposite traffic to the concerned organizational/business webpages (Ramos and Cota, 2009). *Email marketing* is where businesses use electronic mails to market products/services to their existing consumers, and attract new consumer base (Mullen and Daniels, 2011). *Social media marketing*, or *social marketing*, is the creative use of social media sites to advertise and market products to capture potential customers (Evans, 2012).

While all of these digital marketing channels have their strong share of presence and impact, this study is mainly interested in one type of search engine marketing, *pay-per-click advertising* (PPC). The PPC advertising approach is based on competitive bidding among commercial advertisers (Nunan and Knox, 2011). This type of digital marketing strategy is also referred to as *cost-per-click advertising* (CPC). Within this, the owner of a webpage, also known as the web publisher, allows businesses to advertise products/services on the owner's page; each time a visitor on the publisher's webpage clicks on that advertisement, the business will pay a certain amount to the publisher, and hence the name pay-per-click/cost-per-click advertising (Farris et al., 2010).

Mangani (2004) calls this process of offering/selling advertising space on websites as one of the most striking Internet innovations. Dellarocas (2012) calls PPC a rapidly growing advertising sector that has now become a major revenue source for corporations such as Google and Yahoo! Eaton and Kenyon (2014) credit PPC as Google's revenue foundation and state that it underwrites the other free services that their incorporation offers. Khraim and Alkarablieh (2015) state that Google makes 99% of its profit through the PPC model of Internet advertising.

Apart from the advantages that this marketing type brings along, there are certain caveats, the biggest one being click fraud, for which it has been criticized. There are a considerable number of studies examining issues related with the PPC form of advertising. Be it information systems (IS), marketing, computer science, or economics, researchers from varied fields have been investing considerable interests in PPC and its mechanisms (Dellarocas, 2012). The findings from studies available on PPC are varied across different aspects. No review to date has synthesized the findings reported in these publications on PPC. The aim of this paper is to thus *present a systematic review of articles currently available on PPC.*

The next section will offer brief insights on the background of this type of marketing. The succeeding section will present the advantages and limitations of employing PPC. The articles on PPC will then be individually reviewed to highlight the working of this digital marketing type. Discussions on the reported issues will be made, and any commonly identified future research directions will be documented. Finally, conclusions from this literature review will be presented alongside the research implications and limitations.

Background

Jansen and Schuster (2011) consider PPC synonymous with *search engine marketing*; they describe it as the effective utilization of search engines for promoting products and services by displaying them on pages resulting from keyword searches. PPC is also treated as an equivalent of *keyword advertising*, and is regarded as the most prevailing advertising tool of sponsored search (Jansen et al., 2011). Liu et al (2010) address keyword advertising as a noteworthy amalgamation of keyword/keyphrase-based targeting and advertising. McLeod (2012) refer to *target paid listing* as another synonym for PPC; they consider it equivalent to renting real estate on the first page of search-engine derived results. Retailers have moved beyond selling products/services solely through their physical stores, and are now selling them online. While they own their own customized websites to sell these products, they also choose to advertise online in different ways on third party sites, which may be social networking sites (e.g. facebook), search engine page (e.g. Google), price match/comparison website (e.g. shopping.com), online retailer site (e.g. amazon.com), news website (e.g. CNBC), internet-based email service (e.g. Yahoo!), or any other web publisher's page (blogs). Midha (2008) explains that any internet user who owns a website, or weblog, or any type of online space with third party web publishers such as Facebook or MySpace, can create an account with Google's AdSense, or Yahoo's Publisher Network (now known as

Yahoo Bing Network), or any other PPC advertising provider, to themselves become publishers/displayers of PPC advertisements.

PPC is a sponsored search mechanism, originally introduced by Overture and formerly known as Goto.com; the proof of concept was initially presented at a conference in California in 1998 (Ellam, 2004), which was eventually developed into a full-fledged advertising channel. Leading online multinationals, such as Google, Yahoo!, and others have made PPC a huge advertising business worth billions of dollars (Dellarocas, 2012). Google is well known for achieving a 39-fold increase in its total revenue over a period of five years (2002-2007), mostly from the very popular keyword advertising (Liu et al., 2010). Google's AdSense, ruling the keyword advertising business for the corporation, came into being in 2003 (Ratliff and Rubinfeld, 2010). It is said that, given Overture's full control on the PPC market, Yahoo! decided to buy Overture in 2003.

According to Jerath et al (2011), the sponsored search form of advertising is expected to rise at an exponential compound rate of 12%, annually. Display advertisements can be found on content offering websites and search engines in one of the following formats – banners, rich media, text, video, and others (Kwon, 2011). Liu et al (2010) explain that there are two variants in keyword advertising – *sponsored link type* where the advertising is based on keywords entered by the visitors in the search engines, and *contextual advertising* where the advertisements appear based on keywords present in the content the visitors are viewing. Every featured advertisement carries a hyperlink/sponsored link, which when clicked will navigate the visitor to advertiser's website (Sarma et al., 2012). This form of advertising works on an auction based payment system like PPC/CPC (Chen et al., 2007).

According to Kennedy and Kennedy (2008), the purchased and organic listings are dichotomous, with the purchased listings displaying different, not necessarily negative,

content to the visitors. The purchased/sponsored listings are generally placed distinguishingly from the organic listings and most often labelled as *advertisements* in the search page results (O'Connor, 2009). Nunan and Knox (2011) show that a normal keyword search result page on Google can contain links to about 32 sites, of which up to 11 can be PPC links.

PPC has gained popularity as an effective digital advertising tool (Cudmore et al., 2009). The retailer who advertises on a third party site owes the third party owner an amount that is pre-set during a competitive bidding process (Chen et al., 2007). This amount is based on the number of clicks on the advertisement featured in the third party site, which redirects shoppers to retailers' exclusive website to pursue buying. During PPC auctions, advertisers submit bids on the amount they are willing to pay for every click their advertisement will get; this means that every keyword is auctioned and the bidding amount decides which advertisements win a spot on a publisher's website, and in which order they will be featured on those websites (Sarma et al., 2012).

The costs associated with auctions are said to change often, and the entire process can become expensive, considerably burdening a business that has a limited advertising budget (Kennedy and Kennedy, 2008). The manner in which these auctions are executed varies depending upon the search engine (Douzet, 2006). According to Fain and Pedersen (2006), Google and Yahoo! constantly run auctions where an advertiser can at any time bid higher to replace a competitor's advertising spot. Chen et al (2007) put forth that only a limited percentage of these clicks are successful in materializing into sales. The act/stage at which a visitor landing at the advertiser's website makes an actual purchase is termed as *conversion* (Jansen and Schuster, 2011).

A primitive version of PPC is the *pay per impression* (PPI) model, also known as *pay per exposure* (PPE). With PPI, the advertiser pays the web publisher to even appear (be

displayed/featured) on their page/website (Sarma et al., 2012). With PPC, advertisers pay when a visitor clicks on their advertisement (Clarke, 2008). A new day *cost per action* (CPA) or *price per action* (PPA) model is an advancement of the PPC model. Cudmore et al (2009) explain that this competing CPA model performs on the basis of any action initiated by the visitor; instead of paying for a click on the advertisement, the advertiser pays only if the visitor performs some valid action, like purchasing a product/service, or signing up for updates, and so on. Another variant is the *pay per call* (PPC) model, where the advertiser owes money only if they receive a call from the customer that has been processed through an Internet form (Dellarocas, 2012).

With PPC advertising, there are three beneficiaries - *web publisher* or *search engine* displaying advertisements (Google), *advertiser* who has been successful in attracting consumer attention, and *consumers* who find what they search for on the internet, along with the website and price at which that product/service can be bought online (Eaton and Kenyon, 2014).

Advantages and Limitations of PPC

PPC is acknowledged as not only a successful form of advertising, but also as one of the most highly publicized form of performance-oriented advertising strategies (Dellarocas, 2012). When an Internet user enters keywords, the search results that appear across several pages are termed organic results; PPC oriented advertisements related to those keywords appear at different corners of the result page. Liu et al (2010) attribute the success of PPC advertising to its ability to track statistics such as the number of clicks and percentage of sales made from those clicks. According to them, such valuable information can substantially assist advertisers and marketers to better design their advertising campaigns, and gain improved control over

keyword auctions. Nunan and Knox (2011) attribute the increasing popularity of PPC advertising to its ability to enable advertisers to effectively allocate their resources.

The most apparent advantage of using PPC, as Sobusta (2008) suggests, is that the web user who is seeing a PPC advertisement on their search result page is already interested in the advertisement being displayed given they used one of its keywords. This prior interest increases the chances of that web user being interested in buying the product/service featured in that PPC advertisement. Eaton and Kenyon (2014) explain that such PPC advertisements on a result page are far less in number than the organic results, and thus have a better chance at catching the eye of the web user, in turn making the advertiser's chances of attracting a click.

Another advantage that Eaton and Kenyon (2014) reflect on is the possibility of localizing PPC advertising. With PPC, instead of globally advertising, a business can choose to advertise in the region they most expect their consumers to be located. When advertised globally, a business is undoubtedly in a better position of attracting more clicks, but if a business is localized and cannot cater to consumers everywhere, they can choose to localize their advertisements for only the most potential consumer group. Advertising to smaller geographical regions limits the advertisement's visibility, attracting lesser clicks, making lesser amount payable to the web publisher/search engine displaying the advertisement.

An article online typically identifies five advantages of PPC - its ability to launch the advertisement to a targeted traffic at a fast pace; its ability to help expand and highly improve online visibility; its scheduling capability, allowing advertisements to be featured during certain periods in certain locations; its ability to allow low risk keyword and landing page testing; and easy management of costs and conversions maximizing the returns on made investments (Ldesanctis, 2013). Another article claims that web publishers do not charge the

advertisers at the onset to place their advertisements. They identify - better control over budget, instant gratification, keywords tracking, exposure and localized visibility as some of the other advantages of employing PPC (TKG, 2014).

The remaining parts of this section will bring together some of the weaknesses associated with PPC. *Hit inflation attack*, also referred to as *click fraud*, is an issue whereby an automated script/program, or human involvement is present to fraudulently generate clicks on advertisements. This is done for garnering revenues with each click for the web publisher, without the clicker being interested in the advertisement being featured (Knight, 2005; Metwally et al., 2007). Cudmore et al (2009) comment that the occurrence of this fraud is substantiated by an intentional access to a PPC link with either purpose of generating revenues for the web publishers (Kshetri, 2010), or exhausting a competitor's PPC advertising budget; Midha (2008) uses the phrase *affiliate fraud*, also called *publisher fraud* (Soubusta, 2008) or *inflationary fraud* (Wilbur and Zhu, 2009) to address the former type of click fraud, and *competitor fraud* to address the latter type.

Literature recognizes click fraud as a presumed flaw and a well-accepted drawback of employing PPC advertising (Cudmore et al., 2009). A 2005 New York Times article by Ives (2005) refers to the use of programs named clickbots/hitbots that generate invalid clicks on an advertisement; they also indicate the involvement of resentful employees who intentionally commit click fraud to exhaust their company's advertising budget. Another limitation is the placement of advertisements; it has been observed that prominent positioning on a webpage (top of the page) will get the advertiser almost immediately noticed, but a poor positioning can leave the advertisement easily ignored (Eaton and Kenyon, 2014). To further add, another restriction is that not every click will transform into a real sale, and to thus ensure effective advertising, businesses are required to invest time in recognizing the few keywords that will

be most efficient in controlling the cost associated with every click (Kennedy and Kennedy, 2008).

Yet another added limitation is of subsequent rise in price of keywords/keyphrases; Mordkovich and Mordkovich (2005) explain that search engines set prices for keywords based on their popularity, and the number of advertisers competing to associate that keyword with their advertisements. With click fraud, the number of clicks on an advertisement increases exponentially, in effect, the number of clicks for the associated keywords also increase. These keywords are thereby recorded as popular keywords, whose prices then rise globally for all advertisers, and not just for the advertiser who was the victim of that particular click fraud (Mordkovich and Mordkovich, 2005).

Another problem in riding with keyword advertising is of piggybacking. Rosso and Jansen (2010) explain that this problem of piggybacking arises when an advertiser uses its competitors' brand names as its keywords; when this is done, each time a web user searches for a particular brand, the competitor brand, which used that brand name as their keywords, will also appear in their search results. There then lies a good probability that the web user will click on the competitor's PPC link to be redirected to the competitor site, where they might make purchases, in turn resulting in a loss for the business brand that was originally searched for.

A blog posted by Internet and Business Online (2013) on PPC recognizes the problem in identifying the correct keywords that will attract maximum traffic, as its limitation. The post also recognizes selection of the publisher who can maximize revenues, non-assurance of the number of clicks a featured advertisement will get, web users' lack of trust in the legitimacy of the advertisement featured online, and the requirement of an expert to effectively manage the PPC campaign, as its other limitations (Internet and Business Online, 2013). Another

article identifies that use of PPC gets complicated when increasing the quality score of an advertisement (OIT Author, 2012). They point out that PPC advertising can get expensive when the clicks do not materialize into sales. They also raise the issue of how web users tend to ignore these sponsored advertisements, and emphasize on the problems that may arise if the advertisers choose the wrong publishers to feature their advertisements online (OIT Author, 2012).

PPC Related Issues Addressed in Existing Research

A 1997 study by Herzberg and Yochai on MiniPay describes it as a high security, low cost, negligible delay payment mechanism for making small/micro payments on the internet. They briefly mention and discuss PPC while elaborating on MiniPay. Douzet (2006) focuses on issues of marginal benefits fetched by PPC clicks, and the efficiency of fine-tuning keywords into clicks. Anupam et al (1999) discuss the security issues concerning PPC and initiate a hit inflation attack across a click-through payment program to test its viability. They showed that such an illicit program went untraced by the targeted websites, and the click counts also conveniently increased escaping all suspicion. They questioned the success of such vulnerable PPC programs, and concluded that such digital marketing options would remain susceptible to fraud.

Mangani (2004) targets the choice between pay-per-view (PPV) and PPC advertising from a web publisher's perspective. They conclude that the revenue distribution between the two advertising forms is dependent on the elasticity of access and is action-oriented when it comes to the advertising quantity. Mordkovich and Mordkovich (2005) present a detailed study concerning the adverse effects of click fraud and measures that can be employed to control its spread. They quote rising concerns from Google and Yahoo! to emphasize on the apprehensions they have expressed on click fraud and its potential ill effects on internet

advertising. An article by Fain and Pedersen (2006) briefly introduces the concept of sponsored search, where PPC and its sibling forms are generally discussed.

Jansen (2007) defines click fraud to be a resultant of an invalid click on an advertisement with zero probability of value creation. They elaborate to distinguish two types of invalid clicks, *fraudulent click* which is intentionally done with no interest in the product/service being advertised, that could be identifiable or unidentifiable (impossible to tell apart from valid clicks); and *void click* (unintentional fraud) (Midha, 2008) which is not malicious, but is an occurrence of accidental double clicking or an attempt to open a website via a hyperlink that is temporarily down, which could be identifiable or unidentifiable.

Chen et al (2007) evaluate a rationing model for an online retailer advertising seasonal products via digital marketing. They discuss how it is up to the retailer to decide when to start and stop advertising on third party sites based on whether or not the price they are paying per click for the advertisement is fetching them sustainable sales; in doing so, they offer structured properties and strategies along the lines of pricing and inventory for optimizing the decision of whether or not to advertise.

Jansen et al (2007) study the effects of using brand and non-brand related keywords in the sponsored search advertising. They conclude that the combination format of branded key phrases and advertisements increased sales revenues by 15 times. Jansen et al (2013) focus on gender-oriented key phrases in sponsored search advertising. They find that in comparison to either gender, the gender-neutral key phrases fetch 20 times higher revenue and the gender specific phrases lead to increased costs. Edelman and Ostrovsky (2007) present a study on the behaviour of strategic bidders using the auction runs from Google and Overture. They recommend the use of a Vickery-Clarke-Groves mechanism for stabilizing auctions having

neutral to positive bearings on the earned revenues; they comment that this mechanism will be advantageous for search engines and the web visitors/users.

Sen et al (2008) propose a mathematical model for comparing and contrasting the performance of pay-per-purchase (PPP), PPC, and flat fee paid listing options. They conclude that the most popular PPC is not necessarily always the price optimal choice, especially when the percentage of buyers searching and buying on the Internet is high. Soubusta (2008) studies the different facts of click fraud and concludes that it is fairly easy to commit one; they discuss the simplicity of building a botnet for generating invalid clicks. They recommend pay-per-percentage of impressions as an effective solution for this fraud type. Zhang and Guan (2008) get into the insides of tracing fraudulent clicks across the PPC links in the decaying window models. They recommend the use of bloom filters and innovative timing and group bloom filter algorithms for identifying invalid clicks.

Clarke (2008) states that PPC was initially run on limited websites and each ended up attracting many visits. They call PPC the foundation of advertising syndication and consider it similar to Google's AdWords. Jasen and Mullen (2008) discuss sponsored search as an information search instrument. Kennedy and Kennedy (2008) undertook a case study for a manufacturing firm evaluating whether Google or Yahoo! served as the most cost effective option for their PPC advertising. They found that their PPC was higher with Google, and their click through rates were higher with Yahoo!, which led them to conclude that for their case, Yahoo! was a better PPC advertising choice given their limited advertising/marketing budget.

Midha (2008) empirically evaluates the concept of social insensitivity via an ethical behaviour model that integrates constructs from the theory of reasoned action (TRA), theory of planned behaviour, and deterrence theory. They conclude that apart from the

consequences, subjective norms, and perceived behavioural control, some social and cognitive attributes may be responsible for the behaviour behind click fraud (Midha, 2008). Cudmore et al (2009) carry out a beta test to compare and evaluate PPC with the contemporary CPA model for visits recorded and click fraud probabilities. They commend CPA for encouraging customer engagement and promoting brand recall.

Dinev et al (2009) use TRA and behavioural calculus to build a theoretical model for empirically examining the behaviour of online advertisers. They used structural equation modelling to conclude that trust and effectiveness positively influence attitude and subjective norms that significantly impact advertisers' intentions towards PPC. Devanur and Kakade (2009) run an algorithm based study on the truthfulness in auctions for PPC advertising. They analyze the feasibility of 'explore and exploit trade-off' from the web publisher's perspective. A publisher receives income only when an advertisement on their website is clicked; if this publisher invests in finding out which of the advertisements are most clicked, some of their income will be lost, but they may receive some valuable information with which they can strategically place those advertisements, increasing their own chances at earning a higher revenue from the advertisers.

Fulgoni and Morn (2009) highlight the decline in the number of clicks on display advertisements. They generalize that irrespective of less or no click(s), appearing on a webpage helps generate search queries, increasing the number of visits to the advertiser's web page, eventually increasing their sales. Mahdian and Tomak (2009) address PPC as a low risk model from the small advertisers' perspective, but essentially direct their study towards understanding the challenges and counter measures for the PPA model.

O'Connor (2009) point out that the hotel industry has not been successful in effectuating PPC in the favour of their businesses. They find that only a small number of these hotels opt for

PPC, and only a few of those use it successfully. While hotels score extremely well in organic listings, O'Connor (2009) finds that they are suffering from trademark abuse with paid listings, where the customers are redirected to competitor sites. Wilbur and Zhu (2009) investigate if search engines benefit from the eradication of click fraud. They find that when publisher fraud becomes deterministic, the higher bidder can relatively dissuade their competitors from pursuing click fraud, and when the clicks are randomly distributed, the lower bidder will be in a better position to pursue this fraud.

Fjell (2009) compares PPV and PPC advertising. With PPV the advertiser becomes payable each time a visitor opens the website where their advertisement has been featured. They make different recommendations for either type of advertising tool to be used under different circumstances based on the endogenous and exogenous click-through rates. Fjell (2010) analyzes the choice of PPC against PPV from a web publisher perspective. They conclude that if a web publisher offers both PPC and PPV, their pricing ratio should match the typical click-through rate at equivalent market power for both forms. Bruestle (2010) concentrates on the inefficiency induced by the platforms in PPC advertising where advertisements are shown to consumers who are not interested in the advertised product/service. They show that a take-it-or-leave-it pricing strategy can efficiently target advertisements.

According to Hu et al (2010), with both PPC and CPA available in the advertising market, the industry has been often found debating the use of either over the other. They analyze the two forms from the web publisher and advertiser perspectives, alongside exploring market uncertainty, click-through rates, and other risk factors, aimed at improvising the efficiency of advertising campaigns. Liu et al (2010) show that web publishers can assign different weights to advertisers' bids on the basis of the potential they hold for generating clicks, while also studying the effects of differentiated minimum bid policy on the generated revenues.

Ratliff and Rubinfeld (2010) discuss the evolution of the Internet, the coming of web browsers and the concept of graphical user interface. They discuss extant competition between online and offline advertising and comment on the plausible convergence of search and non-search advertisements in the future. Rosso and Jansen (2010) investigate piggybacking; they put forth that this problem is not yet widespread, and that no advertisers prefer for their competitors to show up on their search result pages.

Jansen and Schuster (2011) use seven million records from a US search engine marketing campaign on keyword metrics across PPC, number of clicks, sales, impressions and revenues; they make conclusions based on the different types of keyword searches, with nothing specifically on PPC. Jerath et al (2011) study both PPI and PPC, and call their conclusion a position paradox, where they find that with PPI, an inferior firm paying more to be placed higher than a superior firm will be suffering from relatively lower number of clicks, with the superior firm winning even with a lowly bid lower position.

Wang et al (2011) distinguish clicks on the basis of their value; they explain that not every click fetches sales, and hence there exists a difference in the value of each click that an advertiser receives, yet bids equally for all. They analyze the behaviour of web users after they click on an advertisement to empirically evaluate the click values, and conclude that to effectively manage their advertising strategy, advertisers should group their clicks in an orderly manner and bid differently for each defined group. Li et al (2011) propose a game theoretic model in exploring the motives and repercussions of click fraud. They conclude that it is the competition among the web publishers, which engenders such fraud, and that payoff from advertisers' perspective will remain unaffected by the fraud, while the web publishers' payoff will suffer, disturbing the market equilibrium.

Kwon (2011) presents and analyzes a situation called the balancing problem, where from the web publisher's perspective, they consider a single period of advertising where they have to cater for a PPV contract and at the same time they receive a request for a PPC contract. They analyze a stochastic optimization problem and propose an optimal strategy for arriving at the number of impressions for displaying the PPC advertisements, whilst also offering to consider a mix of PPV and PPC contracts under a set of price-based conditions (Kwon, 2011). Nunan and Knox (2011) study the effectiveness of utilizing PPC for gathering data from the difficult to access samples of health service consumers. According to them, integrating PPC with targeting and messaging constructs can make PPC an efficient targeted sampling tool.

Wang et al (2011) use the game theory perspective and find PPC advertising to be inefficient. They highlight that advertisers put forward a same bid irrespective of the value of click their advertisements receive, making it problematic in cases where a high variance in those click values is involved. McLeod (2012) does a study on the use of PPC advertising for dentists. They recommend dentists to get comfortable with the use of computers and Internet, and also to learn how optimized keywords associated with their revenue-generating PPC advertisements can attract patients to their websites whilst giving them increased exposure in the market. Sarma et al (2012) explore the click probabilities from advertiser's perspective at the auctioning stage for confirming the truthfulness of these auctions whilst characterizing the multi armed bandit mechanism.

Dellarocas (2012) concentrates on PPA, and briefly discusses PPC whilst making propositions on the performance and side effects of the increasingly popular PPA advertising. Kshetri (2013) delves deeper into the techniques used for capturing events of PPC click fraud. They call it a cybercrime and explore the metrics used in the cyber industry to measure such crimes. They also question and discuss the global credibility, utility, and validity of such

crime related information and statistics. Babaioff et al (2014) study PPC auction setting, whereby they explore the effects of multi-armed bandit algorithms on a set condition for the output mechanism to be truthful. They learn that those truthful output mechanisms have structural properties that are particularly strong.

Ives (2005) stressed on the then troubling concern of click fraud for businesses advertising using PPC, which they predicted could sabotage the growth of internet advertising. They quoted responses on click fraud from some known players in the industry, and pointed at how vaguely the web search leaders described their fraud prevention tactics.

Kshetri (2010) concentrates on the economic side of click fraud within the advertising industry. They call identifying the occurrence of click fraud a challenging task and describe the identification methods under three heads – *anomaly based detection*, where a sharp deviation is observed in the illegitimate clicks from the regular predicted behaviour; *rule based approach*, where certain rules are heuristically implemented to tell the illegitimate clicks apart from the valid ones; and *classifier based*, where data mining labels pick on fake clicks.

Ragland (2010) vouches for Facebook as a good bet to invest with a PPC provider through whom payoffs are guaranteed. They discuss the processes of creating an advertisement on Facebook, and how Facebook allows its advertisers to choose their advertising methods (PPI, PPC, and so on), and set their total and daily budgeting options. Brooks (2014) guides localizing content on webpages based on regions by using terminologies and phrases most used in those regions. They claim that such thoughtful localizations will have substantial effects on the costing of PPC campaigns. Eaton and Kenyon (2014) recommend PPC to psychologists and clinicians for advertising their services to potential customers.

Discussions

A concept underlying the use of Internet is web search (Fain and Pedersen, 2006). Jasen and Mullen (2008) call search engines, facilitating these Internet searches, indispensable. Web search leaders, Google and Yahoo!, use the PPC model to sell their advertising spaces to businesses (Hu et al., 2010). Research suggests that the number of clicks is not an appropriate measure for defining the impact of using display advertising such as PPC and CPA (Fulgoni and Morn, 2009). Eaton and Kenyon (2014) put forth that the basic demand of PPC advertising is that there should be a strong match between the content as promised in an advertisement and the actual content of the website to which a visitor is redirected. They also stress on the importance of costing when finalizing the keywords/phrases for a PPC advertisement.

Sen et al (2008) refer to the former banner advertisements, pop up advertisements, and the promotional email marketing as the push form of marketing strategy that disrupts a web users' normal course of web browsing, causing them unnecessary annoyance. In contrast, they refer to the search listing advertising form as the pull form of marketing that is non-intrusive and unobtrusive as it simply runs in the background. Soubusta (2008) addresses competitor fraud as illegal, and publisher fraud as a breach of contract. The first decade of search advertising soared to seven billion dollars (Wilbur and Zhu, 2009). In discussing the ills of click fraud, they state that for some businesses falling in the high-risk group, search advertising may bring more harm than good, if employed. They reemphasize that even leading search engines have confessed of their inability to completely detect click fraud. They quote Google's statement on click fraud detection, which implies that Google cannot capture those fraudulent clicks that do not match a certain pattern; it is difficult to trace invalid clicks if they originate from IP addresses that are highly used.

Mahdian and Tomak (2009) primarily identify the partnering websites as a potential reason behind click fraud. They explain that when advertisers opt for the PPA model, web publishers

can utilize action data to identify those partner websites that are victims of click fraud to relieve them from the problem of click fraud by discounting click values on such websites. In the process, they see an incentive problem being induced that can disturb the bid equilibrium in the market; they recommend future researchers to evaluate this trade-off (Mahdian and Tomak, 2009).

Midha (2008) talks about machine learning algorithms that can be used to combat click fraud. They explain that these algorithms work by the rule of navigational behaviour, which helps them tell apart a man induced click from a script-generated click. Mordkovich and Mordkovich (2005) make a 2001 reference to the president of Alchemist Media who was one of the firsts to successfully combat a click fraud attack and obtain a refund against Goto.com for national corporation chase law group. While one set of analysts and critics accept click fraud as an embedded element of PPC, others voice for devising updated mechanisms and tools for controlling and eventually eradicating all traces of click fraud (Mordkovich and Mordkovich, 2005).

Google said to be dominating the web search industry (Kennedy and Kennedy, 2008). A Google Ads write up on click fraud communicates that Google's AdWords runs by online filters to control click fraud and eliminate any invalid clicks. They claim that invalid clicks on AdWords' advertisements are less than 10%. Their statistical estimations claim that they have saved their advertisers from paying millions of dollars for the clicks that were captured as fraudulent and excluded from their billable amounts (GoogleAds, 2014). Eaton and Kenyon (2014) state that one could make a lifetime career out of getting thorough with the subtleties and procedures that are driving Google Adwords' campaigns.

Kshetri (2010) mentions that many continue to argue on the credibility of click fraud detection techniques run by Google and Yahoo! by terming them to be purely symbolic,

lacking the power to end this fraud type. They refer to an article in The Washington Post, which confirms the existence of active forums and click exchange programs that allow web publishers to exchange tips on how to get away with click fraud. Different click fraud identification techniques are in use by different PPC providers (Kshetri, 2013). They side with the advertisers who accuse PPC providers for not disclosing the real percentage of unidentified invalid clicks, which they presume is higher than the actual disclosed.

In discussing another problem associated with PPC, Rosso and Jansen (2010) claim that piggybacking could have notable effects on all involved parties (web users, web publishers, and advertisers). They further elaborate that the much acclaimed confusion that this piggybacking problem creates could leave consumers annoyed with PPC advertisements that could demotivate them, resulting in lower click through rates, adversely affecting the revenues for the participating web publishers. Jansen (2007) discusses different ways to combat click fraud in the advertising industry. They identify aggressive monitoring and use of improvised human and automated filters for minimizing the occurrences of click fraud. Dinev et al (2009) suggest that such fraudulent clicks can be best managed by employing effective filtering and monitoring tools at the advertisers', search engines', and the web publishers' points to pick and drop such invalid clicks. In addition, they place emphasis on the importance of trust between advertisers and web publishers, and call click fraud a fairly easily manageable problem.

Ratliff and Rubinfeld (2010) make conclusive remarks on how the growth of online advertising has risen over the last decade, and predict its continuing growth for the coming decade; however, they do comment that this growth rate will become slower. As Jansen and Schuster (2011) state, the businesses employing search engine advertising tools as PPC for marketing their products are bestowed with key pieces of information and statistics that they can use to their benefit in examining and eventually improvising the performance of their

advertising campaigns (Jansen et al., 2011). They further suggest that given the key role and strong influence of sponsored searches in internet advertising, it is important to maintain continued understandings of its direct impact on consumer behaviours. As a direction for future research, *they recommend for studies to continue investigating the spread and use of such advertising*.

Conclusions, Limitations, and Future Recommendations

PPC has been universally acclaimed as the ruling pricing model of the internet advertising world, where its simplicity, measurability, and accountability have played the key attributes in its unanimously acknowledged success (Li et al., 2011). For a successful Internet marketing strategy, setting clear objectives is crucial which should be monitored across the performance of the employed digital channels (Chaffey, 2000). The element of click fraud is closely associated with PPC advertising, and this close association becomes even more pronounced with the number of publications on this topic. Of the 50 studies reviewed within this research, 15 studies directly expressed interest in click fraud and its adverse effects on the online advertising industry (Anupam et al., 1999; Dinev et al., 2009; Ives, 2005; Jansen, 2007; Jansen and Mullen, 2008; Kshetri, 2010; Kshetri, 2013; Li et al., 2007; Li et al., 2011; Mahdian and Tomak, 2009; Midha, 2008; Mordkovich and Mordkovich, 2005; Soubusta, 2008; Wilbur and Zhu, 2009; Zhang and Guan, 2008).

The nature of click fraud is quite problematic in itself, but it also leads to the destruction of trust between advertisers and web publishers (Zhang and Guan, 2008), which is destruction of an elementary success factor for all stakeholders involved in a business alliance. With tackling click fraud getting trickier, literature has been reporting that advertisers opting for PPC and similar types of advertising are forced to blindly invest their trust in their web publishers who ensure controlled/monitored click fraud schemes (Wilbur and Zhu, 2009).

Businesses also have an option of hiring third party companies that assure detection of click fraud, which when once confirmed can be used by businesses to claim refunds from their respective publishers (Wilbur and Zhu, 2009), indirectly also curtailing and controlling trust issues between advertisers and their publishers.

For effectively tackling click fraud, Kshetri (2010) recommends strategizing efficiently coordinated and sufficiently funded advertising campaigns which will create a perception of a flawless PPC campaign. Along the same lines as Wilbur and Zhu (2009), they propose seeking assistance from third party measurement systems that can reinforce trust amongst the involved parties. Another interesting recommendation they make is of not using PPC, but its alternatives; they suggest giving consumer reviews, blogs and other forums a try, where specialists or trusted consumers endorse products and services to other consumers, indirectly serving the same purpose as advertising.

In the interest of troubled advertisers who are uncomfortable with the click fraud management strategies of their PPC advertising providers, Kshetri (2013) suggests advertisers to partake in organized activities and movements; such participation is expected to significantly pressurize the web publishers and search engines who are responsible for effectuating PPC auctions and advertisements to carry them out in an explicit manner. They share some Google and Yahoo! related references that are headed towards accountable reporting of the type of clicks an advertisement receives. As Kshetri (2013) suggests, only accumulating information from different metrics that give information on click fraud is not sufficient, utilizing that information in the right light and putting effective measures to counter future invalid click attacks is what the businesses must be aiming at. Another valuable suggestion they make is, if there happen to be multiple sources offering metrics on a particular indicator, then businesses must choose wisely to rely on the information from the most recognized and well established source.

Some of these 50 studies presented their limitations and directions for future research, which have been summarized in the remainder of this section. Bruestle (2010) discuss the problems of inefficient advertising with the over-advertising existing in the targeted form of advertising. They suggest that future researchers interested in targeted advertising should focus on incentives the other Internet advertising channels have to offer. Since advertisement spaces are bought in auctions, they suggest analysing how these auctions influence target-advertising strategies. Liu et al (2010) study keyword auctions, and point out that insufficient clarity on keyword auction model or the posted price model is better than the other, and suggest future research on the same. They also suggest exploring options for estimating future click through rates for a given advertiser, and finding out how competition amongst web publishers affects revenue maximization potential.

In examining the balancing choice between PPV and PPC advertising from a web publisher's perspective, Kwon (2011) concluded advertising a single PPC and a single PPV contract in a single period. They ask future researchers to explore multiple contracts for both advertising types across multiple advertising periods to gather full understanding of the trade-offs web publishers can make under such circumstances. Finally, Dinev et al (2009) made an interesting comment in identifying a limitation of their study on click fraud, where they state that focusing on a single party's perspective will not fetch the whole picture, and hence while pursuing such types of analyses, it is important that the researchers focus on all involved parties (advertisers, web publishers, search engines) instead of restricting focus on any one.

As evident from the numbers available in this literature review, the publications on PPC advertising are limited, and of the limited publications, most are interested in click fraud.

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