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# The Extended Advertising Network Model

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## ABSTRACT

Prior research on Internet advertising has focused on the input and process components of banner ad design, but fail to address the influence of visual display principles on the output component of banner ad design. This may account for the decreasing online banner ad click-through rates, which are significantly below 1%. Motivated by the lack of research on the influence of visual display principles on banner ad design, we have developed the Extended Advertising Network Model. The theoretical background for the Extended Advertising Network Model is the visual perception theories. The Extended Advertising Network Model provides guidelines on how to effectively design advertising network firms and banner ads. Also, the model encourages banner ad designers to pay equal attention to all the components that are involved in banner ad design in order to draw the attention of web users, thus increasing merchants and vendors' revenues and online banner ad click-through rates.

## Keywords

Internet advertising, visual display principles, visual perception theories, extended advertising network model.

## INTRODUCTION

Today, there is a gap in the research that addresses current advertising network issues (i.e. the lack of research relating to the effect of visual display principles on online banner ads when using mobile technologies); thus, in the literature, the advertising network is a very vague research domain as shown in *Table 1*. Advertising network firms are firms that have the resources and use the Internet to help vendors and merchants to customize their advertisements to web users. Turban et al. (2006) define advertising networks as “specialized firms that offer customized Web advertising, such as brokering ads and targeting ads to select groups of customers” (p. 164). Hence, the main purpose of this paper is to theoretically develop the Extended Advertising Network Model (EANM) that focuses on the visual display principles of online banner ads. At the same time, the model will guide advertising network firms on (1) how to develop better customized banner ads, (2) how to adapt to the constant changes in Internet technologies, (3) how to compensate for the continual decline in banner ad click-through rates<sup>1</sup>, and (4) how to design an effective advertising network firm. The theoretical background for the Extended Advertising Network Model is the visual perception theories.

To address all the complex issues in Internet advertising, the new trend is to outsource banner ad design to these specialized firms known as advertising networks rather than to develop the banner ads in-house. The move to advertising network is advantageous because these firms are uniquely positioned to implement all the visual display principles of online banner ad design that might compensate for the reported decline in banner ad click-through rates.

For the past decade there has been a constant growth of the Internet advertising revenues (IAB 2009). The Internet advertising revenue for 1994 was \$358 million US dollars; while in 2008, the Internet advertising revenue was \$23.4 billion US dollars (IAB 2009). In order to improve banner ad click-through rates and ecommerce revenue, many online companies are turning to advertising network firms to improve their banner ad design and hopefully increase ecommerce revenue. For

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<sup>1</sup> Banner ad click-through rates is defined as “the percentage of people exposed to an online advertisement who actually click on the banner” (Laudon and Traver 2007; p. 468).

example, Google paid \$3.1 billion in cash to acquire<sup>2</sup> DoubleClick; AOL purchased TradeDoubler<sup>3</sup> for \$900 million. Also, to improve its competitive ecommerce strategy, Ebay purchased Skype for \$2.6 billion in cash<sup>4</sup>; Microsoft purchased aQuantive for \$6 billion<sup>5</sup>; and on September 16, 2009, the Wall Street Journal announced that Adobe had agreed to purchase Omniture for \$1.8 billion in cash.

Advertising networks' process begins when a web user visits any of the thousands of web sites that are hosted by the advertising network; the advertising network firm then logs the web user access to the site and/or web page, and then follows the web user through the web site and/or web page in order to record web users' behavior online (Idemudia et al. 2007; Idemudia and Lin 2008; Laudon and Traver 2007; Li et al. 2009; Turban et al. 2006). Next, the web users' clickstream behavior and shopping history is then merged with thousands of other customers in the advertising network database to determine the customized online banner ads to display (Idemudia et al. 2007; Idemudia and Lin 2008; Laudon and Traver 2007; Li et al. 2009; Turban et al. 2006).

Our paper is organized as follows: Section 2 presents the visual perception theories and the visual display principles; Section 3 discusses the Extended Advertising Network Model; and Section 4 discusses the conclusions, research, and practical implications.

### VISUAL PERCEPTION THEORIES

Currently, the dominant paradigm in visual perception research is empiricism. In his book, titled *Theories of Visual Perception*, Gordon (2004) says, "The idea that perception is something more than the direct registration of sensations; that somehow other events intervene between stimulation and experience" (pg 119) supports the empiricism that visual perception is learned. To further support the ideas behind empiricism, James (1890) writes, "...whilst part of what we perceive comes through our senses from the object before us, another part (and it may be the larger part) always comes out of our head." The pioneering work of Gordon (2004), titled *Theory of Visual Perception*, also supports that visual perceptions involve cognition and mental processes. Gordon (2004) discusses the ambiguous stimuli: '13' or 'B' and how context influences the interpretation of patterns. Gordon argues that numeral '13' is identical to the letter 'B' if '13' is among different letters. Gordon conducted an experiment to test his hypotheses by displaying A, 13, C and then ask readers what they saw; most readers interpreted what they saw as A, B, C. The writings of the British empiricist, John Locke (1877), indicate that the mind only generates ideas from experience. John Locke in his book titled *Philosophical Works* argues that the mind attains several truths through experience, familiarity, and knowledge. According to empiricism, the foundation of all perception is based on familiarity and past experiences. For example, a child definitely knows the differences between sweet and bitter through familiarity and past experience even before he/she can articulate what those differences are (Locke 1877).

Gordon (2004) argues that familiarity influences perception because perception is based on associative. In his classic work, Kulpe (1904) tested his hypothesis by conducting an experiment to determine the influence of familiarity on perceptions and if perceptions are simply inputs. Kulpe (1904) used a tachistoscope to display various letters with different colors, shapes, and sizes, and then asked observers to describe what they saw. For example, observers gave inaccurate answers when asked: what is the color of the letter? This experiment supports his hypothesis that perception is not simply an input and that familiarity influences perception.

In the ground breaking work, Porter (1954) argues that one's perceptions can be deceived; furthermore, it is not easy to predict one's perceptions. He argues that visual perception involves cognitive and mental processing. Porter (1954) tested his hypotheses by conducting an experiment that involves hidden faces. Initially, he showed readers figures and most readers agreed that the picture is a random jumble with black shapes that is placed on a white background. Porter then told viewers that the figures contained a face; immediately, their perception changed, and they were able to see the face. This demonstrates the concept that hints play a major part in perception—that perception involves both cognitive and mental processing.

Helmholtz (1857), one of the founders of visual perception research, argued that visual perception is an indirect, learned, interpretative, constructive, associative, and inferential process. Kulpe (1904), by conducting a study on human attention argued that visual perception is not simply an input. Sanford (1936) conducted an experiment using school children and found out that hunger influences what one sees. Bartlett in his famous book titled *Remembering* (1932) conducted an

<sup>2</sup> [http://www.nytimes.com/2007/04/14/technology/14DoubleClick.html?\\_r=1](http://www.nytimes.com/2007/04/14/technology/14DoubleClick.html?_r=1)

<sup>3</sup> [https://www.examiner.com/a-510669~AOL\\_to\\_purchase\\_European\\_online\\_advertising\\_firm\\_for\\_900\\_million.html](https://www.examiner.com/a-510669~AOL_to_purchase_European_online_advertising_firm_for_900_million.html)

<sup>4</sup> [http://www.businessweek.com/the\\_thread/techbeat/archives/2005/09/why\\_ebay\\_is\\_buy.html](http://www.businessweek.com/the_thread/techbeat/archives/2005/09/why_ebay_is_buy.html)

<sup>5</sup> <http://www.trustedreviews.com/software/news/2007/08/14/Microsoft-Makes-Biggest-Ever-Purchase/p1>

<sup>6</sup> <http://www.msnbc.msn.com/id/18736303/>

experiment to show that prior expectation, as well as long-term remembering, also influences what one sees. All these studies reinforce the idea that visual perception is a constructive process that involves both cognitive and mental processing. In his book *Theology and Philosophy on the Theory of Vision*, Bishop Berkeley (1709) argues that we can't see distance directly but that distance is perceived through experience and familiarity. Berkeley argued that distance is learned. To support Berkeley's argument, Allen and Rashotte (2006) conducted an experiment, and the finding is that the accuracy of distance estimation is learned from feedback.

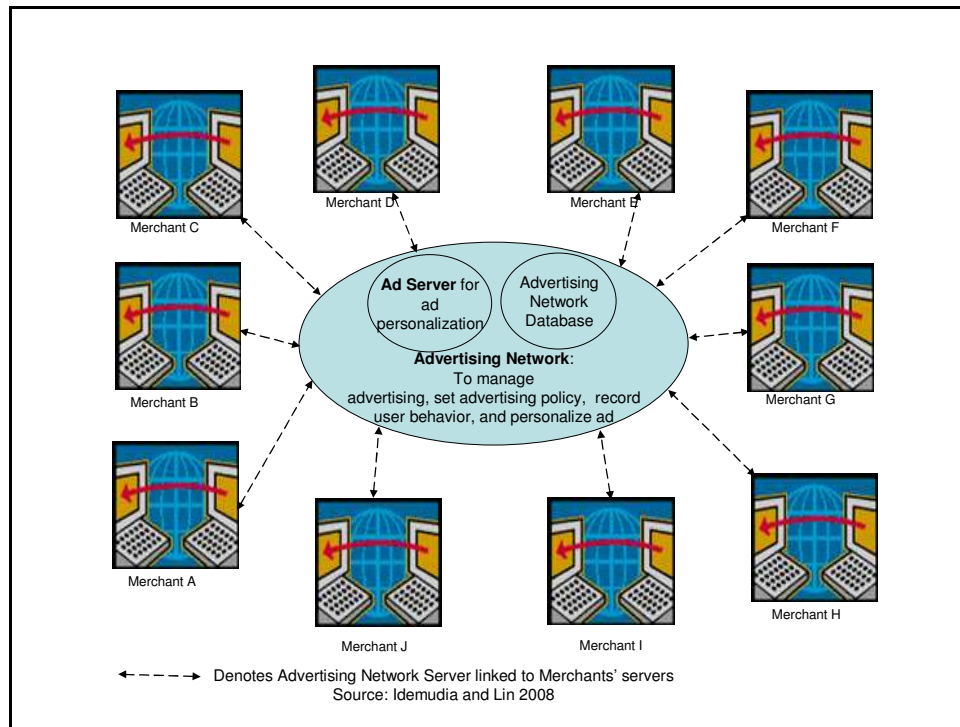
In 1694, the empiricist philosopher John Locke addressed the issue of whether experience and familiarity is important for the development of vision. This question was originally raised by his friend William Molyneux:

Suppose a man born blind, and now adult, and taught by his touch to distinguish between a cube and a sphere of the same metal...and the blind man made to see. Query, whether by his sight before he touched them, could he distinguished and tell which was the globe and which the cube?...The acute and judicious proposer answers: not. For though he has attained the experience that what affects his touch, yet he has not yet attained the experience of how the globe, how the cube, affects his touch so and so, must affect his sight, so as so...

Von Sender (1932) argues that vision slowly develops, which supports the idea that visual perception is learned through visual experience and familiarity. Gregory (2003) discusses the unusual case of a man who regained his sight after 40 years of blindness. This case supports Locke's findings and discussions because as the blind man's knowledge increases, his vision also improves.

**THE EXTENDED ADVERTISING NETWORK MODEL**

By synthesizing research works from psychology, human factors, and advertising literature, we develop the Extended Advertising Network Model (EANM). The EANM is shown in *Figures 2* addresses issues relating to the output component of banner ad design. The EANM draws its theoretical background from the visual perception theories from psychology and applies them to online banner ad design.



**Figure 1. Merchants Network Model**

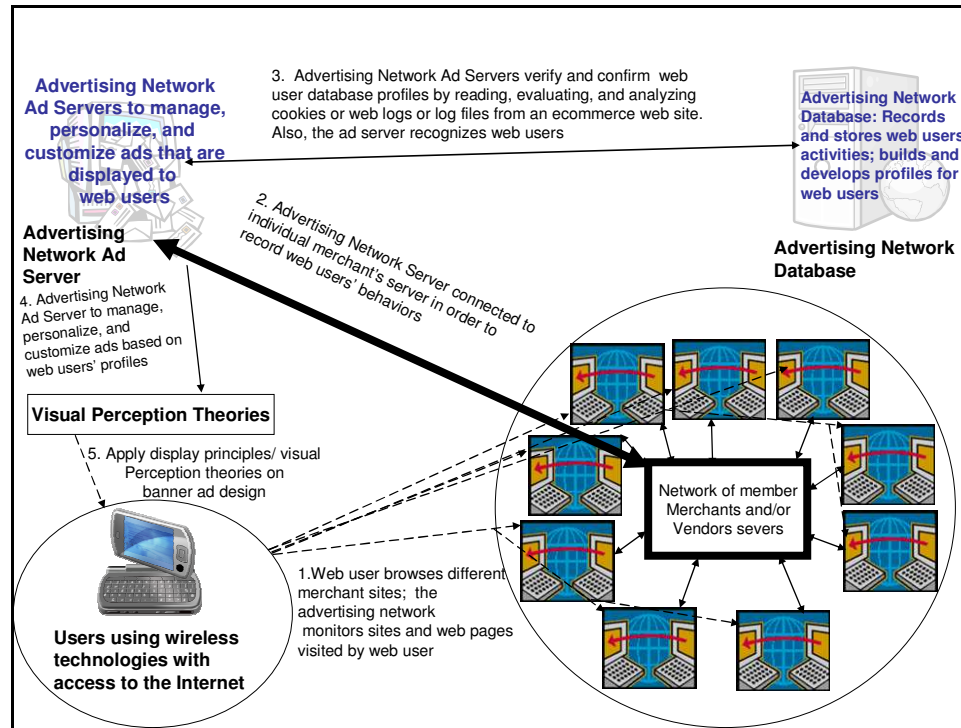


Figure 2. The Extended Advertising Network Model

Idemudia and Lin (2008) argue that the design of banner ads consists of three steps: (1) input (i.e. data is collected from web users); (2) process (i.e. mathematical models that customize online banner ads); and (3) output (i.e. banner ads are displayed on the monitors to draw web users' attention). Prior online banner ad designs focus on only the input and process steps (Kazienko and Adamski's 2007). Also, Table 1 shows prior researchers that have done research relating to the steps in Figure 2. The lack of research relating to the fifth step in Figure 2 might have led to the rapid decline in online banner ad click-through rates. Hence, our study opens the door for IS researchers to apply visual perception theories to the IS domains.

Advertising Network Steps	Researchers that have Directly or Indirectly Addressed the Steps
<b>Step 1:</b> Web Users Browse Merchant Web Sites <b>Step 2:</b> Advertising Network Server Connected to Merchants' Servers <b>Step 3:</b> Advertising Network Ad Server Stores and Retrieves Web Users Profile from Advertising Network Database <b>Step 4:</b> Ad Server Personalized Ads	Amiri A. 2006; Agrawal et al. 2004; Amiri and Menon 2003; Chickering and Heckerman 2003; Facca and Lanzi 2004; Feng et al. 2006; Gallgher and Parson 1997; Idemudia et al. 2007; Idemudia and Lin 2008; Kazienko and Adamski 2007; Karuga et al. 2001; Kohavi 2001; Lacerda 2006; Lee and Lee 2006; Li et al. 2009; Metwally et al. 2007; Nakamura 2005; Oshiba et al. 2002; Yang et al. 2006; Zhao et al. 2005
<b>Step 5:</b> Applying Visual Perception Theories/Display Principles to Online Banner Ad Design relating to Wireless Technologies	<b>None</b>

Table 1. Researchers that have Addressed the Steps in Advertising Network

**The Steps in the Extended Advertising Network Model**

*Web Users Browse Merchant Web Sites*

As web users browse the web sites of different merchants online, the advertising network firms use cookies to monitor their browsing and shopping behaviors. Laudon and Laudon (2006) define cookies as "tiny files deposited on computer hard drive when a user visits certain Web sites" (p. 158). The mechanism behind how cookies track web users behavior online is that if

a web user visit a particular online firm or advertising network that has cookies, the software cookie will now search the web user's hard drive for the particular cookie (Idemudia et al. 2007; Idemudia and Lin 2008; Laudon and Traver 2007; Li et al. 2009; Turban et al. 2006). If the particular cookie is found in the web user hard drive, then the online firm or advertising network will be able to retrieve the behavioral activities (i.e. in-network web sites visited, pages viewed, boxes or items that are clicked, products or items purchased, credit cards used online) of the web user online (Idemudia et al. 2007; Idemudia and Lin 2008; Laudon and Traver 2007; Li et al. 2009; Turban et al. 2006).

#### *Advertising Network Server Connected to Merchants' Servers*

*Figure 1* demonstrates how the advertising network server is linked to merchants' servers. The main objective of the second step is for the advertising network firms to develop a database of all the merchant web sites and web pages, and to keep records of all the specific web users that visit the different merchants' web sites. Both the advertising network servers and the merchants' servers have software and cookies that is able to search the hard drive of web users' computers in order to retrieve their shopping behaviors (Idemudia et al. 2007; Idemudia and Lin 2008; Laudon and Traver 2007; Li et al. 2009; Turban et al. 2006).

#### *Advertising Network Ad Server Stores and Retrieves Web Users Profile from Advertising Network Database*

Laudon and Traver (2007) define the server as a "networked computer dedicated to common functions that the client computers on the network need" (p. 124). *Figures 1 and 2* show how merchants are link to an advertising network using the server. The advertising network ad server collects all the information of the different web users that visit the different merchants' web sites and then stores this information in the advertising network database; this data can then be mined to create different web user profiles for ad personalization (Idemudia et al. 2007; Idemudia and Lin 2008; Laudon and Traver 2007; Li et al. 2009; Turban et al. 2006).

#### *Advertising Network Ad Server Personalized Ads*

There has been a lot of study in the information systems literature using mathematical models and algorithms to generate, allocate, assign, and display ads that address web users' immediate needs and preferences (Kazienko and Adamski 2007). Some researchers that have addressed personalized ads are shown in *Table 1*.

#### *The Fifth Step in the Extended Advertising Network Model is Applying Visual Perception Theories/Display Principles to Online Banner Ad Design*

Prior research has focused mainly on both the input and the process components of banner ad design, but fails to address issues relating to the output component of online banner ad design. To address these issues and to compensate for the rapid decline in online banner ad click-through rates, we have developed the EANM that encourages advertising network firms and banner ad designers to pay equal attention to all the components that are involved in banner ad design.

#### **Application of Both the Visual Perception Theories and the Visual Display Principles on Banner Ad Design Relating to Wireless Technologies**

Visual display principles are rules and guidelines that designers should consider to enhance the effective use of the design products (Norman 2002; Wickens et al. 2005; Yamazaki et al. 2006). Some of the visual display principles in psychology are perceived familiarity, clarity of information content, and perceived usefulness (i.e. displaying the right content at the right time).

##### *Perceived Familiarity*

Banner ads with familiar content and logos that elicit a positive reaction and response in both web users might compensate for the reported decline in banner ad click-through rates for several reasons. First, the visual perception theory known as empiricism posits that visual perception is learned through familiarity (Gordon 2004; Helmholtz 1857; Locke 1877). Proctor and Van Zandt (1994) argue that familiarity affect how users perceive a product because familiarity enhances comprehension and understanding. A strong indication of the effect of familiarity is demonstrated in the work of Gordon (2004), who argues that the letter B is very similar to the numeric number 13. Another example to support the concept that visual perception involves familiarity and past experience is that children are able to distinguish the differences between sweet and bitter even before they can articulate the differences between the sweet and bitter tastes (Locke 1877).

Second, in the information systems discipline, some renowned scholars and researchers have shown the influence of familiarity on information systems adoption. Familiarity has a positive influence on e-vendor adoption (Gefen et al. 2003), programming languages, codes, and software usage (Armstrong and Hardgrave 2007), and on both cognitive and emotional trust (Komiak and Benbasat 2006).

Third, advertising network firms should display banner ads with the logos of reputable firms. Because online shopping's reputation is established based on familiarity and experience (Gefen et al. 2003). Some researchers in the marketing literature have shown in their studies how logo contents and promotional signals influence consumer purchasing decision makings (Kirmani 1990; Milgrom and Roberts 1990; Riel et al. 2001; Spence 1977). Hence, banner ads with a reputable firm's logo and promotional signals might draw the attention of web users, thus possibly leading to an increase in online banner ad click-through rates.

#### *Clarity of Information Content*

For any product that draws the attention of users, the display format of the content should be clear to reduce mental and cognitive load (Wickens et al 2005). Moore and Benbasat (1991) argue that one strategy researchers should implement to ensure the clarity of information contents for different constructs is to distribute the contents to different people with different backgrounds and check to see if the contents convey the same message to different people. Hence, banner ad designers should make sure that banner ad contents convey the same message to different people because web users have different backgrounds, experiences, and exposures. Clear information enhances accuracy (Griffin 1990) and improves products usage satisfaction (Proctor and Van Zandt 1994; Zeithaml et al 2000). Hence, online banner ad with clear contents should increase banner ad click-through rates.

#### *Perceived Usefulness*

In their article, "Universal Design Principles," Yamazaki et al. (2006) argue that a product is helpful and useful if it addresses users' immediate wants and needs. Davis (1989) defines perceived usefulness (PU) as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Researchers worldwide have shown the positive influence of PU on the adoption of a wide variety of technologies (Venkatesh et al. 2003).

Display contents are perceived to be useful if the display contents emphasize significant information to users (Proctor and Van Zandt 1994). Examples of some display content that is perceived to be useful to customers during marketing transactions are: promotional signals and price (Milgrom and Roberts 1990); warranties (Spence 1977); and coupons and rebates (Kirmani 1990).

Yamazaki et al (2006) argue that to enhance the perceived usefulness of any product, the designers should ensure that the display content information is correct, in the right context, and at the right time. Komiak and Benbasat (2006) argue that displaying the right content at the right time (perceived personalization) enhances perceived usefulness of recommendation agents. Hence, online banner ad that is perceived to be useful should increase banner ad click-through rates.

### **CONCLUSION**

The rapid changes in technologies relating to web users' immediate needs, ad servers, network databases, and networks of member merchants have created severe challenges to advertising network firms relating to wireless technologies. To address these challenges, much research has been conducted on both the input and process components of banner ad design. Prior research has been very helpful, but fails to address the influence of visual display principles on the output component of banner ad design when using wireless technologies. To address this limitation, we develop the Extended Advertising Network Model (EANM). The theoretical background for the EANM is the visual perception theories. The EANM provides theoretical guidelines for implementing and developing effective and efficient advertising networks. Also, the EANM helps banner ad designers to pay equal attention to all the steps and components that are involved in banner ad and advertising network designs. This might lead to the design of more effective banner ads that will draw the attention of web users; and thus compensating for the reported decline in online banner ad click-through rates. Another contribution of our paper is that we discuss the influence of visual display principles and visual perception theories on the design of online banner ads and advertising networks.

Our study has significant implications to research and practice. This study represents the first study that has addressed the influence of visual perception theories and visual display principles on banner ad design. Future researchers should extend our study using both visual display principles and visual perception theories on web site and web page adoption. Our study opens the door for future researchers to develop mathematical models and algorithms that can use cookies to differentiate multiple web users that use the same wireless technology. Currently, to the best of our knowledge there is no technique or tool that can use cookies to differentiate multiple users that use the same wireless technology. In addition, our study provides guidelines for future researchers on how to develop tools and techniques to measure the effectiveness and efficiency of all the different components that make up advertising networks.

In addition, our study is the first study that seeks to determine the influence of both visual display principles and visual perception theories on banner ad and advertising network design. Hence, our model, EANM, can help advertising networks



and banner ad designers to pay equal attention to all the steps and components that are involved in banner ad design, leading to the development of effective banner ads that draw web users' attention thus increasing Internet advertising revenues and online banner ad click-through rates.

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