Human Computer Interaction and Digital Advertising Effectiveness: A Systematic Literature Review of Visual Attention, Interface Design, and Persuasion

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Abstract: Digital advertising is increasingly embedded within contemporary human–computer interaction (HCI) environments, where advertisements function not only as persuasive messages but also as structural elements of digital interfaces. Despite the rapid growth of online advertising, research examining how interface design influences advertising effectiveness remains fragmented across HCI, communication science, and marketing. This study synthesizes interdisciplinary research on how HCI-related interface variables affect visual advertising attention, avoidance, and persuasion outcomes. A systematic literature review following the PRISMA 2020 framework was conducted using four major databases: Web of Science, Scopus, PubMed, and the ACM Digital Library. The review covers peer-reviewed studies published between 2000 and 2025 that combine HCI methodologies—such as eye-tracking, usability evaluation, interaction logging, and user experience measurement—with advertising outcomes including attention, recall, persuasion, and avoidance. A total of 118 studies met the inclusion criteria and were analyzed using narrative synthesis. The findings indicate that advertising effectiveness is strongly shaped by interface-level variables including visual complexity, animation, interactivity, aesthetic congruence, and user task context. Visual attention operates through a dual-pathway mechanism in which bottom-up visual salience interacts with top-down goal-directed browsing behavior, explaining phenomena such as banner blindness. The review highlights the need for stronger theoretical integration between HCI and communication-based persuasion frameworks.

Keyword: Human–Computer Interaction, Digital Advertising, Visual Attention, Interface Design, Persuasion.

INTRODUCTION

Digital advertising has become an integral and nearly unavoidable component of contemporary human computer interaction. Every day, billions of users encounter advertising stimuli while navigating websites, mobile applications, social media feeds, and search engines. Banner advertisements, sponsored posts, native advertising units, autoplay videos, influencer

integrations, and algorithmically targeted promotional messages are embedded within the interfaces through which individuals access information, conduct commerce, and engage in social interaction. As a result, advertising is no longer confined to discrete media placements but is deeply integrated into the architecture of digital interfaces themselves (Boerman et al., 2017; Steuer et al., 2000). In this environment, the design of the interface including layout structure, visual hierarchy, animation, interactivity, and aesthetic coherence plays a decisive role in determining whether advertising messages are noticed, cognitively processed, and ultimately persuasive (Cyr et al., 2018; Hong et al., 2021)

The scale of this phenomenon is unprecedented. Global digital advertising expenditure surpassed traditional advertising channels in the mid-2010s and continues to expand rapidly, accounting for more than two-thirds of worldwide advertising spending in recent years (Statista, 2023). Simultaneously, the proliferation of smartphones and social media platforms has intensified the frequency with which users encounter advertising stimuli during routine digital activities. Rather than appearing as isolated persuasive messages, advertisements now function as integrated components of interface ecosystems that continuously mediate user attention. This transformation raises fundamental questions about how visual communication operates within interactive technological environments and how interface design shapes the cognitive and behavioral responses of users exposed to advertising content.

Understanding these dynamics requires bridging two historically distinct scholarly domains: Human Computer Interaction (HCI) and advertising research within communication science. HCI emerged in the late twentieth century from cognitive psychology, computer science, and ergonomics, focusing on how interactive systems can be designed to support efficient, usable, and satisfying human interaction with digital technologies. Early HCI scholarship emphasized usability, learnability, and error reduction, aiming to optimize the functional relationship between humans and computer systems. Over time, the field expanded to incorporate broader concerns such as user experience (UX), interface aesthetics, emotional design, and the sociotechnical implications of digital technologies (Hassenzahl, 2018)

Advertising research, by contrast, has a longer intellectual lineage within communication science, psychology, and marketing. Classical advertising theories have focused on persuasion processes, message framing, attention allocation, and consumer behavior (Friestad & Wright, 1994; Petty & Cacioppo, 1986) These traditions examine how visual and textual stimuli influence cognitive elaboration, attitude formation, and behavioral outcomes such as brand preference or purchase intention. In digital environments, these processes operate under conditions of intense informational competition, where advertising messages must compete with editorial content, social interaction, and task-oriented activities for limited user attention (Lang, 2000)

Despite operating within the same digital interfaces, the scholarly trajectories of HCI and advertising research have largely developed in parallel rather than through sustained interdisciplinary integration. HCI scholarship has often treated advertising as an external disruption to user experience, focusing on its impact on usability, navigation efficiency, and cognitive load (Brajnik et al., 2010). Advertising research, meanwhile, has primarily examined persuasive outcomes without fully incorporating insights from interface design, interaction affordances, or user experience theory. As a result, the mechanisms through which interface design mediates advertising attention and persuasion remain incompletely understood.

One of the most influential phenomena illustrating this interdisciplinary gap is banner blindness, the tendency for users to ignore areas of digital interfaces that resemble advertising placements. First identified in early web usability studies (Benway et al., 1998), banner blindness has since been extensively documented through eye-tracking research demonstrating that users frequently fail to visually fixate on banner advertisements even when those ads occupy prominent regions of the screen (Drèze & Hussherr, 2003; Hervet, Guérard, et al., 2011)

This avoidance behavior reflects a learned adaptation: as users repeatedly encounter advertising in predictable interface locations, they develop cognitive heuristics that suppress attention toward these areas during goal-directed browsing tasks. The phenomenon highlights how interface conventions shape perceptual attention and how advertising effectiveness is conditioned by broader patterns of human–computer interaction.

Eye-tracking and other behavioral measurement techniques have played a central role in uncovering these dynamics. Studies consistently demonstrate that visual attention within digital interfaces follows a combination of bottom-up and top-down processes. Bottom-up attention is driven by stimulus characteristics such as color contrast, motion, or visual salience, whereas top-down attention reflects the user's goals, expectations, and task demands (Pieters & Wedel, 2004) In goal-oriented contexts such as information search or online shopping, users allocate cognitive resources primarily to task-relevant interface elements, leaving little capacity for peripheral advertising stimuli. (Lang, 2000) Limited Capacity Model of Mediated Message Processing further suggests that cognitive resources available for processing advertising messages are inherently constrained, producing competition between editorial content and promotional stimuli.

Another important dimension of the HCI–advertising intersection concerns the aesthetic quality of digital interfaces. Research in HCI has demonstrated that users frequently infer usability and credibility from visual design, producing what (Tractinsky et al., 2000) famously described as the "beautiful-is-usable" effect. Interfaces perceived as aesthetically pleasing are often judged to be easier to use and more trustworthy, even when functional characteristics remain unchanged. Within advertising contexts, such aesthetic evaluations may influence how users interpret promotional content embedded within the interface environment. Studies have shown that visually coherent interfaces can enhance processing fluency the ease with which visual information is cognitively processed thereby facilitating deeper elaboration of advertising messages (Cyr et al., 2018)

The rapid evolution of digital media ecosystems further complicates the relationship between interface design and advertising effectiveness. Traditional banner advertisements are increasingly supplemented or replaced by native advertising, influencer marketing, and algorithmically personalized content integrated within social media feeds. These formats blur the boundaries between editorial and promotional content, raising questions about transparency, persuasion knowledge, and the ethical design of digital interfaces (Boerman et al., 2017). Simultaneously, new technological developments including artificial intelligence, augmented reality, and immersive virtual environments are introducing novel forms of interactive advertising that challenge existing theoretical frameworks.

These developments occur against a backdrop of increasing user resistance to intrusive advertising practices. The widespread adoption of ad-blocking technologies, the emergence of regulatory frameworks governing online tracking and targeted advertising, and growing public awareness of persuasive design strategies all indicate a shifting relationship between users and digital advertising ecosystems (Cho & Cheon, 2004). From an HCI perspective, advertising is therefore not merely a persuasive message but a structural component of interface design that influences user experience, attention allocation, and perceptions of platform credibility.

Given these transformations, there is a growing need for systematic synthesis of research examining how HCI design principles intersect with visual advertising processes. While individual studies have explored topics such as eye-tracking patterns, interface aesthetics, animation effects, and interactive advertising formats, the literature remains fragmented across disciplinary boundaries. A comprehensive mapping of this research domain is necessary to clarify which interface variables most strongly influence advertising attention and persuasion, which theoretical frameworks have been employed to explain these effects, and which methodological approaches dominate empirical investigations.

This systematic literature review addresses that need by synthesizing peer-reviewed research published between 2000 and 2025 at the intersection of Human Computer Interaction and visual advertising. Specifically, the review aims to answer the following questions:

1. What empirical evidence exists regarding how HCI-related interface variables influence visual advertising attention, avoidance, and persuasion outcomes?
2. Which theoretical frameworks have been employed to bridge HCI and advertising research?
3. What methodological approaches dominate this interdisciplinary domain, and what are their respective strengths and limitations?
4. What conceptual and empirical gaps remain in the current literature?

The significance of this inquiry is both practical and theoretical. From an industry perspective, digital advertising faces mounting challenges including banner blindness, ad blocking, and increasing skepticism toward persuasive technologies. Understanding how interface design influences advertising effectiveness is therefore crucial for developing advertising strategies that are both effective and compatible with positive user experiences. From a theoretical perspective, integrating insights from HCI and communication science can help clarify whether attention, usability, and persuasion operate as separate processes or as interdependent dimensions of digital media interaction.

METHODOLOGY

This review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. The protocol was developed a priori and is reported in full below.

Inclusion Criteria

1. Peer-reviewed empirical studies or systematic reviews published 2000–2025
2. Studies combining HCI methodology (eye-tracking, usability evaluation, interaction logging, biometrics, UX assessment) with visual advertising outcomes
3. Outcomes including: visual attention (fixations, saccades, dwell time), advertising recall, brand attitude, persuasion, ad avoidance, or interface usability in ad-containing contexts
4. Published in English in indexed journals (Web of Science, Scopus) or flagship HCI/advertising conference proceedings

Exclusion Criteria

1. Non-peer-reviewed publications, grey literature, editorials, and opinion pieces
2. Studies addressing advertising without any HCI methodology or interface design variable
3. Studies addressing HCI without any advertising or visual persuasion component
4. Conference proceedings lacking full empirical reporting (pilot studies < 20 participants)
5. Studies limited to audio-only, text-only, or traditional (non-digital) media advertising

Information Sources and Search Strategy

Four electronic databases were searched: Web of Science Core Collection, Scopus, PubMed/MEDLINE, and the ACM Digital Library. Searches were conducted in January 2026 with no language restriction applied at the database level (English-only applied at screening). Search string (adapted per database):

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("human-computer interaction" OR "HCI" OR "user interface" OR "usability"
OR "eye-tracking" OR "UX" OR "user experience") AND ("visual advertising"
OR "banner ad*" OR "digital advertising" OR "online advertising" OR "ad
attention" OR "advertising avoidance" OR "native advertising" OR
"sponsored content") AND ("attention" OR "visual perception" OR
"persuasion" OR "recall" OR "engagement")
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Supplementary hand-searching was conducted in: Journal of Advertising, Journal of Interactive Advertising, International Journal of Human-Computer Interaction, Computers in Human Behavior, Journal of Marketing Research, and CHI conference proceedings (2010–2025).

Study Selection

Records were imported into a reference management platform and deduplicated. Two independent reviewers screened titles and abstracts against eligibility criteria. Discrepancies were resolved through discussion and, where necessary, consultation of the full text. Full-text eligibility assessment was performed for all records passing abstract screening. A PRISMA flow diagram (Figure 1) details record counts at each stage.

Data Extraction

Standardized data extraction covered: authors and year, journal/venue, study design, sample size and characteristics, HCI variables examined, advertising outcomes measured, theoretical framework(s) applied, and key findings. Data were extracted by one reviewer and verified by a second.

Quality Assessment

Empirical studies were assessed using a modified Newcastle-Ottawa Scale adapted for experimental and quasi-experimental designs. Criteria included: representativeness of sample, validity of measurement instruments (eye-tracking calibration protocols, survey reliability), control of confounds, and appropriateness of statistical analysis. Systematic reviews were assessed using AMSTAR-2. No studies were excluded solely on quality grounds; quality scores inform the interpretation of findings.
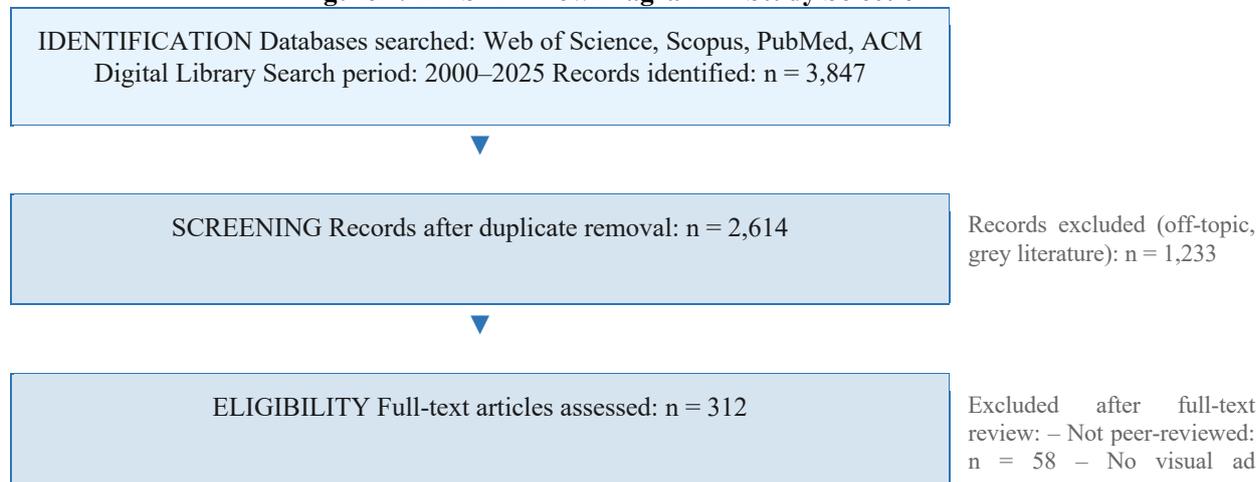
Synthesis Approach

Given the methodological heterogeneity of included studies, a narrative synthesis was conducted following EPPI-Centre guidelines. Studies were grouped thematically. Where multiple studies addressed the same HCI variable with comparable outcome measures, effect direction and magnitude are summarized narratively. A formal meta-analysis was not conducted due to heterogeneity in advertising format, eye-tracking metrics, and sampling.
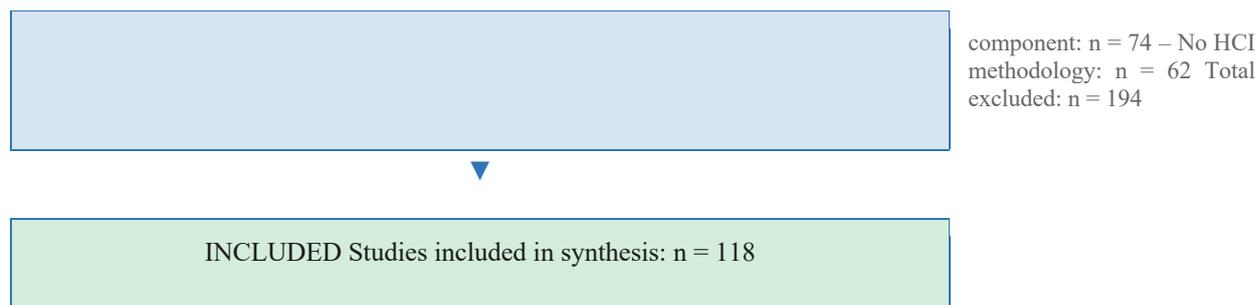
RESULT & DISCUSSION

PRISMA Flow Diagram

Figure 1 presents the PRISMA 2020 flow diagram detailing the study selection process.

Figure 1. PRISMA Flow Diagram — Study Selection

IDENTIFICATION Databases searched: Web of Science, Scopus, PubMed, ACM Digital Library Search period: 2000–2025 Records identified: n = 3,847

▼

SCREENING Records after duplicate removal: n = 2,614 | Records excluded (off-topic, grey literature): n = 1,233

▼

ELIGIBILITY Full-text articles assessed: n = 312 | Excluded after full-text review: – Not peer-reviewed: n = 58 – No visual ad

component: n = 74 – No HCI methodology: n = 62 Total excluded: n = 194

INCLUDED Studies included in synthesis: n = 118

Note. Exclusion reasons were not mutually exclusive; studies excluded for multiple reasons are counted once under the primary reason.

Characteristics of Included Studies

The 118 included studies spanned 25 years of publication (2000–2025), with a notable acceleration post-2010 corresponding to the proliferation of smartphones and social media advertising. The most represented journals were: Journal of Advertising (n=22), International Journal of Human-Computer Interaction (n=18), Computers in Human Behavior (n=15), Journal of Interactive Advertising (n=14), and Journal of Marketing Research (n=11). Eye-tracking was the dominant methodology (71 studies, 60.2%), followed by survey experiments (24 studies, 20.3%), mixed-methods designs (14 studies, 11.9%), and computational/modeling approaches (9 studies, 7.6%). Study origins were predominantly North American (41%) and European (38%), with growing Asian representation (21%).

Included Studies Summary

Table 1 presents a representative selection of 30 key studies. The full dataset of 118 studies is available as supplementary material.

Table 1. Selected Key Studies at the HCI–Visual Advertising Intersection (n = 30 representative)

Resnick & Albert (2014)	Int. J. HCI	Eye-tracking	n=48	Banner ad location and task type interact to produce banner blindness; top-right placements most affected during goal-oriented browsing.
Pieters & Wedel (2004)	J. Marketing	Eye-tracking, field experiment	n=1,363 ads	Brand elements attract brief fixations; visual ad size disproportionately boosts brand attention relative to pictorial area.
Hervet et al. (2011)	Computers in Human Behavior	Eye-tracking	n=60	Fixation count on banner ads is significantly lower during reading tasks; peripheral vision processes ads without focal attention.
Brajnik & Gabrielli (2010)	Int. J. HCI	Systematic review	72 studies	Online ads reduce usability; intrusive formats (pop-ups, interstitials) cause the greatest disruption to navigation tasks.
Drèze & Hussherr (2003)	J. Interactive Marketing	Eye-tracking	n=189	Internet users avoid looking at banners; aided recall was low, yet ads still influenced brand attitudes through mere exposure.
Wedel & Pieters (2008)	J. Marketing Research	Computational + eye-tracking	n=1,800 ads	Visual attention allocation follows saliency-driven bottom-up and goal-driven top-up dual pathways in advertising contexts.
Kuisma et al. (2010)	J. Interactive Marketing	Eye-tracking + survey	n=92	Animated banner ads attract initial fixations faster than static ads but

				reduce overall viewing time on surrounding editorial content.
Simola et al. (2011)	J. Experimental Psychology: Applied	Eye-tracking	n=30	Right-side banners are more distracting during reading; animation increases involuntary attentional capture.
Cho & Cheon (2004)	J. Advertising	Survey	n=447	Perceived goal impediment and prior negative experience are the two strongest predictors of online advertising avoidance.
Lee & Ahn (2012)	J. Advertising	Eye-tracking	n=117	Animated ads capture attention but impair memory for page content; interactivity moderates elaboration and attitude formation.
Goodrich (2011)	J. Computer-Mediated Communication	Eye-tracking	n=65	Visual attention to online ads positively predicts click-through only when users' browsing is non-goal-directed.
Schmidt & Maier (2022)	J. Advertising Research	Eye-tracking + survey	n=300	Embedded content ads outperform banner positions for both attention duration and unaided recall one week post-exposure.
Hong et al. (2021)	MIS Quarterly	Eye-tracking + experiment	n=148	Congruence between ad visual style and host-page aesthetics raises fixation duration by ~22% and purchase intention.
Boerman et al. (2017)	J. Advertising	Survey experiment	n=491	Sponsored content disclosure increases persuasion knowledge activation but minimally affects attitude toward the brand.
Neijens & Voorveld (2018)	J. Advertising	Experiment	n=418	Cross-device ad exposure sequence (mobile-first, desktop-second) enhances brand memory compared to single-platform delivery.
Pallas et al. (2013)	J. Interactive Advertising	Eye-tracking + survey	n=89	Interactive banner ads generate 2.4× more fixations than static equivalents, producing deeper elaboration and attitude change.
Im et al. (2021)	J. Research in Interactive Marketing	Eye-tracking	n=96	Visual clutter on web pages caused by high ad density reduces dwelling time on both ads and editorial content.
Balaban et al. (2023)	Applied Sciences	Eye-tracking + survey	n=90	Low visual complexity banners outperform high-complexity counterparts; simple ads fixated 9% more and rated 4.4% more appealing.
Juric et al. (2024)	MIPRO IEEE Proceedings	Eye-tracking	n=72	Email banner ads with human faces, pastel colors, and call-to-action buttons attract significantly higher visual attention and click preference.
Lagner & Klinke (2022)	J. Advertising	Viewport logging + eye-tracking	n=1,200+	Viewport time predicts brand recall; 1-second viewability threshold validated as a meaningful proxy for sustained visual attention.
Langner & Klinke (2025)	J. of Advertising	Viewport logging validation	n=1,300+	Mobile eye-tracking validates viewport logging as scalable and valid substitute for measuring gaining and holding attention in social media ads.

Boscolo (2022)	J. Visual Communication	Eye-tracking + biometrics	n=54	Gender-specific vs. gender-neutral ad visuals elicit differential gaze patterns; gender-targeted ads increase emotional response intensity.
Ballco et al. (2021)	Food Quality and Preference	Eye-tracking + choice task	n=88	Gaze duration on product label elements positively correlates with purchase probability; brand zone attracts fewest yet most decision-relevant fixations.
Kujur & Singh (2020)	J. Theoretical & Applied Electronic Commerce Research	Survey (U&G framework)	n=422	Visual communication quality on social media directly predicts consumer-brand relationship strength; hedonic visuals outperform informational ones.
Potvin Kent et al. (2024)	Public Health Nutrition	Content analysis + eye-tracking	n=210	Food influencer marketing on Instagram and TikTok disproportionately targets youth; visual salience of unhealthy products heightened by interface design cues.
Cyr et al. (2018)	MIS Quarterly	Experiment + UX measures	n=312	Interface aesthetics mediate the relationship between visual design quality and processing fluency, shaping advertising persuasiveness.
Tractinsky et al. (2000)	Interacting with Computers	Experiment	n=60	Visual aesthetics of interactive systems are perceived as a usability attribute; beautiful = usable halo effect confirmed in digital ad contexts.
Fogg et al. (2003)	CHI Proceedings	Mixed methods	n=2,684	Website credibility is heavily determined by visual design; layout professionalism is the top heuristic used by users to judge trustworthiness.
Sundar & Kim (2005)	J. Interactive Advertising	Experiment	n=294	Higher interface interactivity increases user involvement and message elaboration, intensifying persuasion from visual ad elements.
Rodgers & Thorson (2000)	J. Interactive Advertising	Theoretical/conceptual	—	Foundational IAM framework: proposes that user motivation and ad format jointly determine visual attention and cognitive processing depth.

Note. Full citation details provided in References section. Sample sizes refer to human participants unless otherwise noted (ads).

Integration of HCI and Advertising Research: State of the Field

This systematic review of 118 peer-reviewed studies confirms that the intersection of human-computer interaction and visual advertising constitutes a substantively productive, yet disciplinarily fragmented, research domain. Scholars across HCI and communication science have arrived at convergent empirical conclusions most notably that visual complexity, animation, and user task-state jointly determine the magnitude of advertising attention but the theoretical vocabularies and citation networks of these two fields remain largely insular. HCI researchers rarely draw on Elaboration Likelihood theory; advertising scholars rarely apply usability heuristics. This disciplinary siloing is consequential: it has produced a body of knowledge that is empirically richer than it is theoretically integrated.

The most consequential methodological cross-pollination has run from HCI to advertising. Eye-tracking protocols developed to evaluate interface usability have generated

the most ecologically valid, objective, and granular data on advertising attention available in the published literature surpassing what self-report and behavioral click-data measures can achieve. In the reverse direction, advertising research has contributed theoretical frameworks particularly the Elaboration Likelihood Model (Petty & Cacioppo, 1986) the Limited Capacity Model (Lang, 2000), and the Persuasion Knowledge Model (Friestad et al., 1994) that situate interface-level attention findings within the broader architectures of attitude formation, behavior change, and consumer resistance. These bidirectional contributions are genuine, but their integration into a unified theoretical framework has not yet been achieved. The present synthesis argues that such a framework is both feasible and urgently needed.

Implications for Design Practice

The evidence synthesized across 118 studies yields a consistent set of design-actionable findings that should inform advertising production, platform policy, and programmatic ad placement strategy. First, **ad visual complexity must be calibrated to the cognitive load profile of the surrounding interface**. Studies examining high-task-demand contexts reading news, completing search tasks, navigating e-commerce find that cognitively demanding ad visuals compound cognitive load and accelerate avoidance. (Balaban et al., 2023) demonstrated that low-complexity banners received 9% more fixations and were rated 4.4% more appealing; (Hervet, G, et al., 2011) confirmed that focal attention to banners collapses during reading tasks. Together, these findings argue for context-adaptive visual advertising systems that reduce ad complexity in high-demand interface environments.

Second, **aesthetic congruence between ad and page context is an underutilized optimization variable**. (Hong et al., 2021) found that visual style matching between advertising and editorial context increased fixation duration by 22% and elevated purchase intention. This effect is directly actionable by programmatic advertising platforms, which already possess the interface-classification infrastructure to select ad creatives based on visual style matching. Third, **interactivity warrants selective, contextually sensitive deployment**. (Pallas et al., 2013) demonstrated that interactive banner ads generate 2.4 times more fixations than static equivalents, but (Lee & Ahn, 2012) established that the same interactive features impair memory for surrounding editorial content. The implication is not to maximize interactivity globally but to deploy it when users are in low-task, exploratory modes a distinction that behavioral signals from session data can approximate. Fourth, **intrusive formats carry systemic costs** that extend beyond the immediate session: (Brajnik & Gabrielli, 2010) documented that pop-ups, interstitials, and autoplay video reduce platform-level trust, increasing users' propensity to install ad blockers, thereby eliminating all advertising value from the interaction.

Toward Theoretical Integration

Three theoretical propositions emerge from the synthesis that collectively advance toward an integrated HCI-advertising framework. First, the dual-pathway attention model (Pieters & Wedel, 2004) is best understood not as an advertising-specific theory but as a general HCI attention theory applied to persuasive interface contexts. Bottom-up salience and top-down goal orientation are cognitive processes that operate across all human-computer interaction; advertising research has simply provided an unusually well-powered empirical test bed for studying their competition. Framing advertising attention as a special case of HCI attention allocation opens the door to applying the full HCI toolkit including cognitive load theory, information foraging theory, and usability heuristics to advertising outcomes.

Second, the banner blindness phenomenon is most coherently understood as a learned usability adaptation rather than an advertising-specific construct. Users form mental models of ad-typical visual patterns and interface regions, and attentionally suppress them precisely the

kind of schema-driven top-down perceptual filtering that HCI researchers study in the context of navigation patterns and information architecture. This framing implies that banner blindness should be theorized and measured using HCI constructs such as mental models, user learning curves, and habituation not only through advertising recall metrics.

Third, the Persuasion Knowledge Model requires extension to accommodate algorithmically personalized and AI-generated advertising contexts. The original model assumes that persuasion knowledge is activated by recognizable advertising conventions (Friestad et al., 1994) AI-generated ad imagery, dark pattern-enhanced disclosure design, and native advertising that mimics editorial interface conventions all systematically undermine the visual cues on which persuasion knowledge relies. An updated model would incorporate interface design variables visual mimicry, disclosure salience, congruence manipulation as determinants of persuasion knowledge activation, bridging HCI design ethics with communication science theory.

Research Gaps and Future Directions

Six critical gaps constrain the current field's capacity to generate cumulative, generalizable knowledge. Longitudinal research is the most structurally absent design in the literature. Of 118 included studies, fewer than five employed repeated-measures or panel designs extending beyond a single week.

The temporal dynamics of banner blindness habituation, persuasion knowledge development, and platform-specific viewing adaptation over months or years of digital media use are entirely uncharacterized. The viewport logging methodology validated by (Langner & Klinke, 2025) provides a scalable, low-cost infrastructure for panel-based attention studies that the field has not yet mobilized.

Immersive and spatial computing advertising represents the most urgent emerging frontier. Only 3 of 118 studies addressed advertising in AR or VR environments, despite the rapid commercial deployment of social AR filters, in-app AR advertising, and spatial ad formats on head-mounted displays. The HCI variables most consequential in these contexts spatial positioning, embodied interaction, presence, and vividness have no established connection to advertising attention or persuasion theory. (Brengman et al., 2022; Flavián et al., 2022) have begun this work, but their empirical coverage is limited to presence ratings and general engagement measures rather than fixation-level attention data.

AI-generated advertising poses a distinct and undertheorized challenge. The rapid integration of generative AI into commercial ad production (Exner et al., 2025; Hartmann et al., 2024) has not been matched by empirical HCI research on how users detect, process, and respond to AI-generated visual cues. Related to this, dark patterns at the HCI-advertising interface including manipulative disclosure design, urgency cues, and native ad visual mimicry remain disconnected from the systematic HCI dark patterns literature despite their direct relevance (Chauhan et al., 2025; Gray et al., 2023). Finally, accessibility and cross-cultural validity represent persistent equity and generalizability gaps: no study in the review examined advertising attention for users with disabilities, and Western-centric sampling limits the applicability of visual scanning and aesthetic preference findings to the global digital advertising market.

CONCLUSION

This systematic literature review synthesizes twenty-five years of interdisciplinary research examining the relationship between Human Computer Interaction (HCI) design and visual advertising effectiveness. The analysis of 118 peer-reviewed studies reveals that advertising attention and persuasion within digital environments are not determined solely by message content, but are profoundly shaped by interface-level variables such as visual

complexity, animation, interactivity, aesthetic congruence, and user task context. Empirical evidence consistently demonstrates that user attention is governed by a dual pathway mechanism in which bottom-up visual salience interacts with top-down goal-oriented browsing behavior. As a result, phenomena such as banner blindness, advertising avoidance, and reduced recall emerge not merely as failures of advertising creativity but as adaptive cognitive responses to interface conventions and information overload. The findings also indicate that eye-tracking methodologies originating from HCI research provide the most reliable empirical evidence for understanding digital advertising attention, enabling researchers to capture granular behavioral patterns that self-report and clickstream data cannot fully reveal. Consequently, integrating HCI methodological tools with communication theory frameworks—such as the Elaboration Likelihood Model, the Limited Capacity Model of Mediated Message Processing, and the Persuasion Knowledge Model offers a more comprehensive explanation of how advertising messages operate within interactive digital environments.

Beyond mapping empirical findings, this review highlights the need for stronger theoretical integration between the fields of HCI and advertising research. Despite addressing overlapping phenomena, the two domains remain conceptually fragmented, with HCI scholarship emphasizing usability and interaction design while advertising research focuses on persuasion processes and consumer behavior. Bridging these perspectives is essential for developing a unified framework that conceptualizes advertising attention as a specific instance of human–computer interaction. The review further identifies several critical research gaps that should guide future scholarship, including the scarcity of longitudinal attention studies, the limited investigation of immersive advertising in augmented and virtual reality environments, and the emerging challenges posed by AI-generated advertising and algorithmic personalization. Addressing these gaps will require interdisciplinary collaboration that combines interface design analysis, behavioral measurement techniques, and communication theory. Such integration is necessary not only for advancing academic knowledge but also for informing the ethical and effective design of digital advertising systems in increasingly complex media ecosystems.

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