

Multicriteria Framework for Digital Content Design and Evaluation in Cross-Generational Targeting

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Abstract. Effective digital content that appeals to diverse audience segments is challenging due to varying expectations across generations. Differences in design priorities and evaluation criteria create an opportunity for applying analytical methods based on Multi-Criteria Decision Analysis (MCDA). This study explores how different marketing approaches and types of advertising align with generational preferences, with the aim of identifying the most effective strategy for each generation with the use of perceptual experiment and eye-tracking. The PROMETHEE method was applied to integrate multiple evaluation criteria and derive optimal recommendations. The findings provide valuable insights for campaign design and the application of computational methods, demonstrating how data-driven approaches can enhance marketing effectiveness by aligning strategies with generational characteristics.

Keywords: Digital marketing · MCDA · Consumer Targeting

1 Introduction

The development of the Internet and digital environments in recent decades has significantly transformed business operations. The global digital advertising market has been experiencing rapid growth, with projections indicating further expansion in the coming years. The market value was estimated at \$488.4 billion in 2024 and is expected to reach \$1.164 trillion by 2030, representing a compound annual growth rate (CAGR) of 15.4% between 2025 and 2030 [19]. These developments highlight the need for continuous adaptation of marketing strategies to evolving consumer behaviors and the increasing utilization of innovative tools. Designing a marketing content for a specific audience allows for better content matching, but the challenge is to create a message that is legible for different target groups [2]. The key is the appropriate use of communication elements including informational aspects and providing valuable content in a diverse forms, usage of persuasion techniques with argumentation adapted to the expectations

of both groups, maintaining brand awareness through various channels and appealing to emotions common to all generations [9]. The main contribution of the presented study is the development of a framework for multi-criteria evaluation of digital content for influencing target group from different generations, taking into account evaluation criteria. In the practical aspect, an evaluation model based on the PROMETHEE II method was created with the use of eye tracking based study. The use of marketing content with different influence techniques was assumed. Result showed that analyzing the effectiveness of the message and planning its adjustment to individual groups with the used of Multi-Criteria Decision Analysis methods allows selection of different communication variants and focus on various preferences of recipients to optimize the marketing strategy.

2 Literature review

The Internet has enabled companies to reach consumers more effectively while offering a broad spectrum of marketing tools that facilitate precise ad targeting, audience engagement, and message personalization [13, 4]. The increasing popularity of social media and platforms such as YouTube, TikTok, and Instagram has compelled marketers to adapt their communication strategies to contemporary trends [12]. Contemporary digital marketing encompasses various promotional strategies, including search engine marketing (SEO, SEM), social media marketing, content marketing, email marketing, and display advertising [10]. The importance of these tools continues to grow in parallel with the global increase in internet users, solidifying the internet as a crucial channel for reaching the modern consumer. One of the most critical aspects of an effective digital marketing strategy is tailoring the message to a specific target audience [17]. Given the diverse consumption preferences and habits of different generations, marketers must design their campaigns in a manner that accounts for the distinctive behaviors of users across various age groups [3]. Generational identity is shaped by shared social and technological experiences that influence the perception of reality.

The classification of generations is based on trends in the literature, although their boundaries remain fluid. Millennials (Generation Y) includes individuals born between 1980 and 1999. Generation Z, comprising approximately 30% of the global population, is the first generation raised entirely in a digital environment, significantly influencing their communication styles and identity formation [7]. Effective marketing strategies must account for generational differences in advertising reception by adjusting formats and messaging to consumer preferences. For instance, the generation raised in a digital environment prefers short, dynamic video content and interaction with brands on social media platforms [15]. Generation Z favors dynamic, short-form content, interactivity, influencer marketing, and gamification [18]. The generation that grew up without digital technologies tends to favor more traditional formats, such as email marketing or search engine advertisements [16]. These differing approaches to content consumption necessitate the implementation of distinct advertising strategies that

not only effectively reach audiences but also sustain their engagement over the long term. Millennials respond best to storytelling and content marketing, emphasizing authenticity and long-term brand relationships, while also engaging in brand communities and email communication [14].

Contemporary strategies focus on personalization and innovative formats, such as native advertising, video content, and automated marketing utilizing big data and artificial intelligence [5]. Targeted advertising allows to optimize promotional costs and better tailor content to users [1]. However, the effectiveness of these tools diminishes when attempting to reach an entire generation with diverse media consumption habits, as is the case with Generation Z, which utilizes multiple communication platforms. Furthermore, precise targeting does not always lead to cost savings—companies with more consumer data often invest more in advertising to gain a competitive edge. Superior targeting systems may also contribute to market monopolization by attracting more advertisers and consumers to a single platform [8]. While high targeting accuracy influences pricing strategies by enabling firms to offer customized promotions, it may simultaneously reduce content diversity and limit interactions with new products [6]. As targeting technologies continue to evolve, they will increasingly integrate traditional media with advanced user analytics to optimize advertising effectiveness [11]. While technological advancements have significantly enhanced targeted advertising, their effectiveness is not universal across all demographic groups. The diverse media consumption habits of Generation Z highlight the limitations of precise targeting, necessitating a deeper understanding of how different audience segments engage with digital advertisements. To address these challenges, empirical research is required to assess the actual effectiveness of various advertising formats. This study employs a structured methodological approach, integrating perceptual experimentation with multi-criteria decision analysis (MCDA), to systematically evaluate banner advertisement engagement among different generational cohorts.

3 Conceptual Framework

The study employed a structured multi-stage methodological approach to assess the effectiveness of different types of banner advertisements using eye-tracking technology. The conceptual framework underlying the research process is illustrated in Figure 1 and consists of four distinct phases: perceptual experiment, statistical analysis, multi-criteria decision analysis and results visualization. The data were collected as part of a perceptual experiment aimed at evaluating the effectiveness of various banner advertisement formats. The study sought to understand how participants interact with and visually process advertising content. Set of banner advertisements was selected to ensure stimulus uniformity and mitigate confounding variables such as brand preference. These advertisements adhered to the Interactive Advertising Bureau (IAB) guidelines and represented four distinct advertising strategies: informational, persuasive, reminder, and emotional.

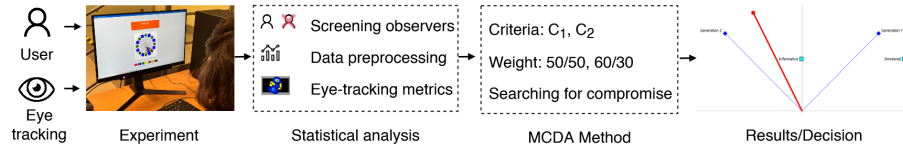


Fig. 1. Study procedure integrating perceptual data analysis and MCDA approach.

To systematically evaluate the effectiveness of different advertisement formats, MCDA approach was applied, specifically the PROMETHEE method. In this approach, two main criteria were considered: Generation Y and Generation Z. To accommodate variations in preferences and perceptual tendencies between these groups, five different weighting combinations were introduced, as described in Section 4.1. The PROMETHEE method facilitated the ranking of advertisement formats by integrating these weight variations, ultimately identifying the most effective advertisement strategy for each generational segment. PROMETHEE ranking results were visualized to depict the effectiveness of each banner advertisement type. These visualizations provided empirical insights into how participants' gaze behavior varied across advertising strategies, contributing to a comprehensive understanding of visual engagement in digital advertising.

4 Experimental Study

4.1 General Results

The experiment was conducted in a controlled laboratory environment utilizing a Tobii Pro X3-120 eye tracker with a sampling rate of 120 Hz. Participants were seated at a distance of 50 to 95 cm from the monitor, following the manufacturer's recommendations. The study initially involved 22 participants, but after filtering out data from two individuals due to excessive head movements, the final dataset comprised 20 participants (8 from Generation Y; 12 from Generation Z). To ensure a naturalistic yet controlled exposure to advertisements, participants engaged in a mandala coloring task while banner ads were displayed at the top of the screen, in line with Google's advertising placement recommendations. Advertisements were shown in a randomized sequence, with five-second intervals between exposures, across three 30-second series. This setup maintained participant engagement while capturing their natural visual attention and processing behaviors. Following data collection, the raw eye-tracking data underwent preprocessing to enhance data quality and facilitate subsequent analysis. This stage comprised several key procedures including screening of observers, data preprocessing with focus on fixation, saccade, and blink detection algorithm. Standard eye-tracking metrics, including fixation duration, fixation count, time to first fixation, and gaze heatmaps, were extracted. These measures provided quantitative insights into participants' visual engagement with the advertisements.

4.2 Priorities and Targeting Scenarios

To effectively compare the effectiveness of advertisements across different generations, three weight distribution scenarios were prepared using the PROMETHEE method. These scenarios allow us to analyze how different prioritization of Generation Y and Generation Z influences the ranking of advertisement types:

- **Equal Weights:** In this scenario, equal priority is assigned to both generations (weight: Generation Y = 50, Generation Z = 50).
- **Priority for Generation Y:** Greater priority is given to the results of Generation Y (weight: Generation Y = 75, Generation Z = 25).
- **Priority for Generation Z:** Greater priority is given to the results of Generation Z (weight: Generation Y = 25, Generation Z = 75).
- **Moderate Priority for Generation Y:** A slightly higher priority is assigned to Generation Y (weight: Generation Y = 66, Generation Z = 33).
- **Moderate Priority for Generation Z:** A slightly higher priority is assigned to Generation Z (weight: Generation Y = 33, Generation Z = 66).

Table 1. The PROMETHEE II method was used in the analysis. We have five scenarios in which we use four variants (Emotional (E), Informative (I), Persuasive (P), Reminder (R)) along with two criteria (Generation Y and Z).

Ranking	Variant	ϕ	ϕ^+	ϕ^-	Ranking	Variant	ϕ	ϕ^+	ϕ^-
scenario 1: 0.5 x 0.5					scenario 2: 0.75 x 0.25				
1	E	0.3333	0.6667	0.3333	1	E	0.6667	0.8333	0.1667
2	I	0.3333	0.6667	0.3333	2	I	0.3333	0.6667	0.3333
3	P	0	0.5	0.5	3	P	-0.5000	0.2500	0.7500
4	R	-0.6667	0.1667	0.8333	4	R	-0.5000	0.2500	0.7500
scenario 3: 0.25 x 0.75					scenario 4: 0.66 x 0.33				
1	P	0.5000	0.7500	0.2500	1	E	0.5556	0.7778	0.2222
2	I	0.3333	0.6667	0.3333	2	I	0.3333	0.6667	0.3333
3	E	0.0	0.5000	0.5000	3	P	-0.3333	0.3333	0.6667
4	R	-0.8333	0.0833	0.9167	4	R	-0.5556	0.2222	0.7778
scenario 5: 0.33 x 0.66									
1	I	0.3333	0.6667	0.3333					
2	P	0.3333	0.6667	0.3333					
3	E	0.1111	0.5556	0.4444					
4	R	-0.7778	0.1111	0.8889					

The PROMETHEE II analysis presented in the Table 1 evaluates the effectiveness of different advertisement types based on varying weight distributions assigned to Generation Y and Generation Z. The results indicate that emotional advertisements consistently achieve the highest ranking when the priority is given to Generation Y (0.75 x 0.25), demonstrating their strong engagement with this demographic. Conversely, persuasive advertisements show the highest ranking in the scenario where Generation Z holds greater weight (0.25 x 0.75), suggesting

that this generation responds more positively to rational and argument-based advertising strategies. Informative advertisements maintain a relatively stable position across different weighting scenarios, indicating a balanced appeal across both generational cohorts. Reminder advertisements consistently rank lowest in all analyzed scenarios, highlighting their limited effectiveness in capturing user attention, regardless of generational preferences.

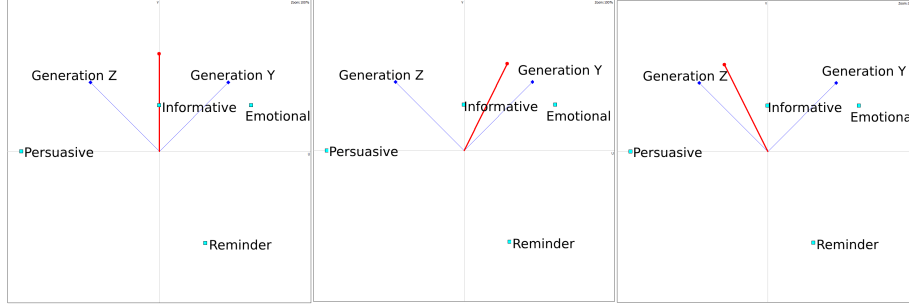


Fig. 2. S1: weight 50Y/50Z **Fig. 3.** S2: weight 75Y/25Z **Fig. 4.** S3: weight 25Y/75Z

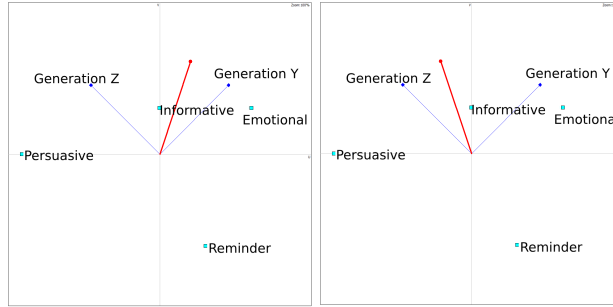


Fig. 5. S4: weight 66Y/33Z **Fig. 6.** S5: weight 33Y/66Z

Figure 2 presents the PROMETHEE II results for Scenario 1, where equal weight is assigned to both Generation Y and Generation Z. Emotional advertisements (EA) rank highest with a score of 19.405, suggesting their universal appeal. Informative ads (IA) follow closely with 19.200, showing the importance of valuable content. Persuasive ads (PA) score 17.990, slightly lower, and reminder ads (RA) are least effective with 17.025. In Scenario 2 (Figure 3), where Generation Y is prioritized, EA again ranks highest (19.747), indicating strong resonance with emotional content. IA (19.325) is also effective, while PA (18.045) ranks third, reflecting some skepticism toward overt persuasion. RA scores lowest (17.137). Scenario 3 (Figure 4) shifts focus to Generation Z, where PA takes the lead (19.075), suggesting a preference for logical, direct messaging. IA is a close second (19.062), while EA drops to third (17.935), and RA remains last (16.912). Scenario 4 (Figure 5) assigns moderate priority to Generation Y. EA

(19.437) still leads, followed by IA (19.090) and PA (17.846). RA continues to be the least effective (16.929). Finally, Scenario 5 (Figure 6) moderately prioritizes Generation Z, with IA ranking highest (18.984), indicating the importance of informative content. PA (18.925) follows, while EA (17.773) is third and RA (16.780) again ranks lowest.

5 Conclusions

The results of the PROMETHEE analysis provide valuable insights into the effectiveness of various types of advertisements in targeting different generational cohorts. The findings indicate that emotional advertisements consistently achieve the highest net scores across all weighting scenarios, highlighting their universal appeal. When equal priority is given to Generation Y and Z, emotional advertisements remain the most engaging, confirming their strong ability to capture attention and foster consumer connection.

Emotional ads dominate Generation Y, reinforcing the idea that this demographic group responds particularly well to narratives and visually compelling content. This suggests that brands targeting Generation Y should focus on storytelling techniques, dynamic visuals, and emotionally driven messages to maximize engagement. Meanwhile, in the scenario where Generation Z is prioritized, emotional advertisements still rank highest, but informative and persuasive ads are positioned closer in ranking. This observation suggests that Generation Z demonstrates more diversified preferences, with an appreciation for both emotional engagement and knowledge-based content.

These results emphasize the necessity of adapting advertising strategies to the distinct characteristics of each generational cohort. While emotional content proves to be highly effective across both groups, a nuanced approach that integrates informative elements may be particularly beneficial when engaging Generation Z. Additionally, persuasive advertisements, although slightly less effective overall, still retain relevance and should be utilized strategically in specific contexts where rational appeals align with consumer expectations.

The broader implications of these findings highlight the dynamic nature of digital advertising effectiveness. As generational behaviors continue to evolve, future research should focus on integrating emerging trends such as AI-driven personalization, influencer marketing, and immersive media formats to further refine advertising strategies. The application of PROMETHEE in this study has demonstrated its potential as a robust decision-support tool in marketing analytics, providing advertisers with actionable insights to optimize content strategies and maximize consumer engagement.

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