

THE IMPLEMENTATION OF A/B TESTING TECHNIQUE

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ABSTRACT

In the digital environment, companies face intense competition, where even minor mistakes may lead to significant revenue losses. This is particularly important given increasingly demanding consumers who expect efficient and seamless online experiences. Consequently, companies need to carefully analyze consumer behavior and systematically test their content elements. A/B testing represents an effective approach for this purpose. By comparing different versions of content elements, it enables the identification of the variant that performs better among users. As a result, organizations may achieve benefits such as higher conversion rates and increased user engagement. However, to obtain reliable results, A/B testing should be conducted through clearly defined phases and supported by appropriate statistical methods. Furthermore, a variety of specialized software tools are available to facilitate the implementation and management of A/B testing processes.

Key words: A/B testing, digital marketing, statistical approach

INTRODUCTION

In digital marketing, as well as in offline environments, one of the primary tasks involves analyzing consumer behavior and understanding their decision-making processes. Consumers' needs and wants represent the foundation of most marketing activities. Although traditional analytical methods can also be applied in the online context, they may face limitations in generating the detailed insights required for optimizing modern marketing strategies. The rapid expansion and continuous evolution of digital platforms, including the introduction of new aesthetic and functional elements, have increased the need for effective marketing tactics thus leading to the application of contemporary evaluation tools, such as A/B testing (Kumar, 2021).

A/B testing is widely used when evaluating the effects of website changes on users, particularly in relation to personalization features (Esteller-Cucala et al., 2020). Considering that well-designed websites tend to attract and retain visitors, consequently leading to increased engagement, improved conversion rates, and ultimately higher revenue (Sharma and Tripathi, 2023), they should be continuously adjusted and improved. A/B testing represents a key tool for validating proposed website modifications before full-scale implementation. Accordingly, this paper presents an explanation of this technique, along with its main phases.

A/B TESTING TECHNIQUE

The technique of A/B testing, in the literature also known as split testing, refers to “comparing two versions of a marketing element such as an email campaign, website layout, or advertisement by exposing different segments of the audience to each version” (Kumar, 2021, p. 323). Quin et al. (2024) define it as a form of online controlled experimentation and hypothesis testing aimed at evaluating and comparing two variants under real-world conditions. The main goal is to identify which variant performs better in attaining predefined objectives (Kumar, 2021).

Mulla (2020) discusses the evolution of the A/B testing method. Its earliest applications were recorded in clinical trials, after which it became widely adopted in digital marketing. Within this domain, A/B testing evolved from a relatively simple procedure into an essential instrument for data-driven decision-making. With the expansion of digital platforms, the method developed into an effective tool for isolating and analyzing specific variables, thereby providing valuable insights into user behavior.

The application of A/B testing offers several advantages. Puri et al. (2022) highlight the following benefits:

- Improved user engagement – testing alternative versions of content enables the identification of the variant preferred by the majority of users; modifying content based on empirical results can enhance the target audience’s experience and increase campaign effectiveness; for example, A/B testing may be applied to evaluate multiple versions of a call-to-action element within the same advertisement in order to select the most effective option.
- Increased conversion rates – A/B testing represents one of the simplest and most effective approaches for identifying which content element prompts the highest proportion of users to perform a desired action, in digital marketing known as a “conversion”; by distinguishing effective from ineffective variants, organizations can optimize content and improve conversion rates for actions such as click-throughs, sign-ups, or video views;
- Ease of analysis and quick results – the evaluation of variants in an A/B test is methodologically straightforward, as performance is assessed using predefined metrics aligned with specific objectives; the variant that demonstrates superior performance relative to alternatives should be selected; even with smaller sample sizes, A/B testing can generate valuable insights, including participant feedback regarding their preferences.

In addition to its benefits, Puri et al. (2022) identify certain limitations of A/B testing. These include:

- High resource consumption – A/B testing is most appropriate when a single element is evaluated at a time; if multiple elements are tested simultaneously, the process may become time-consuming and require greater resources.
- Suitability for specific goals – A/B testing is particularly effective when the objective is to assess the impact of one specific element (e.g., a call-to-action button, video content, or color) on a desired outcome (e.g., clicks, sign-ups, or shares); however, when multiple elements or entirely different content versions are to be compared, alternative approaches, such as offline testing or focus group discussions, may provide more cost-effective results.

A/B testing is widely adopted across various organizations in digital environments. According to Quin et al. (2024), it is extensively implemented by major technology companies, including Google, Meta, LinkedIn, and Microsoft.

In addition to A/B testing, it is important to mention the A/A test, sometimes referred to as a null test, in which users are assigned to two groups but exposed to exactly the same experience. This approach can be used for collecting data and assessing its variability for power calculations, as well as for testing the experimentation system (Kohavi et al., 2009).

A/B TESTING PROCESS

The A/B testing process is typically structured into several phases. Following Quin et al. (2024), three main phases can be distinguished:

- design phase – this phase focuses on designing the A/B test, during which key parameters are defined, including the research hypothesis, the target population and sample selection, the duration of the experiment, and the performance metrics (e.g., number of clicks or click-through rate);
- execution phase – this phase involves implementing the A/B test within the operational software system; after splitting the sample population, both variants are released into a live environment, and relevant data are collected for experimental evaluation.
- evaluation phase – this phase concerns the analysis of experimental outcomes; upon completion of the test, the initial hypothesis is examined using appropriate statistical methods; based on the results, follow-up actions may be taken, such as deploying the winning variation or designing new variants for subsequent testing.

A structured and well-planned A/B testing process can enhance marketing profitability by identifying key areas that require optimization (VWO, n.d.). In this regard, VWO (n.d.) presents five main steps:

- research – prior to designing an A/B testing plan, thorough research on current website performance should be conducted;
- observation and hypothesis formulation – documenting research observations and developing data-driven hypotheses contribute to achieving business objectives;
- variation creation – this step involves creating an alternative version of existing content based on the previously defined hypothesis, with specific modifications subject to testing.
- testing – this phase includes implementing the selected testing method; particular attention should be paid to the choice of statistical approach – Frequentist or Bayesian (Table 1); additionally, timing and experiment duration must be carefully determined; the duration of the test should be calculated based on factors such as average traffic volume, current conversion rate, expected improvement in conversion rate, and the number of variations;
- analyzing results and deploying winning variation – the analysis relies on various performance metrics, including percentage change, confidence levels, and potential effects on related indicators; if the results are statistically and practically significant, the winning variation should be implemented.

Table 1: Statistical approach (VWO, n.d., p. 12)

Frequentist Approach	Bayesian Approach
Frequentist statistics follow the “Probability as Long-Term Frequency” definition of probability.	Bayesian statistics follow the notions of “Probability as Degree of Belief” and “Logical Probability.”
In this approach, only data from the current experiment are used. The Frequentist solution is to conduct tests and draw conclusions.	In this approach, prior knowledge from previous experiments is incorporated into the current data. The Bayesian solution is to combine prior information with observed data to draw conclusions.
Provides an estimated mean (and standard deviation) of samples where A beats B but ignores cases where B beats A.	Takes into account the probability of A beating B and calculates the expected range of improvement.
Requires the test to run for a fixed period to obtain sufficient data, but does not indicate how close or far apart A and B actually are. It does not provide the probability of A beating B.	Provides greater control over testing. It allows better planning, a more accurate basis for ending tests, and clearer insight into how close or far apart A and B are.

HubSpot (n.d.) outlines six core principles for conducting effective A/B testing, particularly in relation to accurately measuring results and identifying the better-performing variant. These principles include: testing one variable at a time, implementing small modifications to the tested content, considering larger variables such as an entire landing page, evaluating both conversion rates and long-term business outcomes, ensuring comparable audiences of similar size and background, and controlling for timing effects. HubSpot (n.d.) also proposes the following steps for carrying out an A/B test:

- selection of the test variable,
- defining the objective,
- hypothesis formulation,
- identification of testable elements,
- determination of sample size and experiment duration.

Based on a systematic literature review, Quin et al. (2024) report that A/B testing is most frequently used to test algorithms, visual elements, and workflow or process modifications, with web, search engine, and e-commerce contexts representing the predominant application domains. Furthermore, equality-based hypothesis testing is commonly employed to analyze experimental outcomes, while bootstrapping methods are also discussed in several primary studies.

A/B TESTING TOOLS

There are several software tools that provide A/B testing services. Following CRO experts' recommendations, Massey (2024) listed tools for running A/B tests as well as tools supporting data collection processes. Among the presented A/B testing tools, Optimizely was described as a leading platform, offering benefits such as ease of use, retroactive filtering, intuitive data display and goal comparison, saved audiences, and strong third-party integrations. However, it has limitations in advanced targeting, slow updates for saved changes to the content delivery network (CDN), a less intuitive test setup compared to competitors, and issues with carrying query parameters or cookies within certain tests. The second tool on the list was VWO, described as particularly popular within the marketing domain and suitable for businesses with smaller budgets. Its advantages include faster updates, easier goal setup, simplified data export, responsive customer support, and an intuitive color-coded interface. Reported limitations include the inability to view all goal reports simultaneously, lack of saved targeting options, and the absence of a cumulative conversion rate graph under low-traffic conditions (Massey, 2024). The Table 2. presents selected A/B testing tools reviewed by Solomon (2026).

It should be noted that some companies develop and use internal A/B testing tools tailored to their specific needs. To the best of the authors' knowledge, based on publicly available information and online research, no widely recognized A/B testing platforms originating from Serbia were identified.

CONCLUSION

One of the primary tasks of any market-oriented company is to analyze consumer behavior. Before undertaking important activities, consumer preferences and responses should be carefully examined. In digital marketing, A/B testing represents an approach that can serve this purpose. It involves the comparison of two content versions, allowing the target audience's responses to determine which version performs better. This technique offers several advantages, including improved user engagement, increased conversion rates, and ease of analysis with relatively quick results. However, certain challenges related to its implementation should also be considered, particularly resource requirements and its suitability primarily for specific goals. To ensure accurate and reliable outcomes, A/B testing should be conducted through several structured

phases, beginning with research on current website performance. After documenting research observations and formulating hypotheses, variations are created and tested using appropriate statistical methods. The results are then analyzed, and the better-performing variation is selected for implementation. In addition to internal A/B testing solutions developed by individual companies, numerous publicly available software tools can support the design and execution of A/B tests.

Table 2: A/B testing tools (Solomon, 2026)

Tool	Best for	Trial info	Price
Zoho Pagesense	Best for conversion optimization	Free trial available	From \$15/month (billed annually)
Omniconvert	Best for data-driven A/B testing	Free demo available	From \$167/month (billed annually)
LaunchDarkly	Best for customizable feature flagging options	14-day free trial	From \$12/service connection/month
Instapage	Best for AI-driven A/B testing	Free demo + 14-day free trial available	From \$79/month (billed annually)
VWO	Best for website behavioral analytics	Free demo + 30-day free trial available	Pricing upon request
Crazy Egg	Best for Shopify ecommerce stores	30-day free trial	From \$29/month (billed annually)
Optimizely	Best for targeted product rollouts	Free demo available	Pricing upon request
Leanplum	Best for A/B testing of mobile notifications	14 day free trial	From \$330/month
Convertize	Best for code-free webpage edits	Free trial available	Pricing upon request
Adobe Target	Best for personalized audience experiences	Free demo available	Pricing upon request

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