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DEVELOPMENT OF VISUAL EDITORS FOR DIGITAL MEDIA: ARCHITECTURE, WEBSITE INTEGRATION, AND ADVERTISING POTENTIAL OF INTERACTIVE CONTENT

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РАЗРАБОТКА ВИЗУАЛЬНЫХ РЕДАКТОРОВ ДЛЯ ЦИФРОВЫХ СМИ: АРХИТЕКТУРА, ИНТЕГРАЦИЯ С САЙТАМИ И РЕКЛАМНЫЙ ПОТЕНЦИАЛ ИНТЕРАКТИВНОГО КОНТЕНТА

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Abstract

The article analyzes the engineering and architectural foundations underpinning the development of visual editors for digital media. It examines principles of modularity, extensibility, and separation of concerns, which enable the creation of interactive content without programmer involvement. It is emphasized that such editors support the automation of multimedia content production, facilitate integration with websites via API, and ensure secure isolation of executable code. The article also examines monetization strategies that include integrating advertising formats into visual media and assesses the impact of interactive features on audience engagement metrics. It is emphasized that utilizing visual editors aids in streamlining resource usage and fostering a technology-resistant framework for digital media creation.

Keywords: visual editor, digital journalism, interactive content, user engagement, advertising, marketing.

Аннотация

В статье анализируются инженерные и архитектурные решения, лежащие в основе разработки визуальных редакторов для цифровых медиа. Исследуются принципы модульности, расширяемости и разделения ответственности, позволяющие обеспечить работу с интерактивным контентом без участия программистов. Подчёркивается, что такие редакторы позволяют автоматизировать процесс создания мультимедийных публикаций, интегрироваться с сайтами через API и обеспечивать безопасную изоляцию исполняемого кода. Кроме того, в статье рассматриваются модели монетизации, предполагающие интеграцию рекламных форматов в структуру визуальных публикаций, а также проводится анализ влияния интерактивных механизмов на поведенческие метрики аудитории. Подчеркивается, что использование визуальных редакторов способствует оптимизации ресурсозатрат и формированию технологически устойчивой инфраструктуры цифрового медиапроизводства.

Ключевые слова: визуальный редактор, цифровая журналистика, интерактивный контент, вовлеченность пользователей, реклама, маркетинг.

Introduction

The swift progress of digital technologies, along with changing trends in media consumption, has caused a change in the formats employed for delivering journalistic content. Modern viewers –

especially younger ones – show a steady inclination for visually appealing, interactive, and animated content that reveals notably greater engagement than conventional text-focused publications. The creation of such content often necessitates the participation of expert technical teams, rendering the process labor-intensive, time-consuming, and expensive regarding both development and continuous upkeep.

In response to these challenges, there is growing interest in tools that democratize the creation of visual content. One such solution is the integration of embedded visual editors within the editorial systems of digital media platforms. These editors enable designers and editorial staff to independently assemble full-fledged multimedia articles incorporating animations, interactive components, and visual narratives – without the need for developer involvement. The rendering and functionality of these visual publications are managed via a universal client-side script delivered from the editor vendor's cloud infrastructure. This architectural approach facilitates centralized control over presentation logic, ensures backward compatibility with previously published materials, and allows for rapid deployment of new features without requiring modifications to individual articles.

The aim of this study is to analyze the engineering and architectural foundations underlying the development of visual editors for digital media, to explore their integration within existing website infrastructures, and to examine their role in enabling new models of monetization through interactive advertising content.

Main part. The transformation of content formats in digital journalism

The evolution of visual and interactive genres in online journalism has introduced radical changes to forms of presenting information, away from the traditional text and static images towards dynamic, multimedia, and interactive journalism. Although text accompanied by images continued to be the primary format in the initial phases of digitalization, multimedia longreads have become more prominent since the mid-2010s. They consist of images, infographics, integrated videos, and animations, all contained in a unified visual story.

As learned, the population on the internet grew to over 5,5 billion during the period 2005-2024. This rapid increase not only heightened access to online media, but it totally revolutionized expectations on the part of audiences regarding the shape and scope of information content (fig. 1).

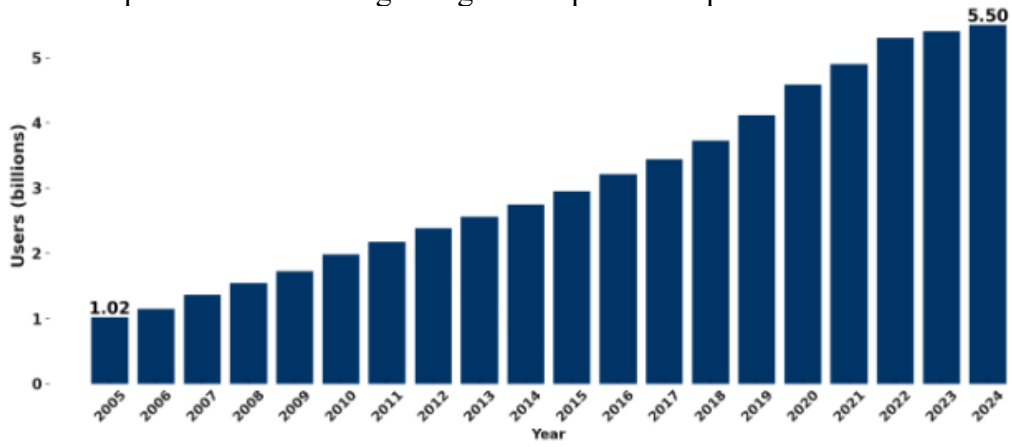

Figure 1. Number of Internet users worldwide, billions [1]

Under these conditions, visual and interactive solutions have become a key mechanism in the competition for users' attention. One of the first and most influential examples of this approach was The New York Times' report «Snow fall: the avalanche at tunnel creek» (2012), which utilized 3D animations, interviews, maps, and visualizations that were automatically activated as the reader scrolled down the page [2]. According to Source and OpenNews, the longread received over 3,5 million page views and around 2,9 million unique visitors during the first six days since being published, justifying the strong user interest in the multimedia format. The success of these projects demonstrated the potential of combining visual and interactive content in digital journalism, not merely enabling the transmission of information but also the building of an integrated audiovisual product that increases emotional engagement with the material.

Generally, the international media environment has experienced a deep change in the last two decades, passing from traditional media to digital media. Oberlo's data report that by 2025 the differential between time spent on traditional media and digital media in the USA is over three hours per day (fig. 2).

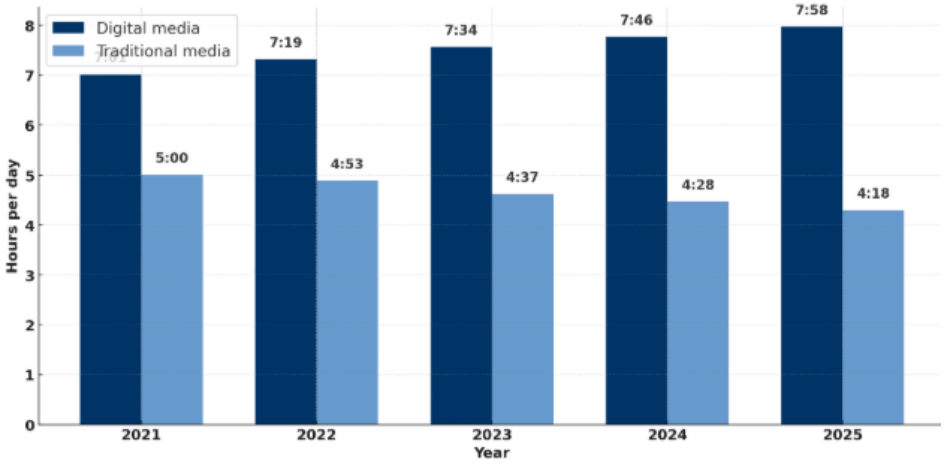

Figure 2. Comparison of time spent by users on media consumption [3]

This tendency clearly mirrors the general media market transformation from traditional content consumption to customized digital formats. Social media are not just leading communication platforms, but also leading news, entertainment, and advertising content providers that have successfully displaced print and television media in consumers' daily media consumption patterns.

At the institutional level, digitalization has contributed to a redefinition of professional roles within newsrooms [4]. Journalistic work is no longer solely text-centered: contemporary journalists engage with visual editor interfaces, make decisions regarding the structure and visual logic of content presentation, and participate in the development of interactive storytelling scenarios.

The automation of visual content production through the use of an embedded visual editor significantly streamlines editorial workflows. Key stages such as preparation, layout, and publication of multimedia materials can be carried out without developer involvement, thereby reducing the workload on technical teams and accelerating the overall production cycle (table 1).

Table 1

Comparative analysis of production workflow stages in traditional and automated models

Production stage	**Traditional approach (without visual editor)**	**Automated approach (with visual editor)**
Initiation and planning	Requires coordination between editors, designers, and the technical team to assess project feasibility.	Performed autonomously by the editorial team during internal prototyping using the editor interface.
Layout and composition	Executed manually by developers using HTML, CSS, and JavaScript.	Performed through a graphical interface without programming, using visual component configuration
Approval process	Involves multiple iterations between editorial, design, and development teams; delays are possible.	All changes are made and approved within a unified editorial system and workflow.
Testing and debugging	Requires testing of scripts, CMS compatibility, and cross-browser behavior.	Uses a unified rendering engine, which minimizes behavioral inconsistencies and reduces the need for testing.
Editing and revisions	Requires returning to the technical implementation stage and recompiling.	Editorial team retains access to the publication; changes can be made at any time via the editor interface.
Publication and integration	Requires manual embedding of code blocks into the CMS and	Publication is automated and integrated through API with the content management system.

	configuration of the execution environment.	

Thus, the shift from manual development to systems for visual content assembly reflects a broader trend in the evolution of digital media – from designing isolated publications to building a flexible and reusable production environment.

Architecture of the visual editor

The modern architecture of a visual editor for digital media is based on the principles of modularity, extensibility, and separation of concerns across application layers. A key design goal is to offer non-technical users – including editors, designers, and content creators – user-friendly tools for visual layout. The user interface adheres to **WYSIWYG** (What You See Is What You Get) concepts, tailored to media-specific processes: editable elements (e.g., cards, containers), animation triggers, timelines, and customizable visual settings are all set up through forms or direct interaction.

The **interface** is built upon a component-based framework that clearly differentiates functional logic from visual display. This improves extensibility by permitting the inclusion of additional widgets – such as custom blocks for data visualizations, 3D spaces, or multimedia players. Multimedia support employs standard browser APIs: Canvas is used for 2D graphics, WebGL for 3D content, and video elements are handled by HTML5 <video> tags along with wrappers for managing playback and synchronization. Interactive components – including maps, sliders, and polls – are encapsulated as self-contained modules with state management facilitated by a centralized data tree.

From an architectural perspective, the editor employs a **client-server model with clear roles.** The customer, a single-page application utilizing frameworks such as React or Vue, handles interactivity and local state management. The server manages storage, authentication, access rights, and version control. Content is saved in a serialized format (e.g., JSON), distinguishing structure from presentation and guaranteeing long-term adaptability.

A fundamental architectural element is a universal client-side script that displays content in the user's browser according to saved descriptions. The division of data, logic, and rendering facilitates simpler maintenance and scalability. Centralized updates, like adding new features or modifying rendering engines, necessitate no modifications to separate articles, boosting resilience and reducing ownership expenses.

Integration with digital media websites

Data exchange between the website and the visual editor is organized according to a distributed interaction model, utilizing RESTful API and webhook mechanisms. During the initialization phase, the website transmits the article ID, access parameters, current document structure and a callback URL to the editor. Upon saving, the editor generates a JSON document containing the full structure of the publication and notifies the website via the specified webhook, providing a URL from which all associated media assets can be downloaded. This architecture ensures a clear separation of responsibilities: the website remains the source of metadata, authorization and content distribution, while the editor functions as the interface for content editing (table 2).

Table 2

Formats and protocols of interaction between the editor and the website [5, 6]

Interaction stage	Protocol / method	Description
Session initialization	POST /api/session/open	The website sends the article ID, access parameters, and callback URL.
Resource loading	HTTPS (GET)	The editor fetches media assets from the site using deferred authorization.
Saving changes	Webhook (POST /callback)	The editor sends a JSON document with article data and a link to media resources.
Editor access	JWT / OAuth2	Authentication of editorial users via token-based authorization.
Content serialization	JSON or Markdown-like DSL	Structured article description for a universal rendering engine.

Visual publications, which may include scripts, external frames, and API interactions, need to be separated from the primary website environment. In practice, there are two main methods employed: incorporating content inside an iframe with limited settings (such as sandbox, CSP), and hosting interactive materials on a subdomain with a distinct execution context. CSP configurations are enforced by the visual editor for the published content, enabling strict control over script loading, inline code execution, and requests to external domains. This is especially important when working with user-generated content (UGC) systems, where the threat of introducing harmful code must be completely addressed (table 3).

Table 3

Execution environment isolation mechanisms

Isolation method	Technology	Application
Isolated iframe	sandbox, allow-scripts	Execution of interactive publications in a container without access to the website's DOM.
Subdomain with CORS	story.domain.com, Access-Control-Allow-Origin	Separation of security policies between the main site and the publication.
CSP	Content-Security-Policy	Restriction of inline scripts; control over external content sources.
Token-based access	JWT, HMAC, temporary tokens	Access control for publications and protection against cross-site request forgery (CSRF) attacks.

In the context of using visual stories on UGC platforms, it is essential to account for specific security threats associated with publishing content of unknown origin. Unlike articles created by in-house editorial teams, user submissions may contain potentially unsafe HTML, external scripts, or improperly formatted media files. To mitigate these risks, an automated moderation system is implemented, encompassing document structure analysis, HTML and CSS sanitization, link and media validation, and semantic text analysis.

Moderation can be performed either on the editor side (prior to submission) or on the website side (upon publication). When necessary, execution environments are sandboxed using containerization techniques with limitations on script execution time and memory usage, including the use of Web Workers and WebAssembly-based sandboxing. This approach ensures platform security while preserving the interactive capabilities of the visual editor.

Thus, the effective integration of a visual editor into a digital media infrastructure relies on strict adherence to architectural principles of distributed interaction, a multi-layered execution security model, and automated content moderation mechanisms.

Advertising effectiveness and monetization potential of interactive content

The development of visual editors within the digital media ecosystem contributes to the emergence of new monetization models based on a high degree of integration between advertising content and editorial formats. Unlike traditional formats – such as banners and static ad blocks – interactive publications enable the creation of full-scale branded projects in which commercial messages are seamlessly embedded into the logical and visual structure of the material, without disrupting the user experience.

According to Precedence Research, the global digital advertising market reached $600 billion in 2024. It is projected to exceed $1,483 billion by 2034, with an average annual growth rate of 9,47% during the 2025-2034 period (fig. 3).

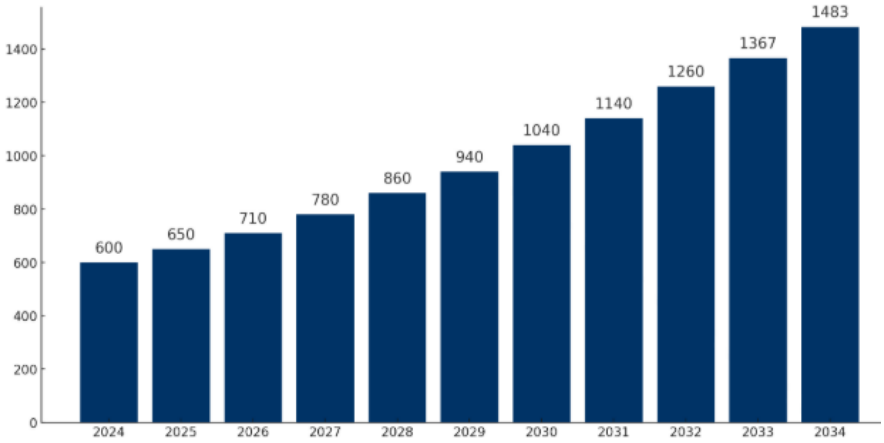

Figure 3. Global digital advertising market size, billion dollars [7]

This dynamic highlights a strategic shift in the advertising industry toward digital and personalized channels of engagement. Interactive formats are of particular interest in this context, as they deliver significantly higher levels of user engagement compared to traditional media. According to Mediafly, the average time spent interacting with interactive content is 13 minutes, compared to just 8,5 minutes for static content – demonstrating superior audience retention capabilities.

Interactive elements such as animated transitions, visual highlights, tabs, quizzes, and infographics enable the construction of personalized perception pathways in which branded content becomes an integrated part of the user experience [8]. The adaptive architecture enables consistent performance across various devices, it necessitates addressing the distinct requirements of desktop and mobile environments during the markup phase of interactive article development.

Performance measurements further confirm the advantages of interactive formats: the click-through rate (CTR) for native ads embedded in interactive publications reaches 0,2%, which is four times higher than the industry average for banner ads (0,05%). Moreover, 88% of marketers report that personalized interactive content helps them stand out from competitors and enhances the impact of advertising messages [9].

Current data on corporate intentions also affirm the high potential of interactive solutions. A 2025 survey conducted by Wynter among content marketing and SEO managers and directors found that 11,3% of respondents planned to invest more than $45,000 per month in content marketing – up from 4,1% in 2024. This indicates growing confidence in digital formats as cost-effective promotional channels.

Additional metrics further reflect increasing efficiency: according to a HubSpot survey of 336 SEO professionals and marketers in the U.S., the average click-through rate for SEO content is 13%, with a median of 8%, and users view an average of 7 pages per session. Furthermore, 43% of web analysts reported increased traffic to their primary websites in 2024 compared to the previous year, while only 14% noted a decline.

Taken together, these data points illustrate that interactive formats are no longer just a supplement to digital strategies, but have become a central component. By integrating visual, technical, and marketing advantages, they enable the development of a sustainable ecosystem of digital storytelling with high commercial returns. In today's oversaturated media environment – where user attention is the most valuable resource – interactivity and content personalization emerge as key drivers of communication effectiveness and audience loyalty.

Conclusion

Visual editors integrated into the infrastructure of digital media represent a technologically grounded tool capable of driving systemic transformation across editorial, user, and commercial aspects of media production. Through architectural modularity, support for universal interaction interfaces, and the separation of data presentation logic from storage layers, such systems reduce transactional costs, enhance the flexibility of the content cycle, and enable new monetization pathways. Amid the growing importance of visual and interactive content, the visual editor emerges

as a resilient element of the digital media ecosystem – combining engineering reliability with editorial efficiency.

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