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Design and Development of a Multimedia-Based Promotional Website for Digital Branding at LKP KARYA PRIMA KURSUS Using the Waterfall Method

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Abstract

Digital transformation in the education sector requires educational institutions to provide promotional media that deliver information quickly, interactively, and efficiently. LKP KARYA PRIMA KURSUS continues to experience limitations in information dissemination due to the reliance on conventional promotional approaches, reducing the effectiveness of digital branding and communication with prospective students. A multimedia website was developed to provide an integrated promotional platform that increases institutional visibility, accelerates access to information, and supports digital registration services. The Waterfall methodology was applied through the stages of requirements analysis, system design, implementation, testing, and maintenance. The implementation results demonstrate that the website was successfully developed with a responsive architecture that effectively presents multimedia content across desktop and mobile devices. System testing confirmed that all primary features operated according to functional specifications without critical errors. The integration of interactive multimedia improved the quality of information delivery and strengthened the institution's digital brand identity. In addition, server optimization and responsive interface design produced stable page accessibility and efficient performance under various network conditions. The developed system also supports scalability for future feature expansion, including interactive services and real-time communication modules. These findings indicate that applying the Waterfall method effectively produces a multimedia promotional website that supports institutional promotion and digital branding in the educational sector.

Keywords: multimedia website, digital branding at LKP Karya Prima course, Waterfall method, web-based promotion, educational institution system

1. INTRODUCTION

In the current era of rapid digital transformation, the internet serves as a critical infrastructure for institutions to enhance their visibility and reach a broader demographic [1]. For educational institutions such as LKP KARYA PRIMA KURSUS, establishing a professional online presence is essential to overcome the limitations of manual information dissemination and effectively showcase institutional profiles, course offerings, and student achievements [2]. However, many such institutions currently struggle with fragmented promotional efforts, relying on ineffective conventional methods that fail to provide real-time engagement or comprehensive accessibility [3]. To address these systemic shortcomings, a structured development framework is necessary to ensure a systematic, responsive, and reliable digital platform [4], [5]. The Waterfall methodology provides a disciplined, sequential approach—spanning requirements analysis, system design, implementation, and testing—to guarantee that the final product aligns with organizational branding objectives [6], [7].

LKP KARYA PRIMA KURSUS faces significant challenges in maintaining a competitive edge due to the lack of an integrated digital interface, which often leads to missed opportunities for prospective students to access accurate and timely course information [8]. This reliance on traditional promotional channels limits the institution's ability to facilitate seamless communication and interactive engagement with its target audience [9]. By integrating a centralized website, the institution can digitize its content—including course curricula, multimedia testimonials, and registration procedures—to improve transparency and information accessibility for potential learners [10], [11]. This digital transition serves to standardize institutional branding and cultivate an interactive environment that fosters sustained growth in student acquisition [12]. Consequently, the adoption of a web-based application is projected to optimize business management processes while minimizing the data loss and operational inefficiencies commonly associated with conventional administrative methods [13].

The primary obstacles include the absence of a centralized digital hub for prospective students to access course details, leading to information asymmetry and inefficient administrative workflows [14]. Furthermore, the manual nature

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of inquiry processing contributes to delays in communication and hinders the institution's ability to convert potential leads into enrollments [15]. Additionally, the existing promotional strategies lack the necessary multimedia integration to effectively convey the institution's value proposition, resulting in low brand recall among the target demographic [16]. To mitigate these issues, a robust web-based application must incorporate automated registration features and interactive interface design to streamline user engagement and improve the accuracy of collected student data [17]. By shifting toward a digital-first approach, the institution can leverage modern frameworks to build a stronger brand image and ensure that real-time information remains accessible to all stakeholders [18], [19]. effectively alleviating the administrative burden caused by physical form processing and redundant manual record-keeping [20], [21].

The primary objective of this research is to design and develop a comprehensive, multimedia-oriented promotional website for LKP KARYA PRIMA KURSUS using the Waterfall software development life cycle[22], [23],. Furthermore, this study aims to facilitate seamless interaction between the institution and prospective learners, ensuring that digital promotional content is accessible and consistently updated to reflect modern branding standards [24]. By transitioning to an integrated digital platform, the institution seeks to improve its operational efficiency and user satisfaction, ultimately establishing a more transparent and competitive presence in the education sector [25]. Moreover, this system is intended to provide a scalable solution for disseminating course information, thereby addressing the specific marketing limitations that currently hinder community awareness of the institution's educational programs [26]. This implementation will serve as a foundational step in digitizing institutional workflows, similar to how structured systems address the challenges of manual information delivery in academic environments [27]. Such systematic development models not only optimize institutional communication but also significantly mitigate communication gaps by providing timely, accessible, and centralized information for all prospective users [28]. This digital infrastructure further enables administrators to reduce clerical errors and expedite the registration process through automated data management systems [29].

2. RESEARCH METHODOLOGY

2.1 Research Framework

The research employs a structured, linear approach to software development, utilizing the Waterfall methodology to ensure each phase is systematically completed before progressing to the subsequent stage. This methodology incorporates rigorous requirements analysis to identify both functional and non-functional needs, ensuring that the final multimedia application aligns precisely with the institution's promotional objectives. Following this analytical phase, the project transitions into system design, where the overall structure, interface layout, and multimedia integration strategy are meticulously architected before commencing implementation [30]. Subsequently, the coding phase translates these blueprints into a functional digital platform, which is followed by comprehensive system testing to validate software performance against specified standards. Finally, the maintenance phase ensures the long-term viability of the website by addressing necessary updates and technical support to maintain consistency with evolving digital branding trends.

Figure 1. Research Process Using the Waterfall Development Method

The research process follows the Waterfall software development methodology, which emphasizes a sequential, systematic workflow. The first stage, Requirements Analysis, focuses on identifying functional and non-functional system requirements, including promotional needs, multimedia content specifications, and user expectations. This stage ensures that the developed web multimedia platform aligns with the institutional branding objectives. The second stage, System Design, involves designing the application's overall architecture, including interface layout, navigation structure, database organization, and multimedia integration. This stage serves as the conceptual blueprint for the development process. The third stage, Coding and Implementation, translates the system design into an operational web multimedia application through programming and multimedia integration. At this phase, all designed features are implemented into a functional digital platform. The fourth stage, System Testing, evaluates the application's performance, usability, and functionality. Testing is conducted to ensure that all features operate according to predefined specifications and that the system performs effectively across different usage scenarios. The final stage, Maintenance and Evaluation, ensures the website's sustainability and continuous improvement. This stage includes system updates, bug fixes, content revisions, and technical support to maintain compatibility with evolving digital branding and promotional trends.

2.2 System Analysis Phase

This stage involves the comprehensive collection and documentation of functional requirements, which are derived from interviews with the institution's management and an assessment of current promotional challenges. Furthermore, this process identifies non-functional requirements such as system performance and usability, which serve as essential benchmarks for the subsequent design and implementation phases. Data-gathering techniques, including semi-structured

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interviews and field observations, are used during this phase to capture critical insights from stakeholders regarding institutional expectations and user experience limitations. These gathered insights facilitate the definition of precise functional constraints, such as the need for multimedia content integration and intuitive navigational pathways, to address existing visibility gaps [31], [32]. These requirements provide a technical foundation that informs the transition to the system design phase, where developers establish the overall architecture and specify the necessary hardware and software constraints. This architectural blueprint specifically encompasses the development of use case diagrams and interface wireframes to visualize the intended user journey[33], [34].

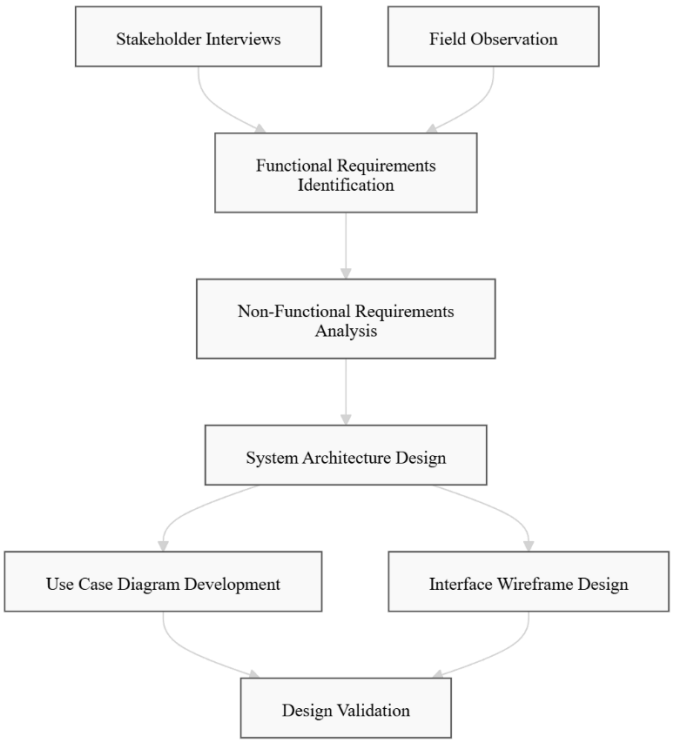

Figure 2. Requirements Analysis and System Design Process

The process begins with stakeholder interviews and field observations to gather comprehensive information regarding institutional promotional challenges, user expectations, and current system limitations. These activities enable researchers to understand the institution's practical needs and identify deficiencies in the existing promotional media.
The collected data are then analyzed to define functional requirements, including multimedia integration, content management, and navigational structures. Simultaneously, non-functional requirements such as usability, accessibility, performance, and system reliability are established to ensure the effectiveness of the developed application. After the requirements analysis stage is completed, the process transitions into system architecture design. This stage defines the structural framework of the multimedia web application, including software specifications, hardware requirements, and overall system organization. Subsequently, use case diagrams are developed to illustrate interactions between users and the system, while interface wireframes are designed to visualize the layout, navigation flow, and multimedia presentation structure. Finally, the proposed designs undergo validation to ensure alignment with user requirements and institutional branding objectives before implementation begins.

2.3 System Design Phase

The design phase focuses on establishing the system's structural framework, encompassing interface layouts, database modeling, and the specification of multimedia integration protocols [35]. This stage involves creating a detailed plan for the digital platform, including the user interface and program specifications, to ensure that the visual and interactive elements align with the institution's branding strategy [36]. Furthermore, this stage entails defining the technical specifications and selecting appropriate frameworks to translate conceptual requirements into a concrete system structural design [32]. This process involves planning the overall architecture and information flow, ensuring the application structure effectively supports the intended user experience. Following these architectural definitions, developers translate initial requirements into low-fidelity wireframes and high-fidelity prototypes to visualize layout interactions and ensure the platform's visual identity resonates with the institution's branding.

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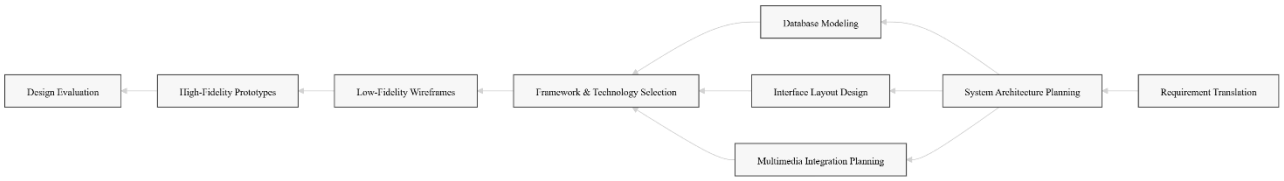

Figure 3. System Design and Multimedia Architecture Process

The design phase begins with translating system requirements into a structured development framework. At this stage, developers define the overall system architecture to ensure the multimedia web platform effectively supports institutional promotional and branding objectives. The process continues with database modeling, interface layout design, and multimedia integration planning. Database modeling organizes data structures and relationships required by the system, while interface layout design focuses on creating intuitive navigation and visually appealing user interactions. Multimedia integration planning ensures that images, videos, animations, and other digital assets are systematically incorporated into the platform. After the architectural components are established, developers determine the appropriate frameworks and technologies required for implementation. This includes selecting programming environments, multimedia tools, and supporting technologies that match the system requirements and performance expectations. The next stage involves creating low-fidelity wireframes to visualize the application's initial structure and navigation flow. These wireframes are then refined into high-fidelity prototypes that represent the final visual appearance and interactive behavior of the multimedia platform. Finally, the design evaluation stage assesses whether the developed prototypes align with institutional branding strategies, usability principles, and intended user experiences before proceeding to implementation.

2.4 Implementation Procedures

During this stage, the documented architectural blueprints and wireframes are transformed into a functional digital platform through rigorous programming and database configuration (Bakar et al., 2025, p. 3). Developers utilize selected programming languages and content management frameworks to execute these specifications, ensuring that the integration of multimedia components adheres to established design patterns (Chansanam et al., 2021, p. 351). This phase prioritizes the construction of original code to integrate dynamic features, such as interactive media galleries and discussion forums, while strictly maintaining the integrity of the institution’s brand identity (Rajas et al., 2023, p. 1943). Following the construction of the core functionality, the system undergoes a rigorous testing phase, employing techniques such as black-box testing to validate that every component meets the specified technical requirements (Pinem & Nurahmi, 2024, p. 3). This quality assurance process incorporates preliminary function testing to detect and rectify system anomalies before the site is officially deployed (Megawati & Palevi, 2024, p. 4).

2.5 Literature Review

The theoretical framework for this study is grounded in the principles of software engineering and digital marketing, which emphasize the necessity of systematic development lifecycles to overcome organizational constraints (Cahyanti et al., 2024). Specifically, the Waterfall methodology offers a methodical progression through distinct phases—requirements analysis, system design, implementation, and testing—which ensures that the final digital product adheres strictly to predefined institutional branding requirements (Muslihah et al., 2025). In this context, the adoption of structured development models is instrumental in mitigating the inefficiencies of conventional, manual reporting systems that often lack agility and accuracy (Irani & Azzahra, 2023, p. 5).

2.5.1 Digital Branding Concepts

Digital branding acts as the strategic foundation for educational institutions, utilizing web platforms to serve as centralized hubs for conveying institutional achievements, superior programs, and professional identity (Sari et al., 2025). By utilizing high-quality multimedia content and optimized user interfaces, institutions can effectively cultivate a distinct brand image that resonates with prospective students in a saturated digital marketplace. Furthermore, the integration of user-centric features and responsive design principles remains essential for building trust and long-term loyalty among learners (Thủy & Ngan, 2025). This strategic utilization of digital marketing insights is instrumental in fostering a resilient and forward-thinking academic setting that captures the interest of potential students (Wijaya et al., 2023, p. 149). Effective online branding also relies on the strategic use of social media and interactive content to increase institutional visibility and gather actionable insights into applicant preferences (Ly-Le, 2025, p. 4).

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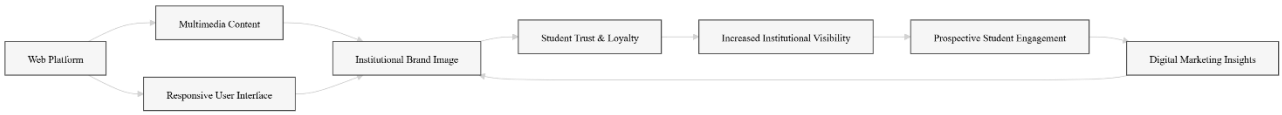

Figure 5. Digital Branding Framework for Educational Institutions

The digital branding framework begins with developing a web platform that serves as the primary communication medium for educational institutions. This platform becomes a centralized hub for presenting institutional identity, academic programs, achievements, and promotional information to prospective students. The second component involves integrating multimedia content, including images, videos, animations, and interactive visual elements, to enhance communication effectiveness and create an engaging digital experience. Simultaneously, responsive user interface design ensures accessibility and usability across different devices and screen sizes. These elements collectively contribute to the formation of a strong institutional brand image. A visually appealing and user-centered platform enhances professionalism, credibility, and competitiveness within the digital education environment. The framework further emphasizes the importance of establishing student trust and long-term loyalty through consistent digital experiences and accessible information delivery. Increased trust contributes directly to greater institutional visibility and broader audience reach.

Subsequently, enhanced visibility supports prospective student engagement by encouraging interaction with institutional content, promotional materials, and online services. Finally, digital marketing insights derived from user interaction and social media engagement provide valuable information regarding applicant preferences and online behavior. These insights are then used to continuously refine branding strategies and strengthen the institution's digital presence.

2.5.1 Multimedia Website Principles

Effective multimedia integration requires the harmonious synthesis of visual elements, audio-visual narratives, and interactive content to transform static institutional information into compelling, high-engagement digital storytelling [37]. By prioritizing an intuitive information architecture alongside these elements, developers can ensure that prospective students encounter a seamless interface that functions as a reliable signal of institutional promise [38]. Moreover, the application of ISO 9126 quality standards—covering functionality, usability, and reliability—ensures that the technical execution of these multimedia assets directly reinforces the institution's market position. This systematic approach to development enables rigorous documentation of both functional and non-functional specifications, ensuring that every interface component aligns with the institution's broader marketing goals [39].

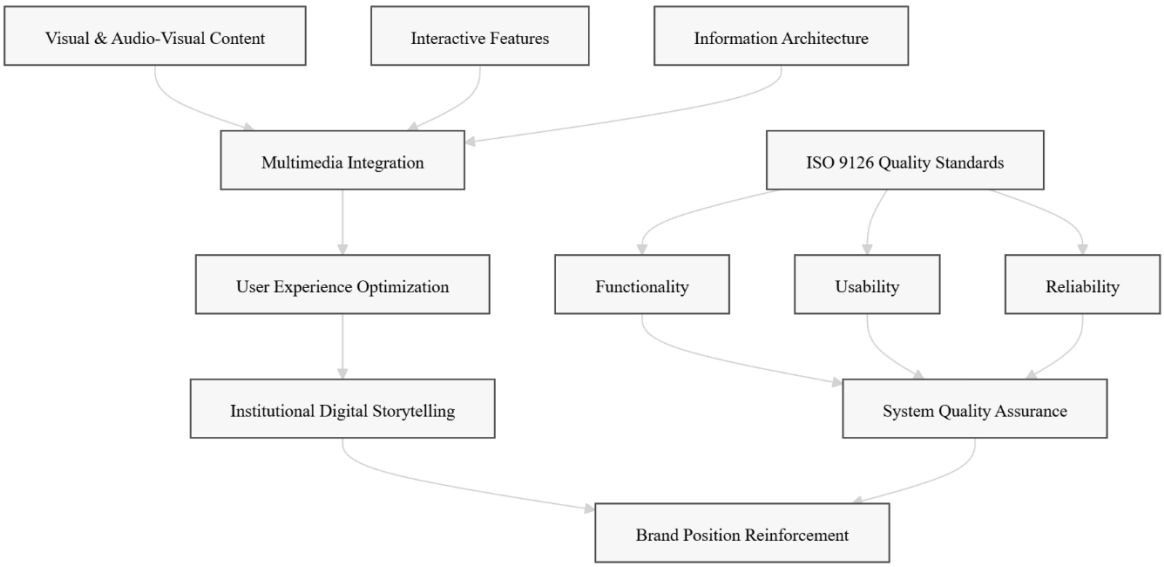

Figure 6. Multimedia Integration and Quality Assurance Framework Multimedia Integration and Quality Assurance Framework

The multimedia integration framework begins with preparing visual and audiovisual content, including images, videos, animations, and promotional media, designed to communicate the institution's identity effectively. Interactive features are also incorporated to increase user engagement and encourage active exploration of institutional information.

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Simultaneously, information architecture planning ensures that all multimedia elements are organized systematically within an intuitive navigation structure. This stage focuses on improving accessibility, content flow, and user interaction efficiency throughout the digital platform. The integration of multimedia content and structured information architecture directly contributes to optimizing the user experience. A seamless, visually engaging interface enhances usability and creates a more professional, attractive institutional presentation for prospective students. These optimized interactions support the development of effective institutional digital storytelling, in which multimedia components collectively convey academic values, achievements, and promotional messages in a compelling manner. As a result, the institution's brand position is strengthened within the competitive digital education environment. To ensure technical quality, the framework incorporates ISO 9126 quality standards, which evaluate system functionality, usability, and reliability. These quality dimensions collectively support system quality assurance by verifying that the multimedia platform operates effectively, consistently, and in line with user expectations. Finally, the quality assurance outcomes reinforce institutional branding objectives and long-term digital marketing strategies.

2.5.2 Waterfall Development Model

The Waterfall model provides a linear and sequential approach, enforcing a disciplined progression from initial requirements gathering to final deployment and maintenance [40]. This structured framework minimizes scope creep by necessitating comprehensive documentation at each stage, thereby ensuring that the final application is robustly aligned with the specific promotional requirements of LKP KARYA PRIMA KURSUS. By establishing clear development milestones, the model enables project stakeholders to verify that each phase—from conceptual system architecture to the final deployment of the promotional site—addresses the identified limitations in digital visibility [41]. This linear methodology facilitates consistent progress tracking, enabling the development team to isolate and resolve technical impediments before transitioning to subsequent deployment cycles.

Figure 4. Waterfall Development Model for Multimedia Web Development

The Waterfall development model applies a structured, sequential approach to software development, ensuring that each stage is completed before proceeding to the next. This methodology emphasizes systematic documentation, process control, and clear project milestones throughout the development lifecycle:

1. The first stage, Requirements Analysis, focuses on identifying system objectives, user needs, and institutional promotional challenges. Functional and non-functional requirements are comprehensively documented to establish a strong foundation for development.
2. The second stage, System Design, translates the collected requirements into technical blueprints. This includes interface design, database modelling, multimedia integration planning, and architectural structuring to ensure the system aligns with institutional branding objectives.
3. The third stage, Implementation, involves converting the approved system design into a functional multimedia web application through coding and software integration. All designed features and multimedia components are developed during this phase.
4. The fourth stage, System Testing, evaluates the functionality, usability, performance, and reliability of the developed application. Testing ensures that the system operates according to predefined specifications and minimizes technical errors before deployment.
5. The fifth stage, Deployment, refers to the release and operational use of the multimedia website within the institutional environment. At this stage, the application becomes accessible to users and serves as an official digital promotional platform.
6. The final stage, Maintenance, ensures the long-term sustainability of the system through periodic updates, technical improvements, bug fixing, and content revisions. This stage allows the platform to remain adaptive to evolving digital branding trends and user expectations.

3. RESULTS AND DISCUSSION

This section evaluates the effectiveness of the developed multimedia platform in bridging the institution's existing digital visibility gaps through empirical performance metrics and stakeholder validation. Specifically, this evaluation considers how effectively the integrated multimedia elements enhance user engagement while meeting the technical specifications established during the initial design phase. Furthermore, the integration of multimedia components—including content size and clarity—was validated against the institution's functional requirements to ensure optimal delivery of promotional materials [42]. Subsequent performance analysis indicates that implementing a responsive layout significantly improves user accessibility across diverse mobile and desktop devices, thereby directly contributing to

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heightened institutional visibility. Furthermore, the testing process confirmed that the system's usability and functional accuracy meet the established promotional benchmarks, ensuring that all multimedia content aligns with the institution's core branding objectives. Additionally, deploying the website on a robust server environment has optimized access speeds, thereby facilitating a seamless experience for prospective students navigating the institution's promotional content. These empirical findings suggest that the platform's architecture effectively supports scalability, enabling future modular upgrades, such as interactive virtual tours or real-time inquiry systems [43].

3.1 Use Case Diagram Model

Use Case Diagram of the multimedia-based promotional website developed for LKP KARYA PRIMA KURSUS. The diagram illustrates the interaction between users and the system in support of digital promotion and branding activities. The system involves two main actors: the Visitor (Prospective Student) and the Administrator (Admin). The Visitor represents users who access the website to obtain information about the institution, while the Administrator manages and updates the website content. The Visitor can perform several activities, including viewing the homepage, viewing the institution profile, accessing course information, viewing multimedia galleries, reading news and events, submitting registration forms, and sending inquiry or contact messages. Some activities contain supporting processes. For example, the "View Profile" and "View Courses Information" features display detailed content. The multimedia gallery also includes playback features for videos and interactive media. When visitors submit registration forms or contact messages, the system automatically stores the submitted data in the database. The Administrator is responsible for managing all website content and operational data. Administrative activities include managing course data, updating news and event information, managing multimedia gallery content, processing registration data, and handling visitor inquiries. These functions ensure that the information displayed on the website remains accurate, up to date, and relevant to promotional objectives.

Overall, the use case diagram demonstrates how the multimedia website facilitates interaction between prospective students and administrators through an integrated digital platform. The system supports promotional activities, improves information accessibility, and strengthens the institution's digital branding process.

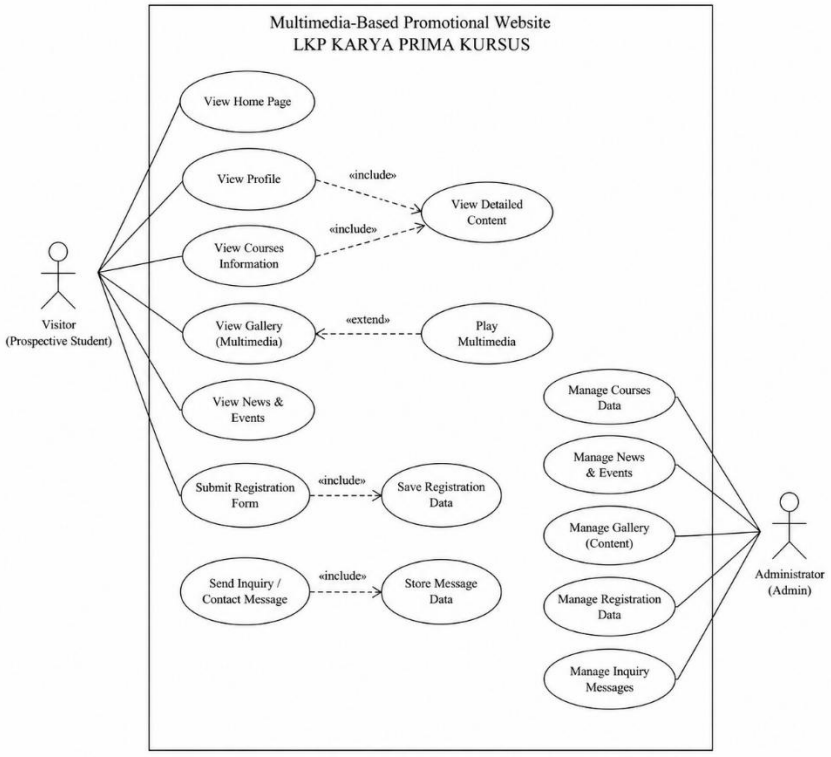

Figure 7. Use Case Diagram of the Multimedia-Based Promotional Website LKP Karya Prima Kursus

3.2 Website Architecture Design

The structural framework utilizes a modular client-server architecture designed to streamline information retrieval and ensure consistent rendering of multimedia assets across varying network conditions. This configuration employs a MySQL database to manage authentication and dynamic content delivery, ensuring that backend administrative modules and frontend user interfaces operate in synchronization. This integration ensures that all functional modules maintain high reliability, as the platform demonstrates a performance capability free of critical defects during cross-platform

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interactions. Moreover, the systematic adoption of this framework ensures that the digital platform adheres to stringent software quality models, which is essential for maintaining consistent performance and high user satisfaction. Furthermore, implementing performance optimization techniques, including lazy loading and strategic content caching, helps the platform maintain low latency even under high volumes of rich-media traffic [44], [45]. Additionally, applying database indexing and normalization techniques further enhances query efficiency, facilitating rapid data retrieval for administrative and student-facing modules.

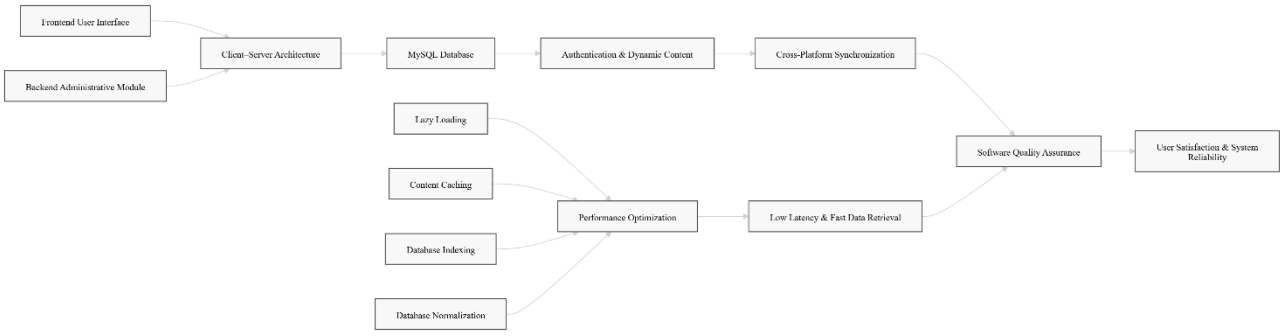

Figure 8. Client–Server Architecture and Performance Optimization Framework

3.3 Multimedia Integration Analysis

This analysis evaluates the effectiveness of incorporating high-resolution visual assets and interactive galleries to enhance users' perceptions of the institution's service offerings. By optimizing these assets for varying bandwidth environments, the system balances visual fidelity and loading speed, minimizing jitter during media streaming to ensure a consistent user experience. Moreover, the use of reusable component structures enables more efficient management of future content updates [46]. This modular approach facilitates the integration of real-time communication libraries, enabling future iterations to incorporate interactive features like live support or bidirectional feedback channels. Consequently, the platform's capacity to support such dynamic interactions fosters a more robust connection between LKP KARYA PRIMA KURSUS and its prospective students, directly enhancing the perceived value of its educational services [47]. Ultimately, this modular design allows the institution to adapt its promotional strategy through rapid content updates, ensuring the digital interface remains both responsive and aligned with emerging market demands [48].

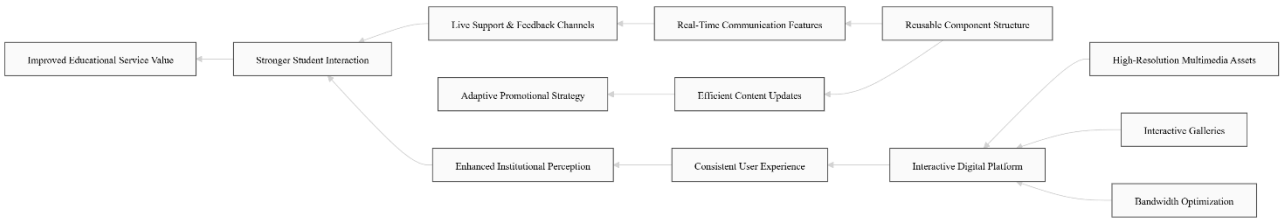

Figure 9. Modular Multimedia Interaction and Promotion Framework

The framework begins by integrating high-resolution multimedia assets and interactive galleries into the digital platform. These visual and interactive components are designed to create a more attractive and informative promotional environment for prospective students. To maintain stable system performance, bandwidth optimization techniques are implemented to balance visual quality and loading efficiency. This process minimizes streaming interruptions and ensures that multimedia content remains accessible under different network conditions, thereby supporting a consistent user experience. The improved multimedia experience contributes directly to enhanced institutional perception by presenting the institution as modern, professional, and technologically adaptive. This positive perception strengthens the institution's digital branding and promotional effectiveness. The framework also incorporates reusable component structures that simplify future content management and system expansion. Through this modular approach, administrators can efficiently update promotional materials, multimedia assets, and institutional information without extensive redevelopment. Additionally, the modular architecture supports the future integration of real-time communication features such as live support systems and bidirectional feedback channels. These interactive capabilities enable stronger communication between the institution and prospective students.

Finally, increased interaction and continuous content adaptability improve the perceived value of the institution's educational services. The flexible framework allows the promotional platform to remain responsive to technological developments, user expectations, and emerging digital marketing trends.

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3.4 Performance Evaluation

The system's responsiveness is assessed through multi-user load testing, which monitors CPU and memory utilization to verify stability under varying traffic densities. These technical assessments are complemented by user-centric evaluations to confirm that the platform effectively bridges the gap between functional performance and perceived usability [49]. Quantitative metrics derived from these evaluations demonstrate an average page load time optimized for various network configurations, ensuring consistent accessibility for all prospective users (Samanta et al., 2024, p. 7). Moreover, longitudinal monitoring of the server environment indicates that resource utilization remains well within acceptable thresholds, confirming that the architecture supports high concurrent access without compromising data integrity [50], [51]. In addition, the implementation of CSS-based responsive design ensures that interface elements—such as menus, buttons, and high-resolution multimedia—automatically adapt to a range of mobile and desktop screen resolutions [52]. This approach directly addresses usability challenges by ensuring that navigation and content interaction remain intuitive regardless of the user's hardware specifications [53].

Table 1. Black-Box Testing of System Responsiveness and Usability

No	Test Scenario	Input / Action	Expected Result	Actual Result	Status
1	Homepage Loading Test	User accesses the homepage using a desktop browser	Homepage loads completely within an acceptable response time, and all multimedia assets display correctly	Homepage displayed successfully with stable loading performance	Valid
2	Multi-User Load Test	Multiple users access the system simultaneously	System remains stable without server crash or significant latency increase	The system maintained stable performance during concurrent access	Valid
3	CPU and Memory Utilization Test	Continuous access under high traffic density	Resource utilization remains within acceptable operational thresholds	CPU and memory usage remained stable	Valid
4	Responsive Navigation Test	User opens the menu on mobile and desktop devices	The navigation menu adjusts automatically and remains functional on all screen sizes	Navigation displayed correctly across devices	Valid
5	Multimedia Rendering Test	User accesses image galleries and video content	Multimedia content loads smoothly without jitter or distortion	Images and videos rendered properly	Valid
6	Responsive Layout Adaptation Test	System accessed using different screen resolutions	Interface components automatically adapt to screen dimensions	Layout adjusted correctly on mobile and desktop displays	Valid
7	Button Interaction Test	User clicks interactive buttons and menus	Buttons respond accurately and redirect to intended pages	All buttons functioned correctly	Valid
8	Content Accessibility Test	User accesses pages using varying network conditions	Content remains accessible with an acceptable loading speed	System maintained accessibility under different network conditions	Valid
9	Data Integrity Test	Simultaneous data access by multiple users	Data remains consistent without corruption or synchronization issues	Data integrity was maintained successfully	Valid
10	Cross-Browser Compatibility Test	System tested on multiple web browsers	Website appearance and functionality remain consistent across browsers	The system operated consistently on the tested browsers	Valid

3.5 Promotional Website Homepage

The homepage layout of the LKP KARYA PRIMA KURSUS multimedia promotional website features a modern, responsive interface that prioritizes visual communication and accessibility, accessible at the URL: https://brosur.lkpkaryaprima.id. The top section includes a navigation menu integrated with the institution's logo, followed by a multimedia banner showcasing promotional content, educational offerings, and branding elements. Interactive elements—such as call-to-action buttons, course information panels, and multimedia galleries—are strategically placed to enhance user navigation and optimize information delivery. The responsive design ensures optimal display compatibility on both desktop and mobile devices. In the middle and lower sections, the homepage displays the institution's profile, flagship programs, student activities, multimedia content, and contact information in a structured layout. High-resolution images, animations, and interactive galleries are used to reinforce digital branding and boost user

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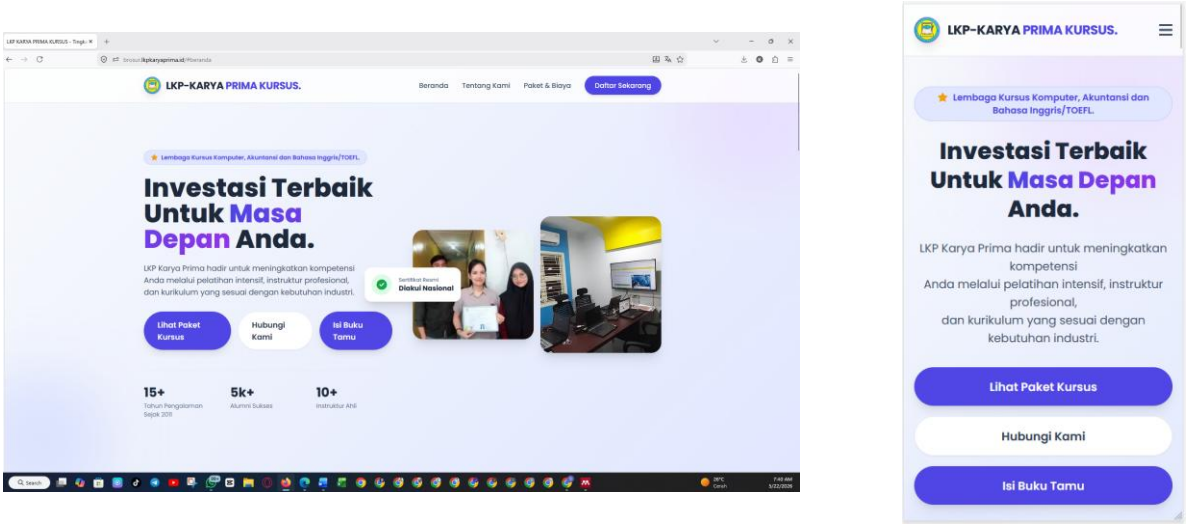
engagement. The platform also integrates registration and communication features that allow prospective students to access information and interact with the institution efficiently. Overall, the homepage serves as an integrated multimedia promotional platform that enhances the institution's visibility and supports digital marketing goals.



(a). a display accessed via a web browser

(b). a responsive website accessed on a smartphone

Figure 10. The homepage of a promotional multimedia website accessible on computers and smartphones

Figure 10 presents the homepage interface of the multimedia promotional website developed for LKP KARYA PRIMA KURSUS in both desktop and smartphone views. The desktop interface displays a structured layout consisting of a navigation menu, institutional logo, promotional headline, multimedia images, and interactive action buttons. The homepage emphasizes digital branding through modern typography, high-resolution visuals, and well-organized information placement. Key information related to institutional services and course offerings is presented clearly to support accessibility and improve user engagement. The smartphone interface demonstrates responsive web design, in which all interface components automatically adapt to smaller screens without reducing functionality. Navigation menus, promotional content, buttons, and multimedia elements remain accessible and visually consistent across mobile devices. This responsive capability ensures that prospective students can access institutional information efficiently regardless of the device used. The layout also supports usability and interaction efficiency by maintaining intuitive navigation and optimized multimedia presentation across different screen resolutions.

4. CONCLUSION

The implementation of the Waterfall method effectively addressed the promotional objectives of LKP KARYA PRIMA KURSUS by delivering a stable, scalable, and responsive digital platform. This structured development approach ensured rigorous quality control throughout the lifecycle, culminating in a high-functioning system that successfully serves as a dynamic interface for institutional outreach. By providing a modernized, efficient, and engaging interface, the system successfully meets stakeholders' expectations and positions the institution to thrive in the competitive digital landscape. Future research should explore integrating advanced analytics tools to more accurately measure the conversion rate of website visitors into registered participants. Furthermore, conducting comparative studies with alternative development methodologies could provide additional insights into enhancing the flexibility and iterative potential of such promotional systems. Ultimately, such assessments will contribute to the ongoing refinement of user experience standards, ensuring the institution remains technologically aligned with evolving pedagogical outreach requirements. Consistent with established development protocols, the maintenance procedures prepared during the final phase of this project will ensure the long-term functionality and security of the website's multimedia infrastructure. This structured maintenance framework facilitates ongoing optimization, allowing the institution to adjust promotional content in response to fluctuating market trends and institutional needs. By fostering this cycle of continuous improvement, the institution can proactively refine its digital branding strategy to maintain competitive relevance in the educational sector.

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