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DESIGN OF A WEB-BASED GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR MAPPING OF THE ZEE STUDIO ARCHITECT PROJECT.

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This research aims to design and implement a web-based Geographic Information System (GIS) as a portfolio and project monitoring tool at Zee Studio. The main problems encountered were the difficulty in visualizing dynamic project distribution and limited access to spatial documentation. This system was developed using Agile development methods with a Scrum approach, which allows for rapid and adaptive feature iteration. The technologies used include PHP (MySQLi), JSON, and the Leaflet.js library for digital map management. Through several Sprint cycles, the system successfully integrated mapping features with project status indicators, automatic statistics, and multimedia information pop-ups that support narrative descriptions and photo galleries. Test results showed that the Agile approach was effective in producing a responsive system, secure from SQL Injection vulnerabilities, and able to increase marketing conversions through the integration of Meta Ads Pixel and WhatsApp API.

Keywords:Geografis Information System, Web-GIS, Agile Development, Scrum, Leaflet.js.

Penelitian ini bertujuan untuk merancang dan mengimplementasikan Sistem Informasi Geografis (SIG) berbasis web sebagai alat pemantauan portofolio dan proyek di Zee Studio. Masalah utama yang dihadapi adalah kesulitan dalam memvisualisasikan distribusi proyek yang dinamis dan akses terbatas ke dokumentasi spasial. Sistem ini dikembangkan menggunakan metode pengembangan Agile dengan pendekatan Scrum, yang memungkinkan iterasi fitur yang cepat dan adaptif. Teknologi yang digunakan meliputi PHP (MySQLi), JSON, dan pustaka Leaflet.js untuk manajemen peta digital. Melalui beberapa siklus Sprint, sistem berhasil mengintegrasikan fitur pemetaan dengan indikator status proyek, statistik otomatis, dan pop-up informasi multimedia yang mendukung deskripsi naratif dan galeri foto. Hasil pengujian menunjukkan bahwa pendekatan Agile efektif dalam menghasilkan sistem yang responsif, aman dari kerentanan SQL Injection, dan mampu meningkatkan konversi pemasaran melalui integrasi Meta Ads Pixel dan WhatsApp API.

Kata Kunci: Usabilitas, Zee Studio, Situs Web, Heuristic Evaluation, Efektivitas, Efisiensi, Kepuasan.

INTRODUCTION

The development of information technology in the era of digital transformation has triggered a paradigm shift in data management and presentation in the multimedia creative industry. Zee Studio, as a professional entity in this field, faces the challenge of presenting a transparent and informative project portfolio to the public. Until now, the representation of work results has tended to use conventional, static media, where project location data is only presented in the form of text lists or image galleries, separated from their spatial context. This limitation has led to the emergence of an information gap, where potential clients cannot see the correlation between project identity, actual on-the-ground conditions, and the geographic distribution of services in a comprehensive and real-time manner.

The issue of efficient data visualization is becoming increasingly crucial as the volume of projects spread across multiple geographic regions continues to grow. The inability of legacy media to integrate project documentation with precise coordinates results in the loss of data's strategic value as a monitoring instrument and digital marketing tool. Furthermore, monitoring project progress—whether a project is still in progress or completed—becomes difficult without a platform capable of dynamic data synchronization. In the modern business ecosystem, integrating field operational data with digital marketing strategies has become an absolute necessity to increase a company's credibility and service conversion.

To address these challenges, this study proposes the development of an innovative solution through the design of an intelligent web-based Geographic Information System (GIS). Web-GIS technology, utilizing the Leaflet.js library, was chosen due to its lightweight, responsive nature and ease of integration with various multimedia data sources. Unlike traditional mapping systems, this platform integrates spatial data with descriptive narrative features and interactive photo galleries that can be dynamically accessed through an API. This approach enables each marker on the map to become more than just a location marker, but a multimedia information portal that provides visitors with a complete visual overview of the quality and reality of projects at that location.

This system was developed using Agile methods with a Scrum framework to ensure each feature is completed iteratively and adaptively to dynamic needs. In addition to mapping functionality, this system is designed to adopt Digital Marketing elements through the integration of advertising analytics tracking and direct communication to support the company's business ecosyste m. Academically, the development of Smart Web-GIS is expected to become a practical reference in the implementation of GIS for the creative industry, as well as proving that the combination of geospatial disciplines with multimedia techniques can produce significant added value, both in terms of information management and marketing competitiveness in the digital era.

METHODOLOGY

A. System Development Framework (Agile Scrum)

This research uses the Agile development method with the Scrum framework as the project implementation methodology. This method was chosen based on the characteristics of Web-GIS projects that require high flexibility to change multimedia features and rapid API integration. In the Scrum framework, the development process is not carried out linearly, but through a series of short iterations called Sprints. This approach allows researchers to continuously evaluate each map function and system security, ensuring the final product truly meets the needs of users in the multimedia industry.

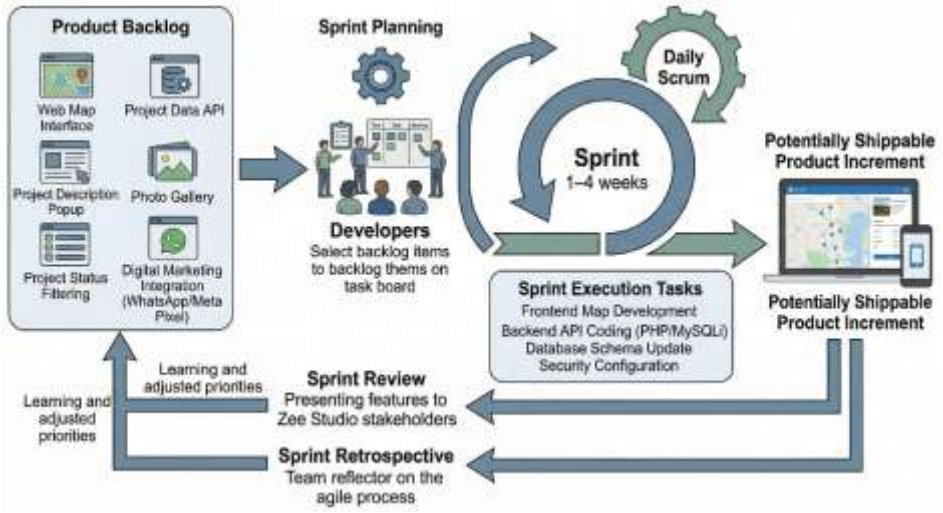

Figure 1 Agile Scrum Flowchart

The Zee Studio Web-GIS system development process is implemented through an iterative and adaptive cycle, as illustrated in Figure 1. The figure shows the Agile Scrum workflow, where dynamic multimedia feature requirements are addressed through measurable stages, starting with Product Backlog development and continuing through the development of a Potentially Shippable Product Increment in each Sprint cycle. The following is an explanation of the stages in Figure 1:

1. Product Backlog: A master list of features to be built, such as a map interface, JSON API, photo gallery, multimedia descriptions, and WhatsApp/MetaPixel integration.
2. Sprint Planning: The research team chooses and prepares technical tasks for the next period of work, which usually lasts from 1 to 4 weeks. These tasks may include programming the user interface (frontend) or the server logic (backend).
3. Daily Scrum & Sprint: Every day during development, the team holds a brief meeting to update each other and ensure everyone is aligned. This keeps coding and group collaboration moving smoothly.
4. Sprint Execution Tasks: These are specific steps, such as programming in PHP (a web programming language), setting up maps with Leaflet.js (a mapping tool for websites), and configuring how the website responds to different URLs with .htaccess (a web server file).
5. Potentially Shippable Product: This is the result of each working cycle—a software version that can be shown to users, such as a map screen that successfully displays interactive pins or markers.
6. Review & Retrospective: After each cycle, the team evaluates the product with stakeholders (such as Zee Studio) and discusses what went well or needs improvement for the next development round.

B. Web-Based Geographic Information System (GIS)

A Geographic Information System (GIS) is a computer system designed to capture, store, manipulate, analyze, manage, and present all types of geographic or spatial data. In the context of this research, GIS is implemented as a Web-GIS, a GIS architecture that utilizes the internet as a communication medium between the data server and end users. The main advantage of Web-GIS is its ability to disseminate spatial information widely without requiring users to have special software, simply through a web browser. Technically, this system works by integrating two main types of data:

1. Spatial Data: Represents geographic locations in the form of latitude and longitude coordinates that determine the absolute position of Zee Studio projects on the Earth's surface.
2. Attribute Data: Provides additional information about the characteristics of the location. In this system, attribute data includes the project name, progress status, narrative description, and multimedia assets, such as images. Attribute data describes non-spatial qualities linked to specific geographic locations.

The GIS implementation in this research uses the Leaflet.js library, an open-source JavaScript-based mapping engine. Leaflet.js was chosen for its efficient processing of digital map Through this approach, GIS functions not only as a static visualization tool but also as a dynamic platform that filters real-time data and presents multimedia information in the context of the user's selected location.e data and presenting multimedia information in the context of the user's selected location.

SYSTEM ANALYSIS AND DESIGN

A. SYSTEM ANALYSIS

The analysis was conducted to identify functional and non-functional requirements to ensure the Zee Studio Web-GIS system runs optimally in line with the research objectives.

1. Functional Requirements
   a. Mapping System: The system must be able to display interactive maps and render markers based on latitude and longitude coordinates from the database.
   b. Multimedia Information Management: The system must be able to present detailed project information, including name, status, narrative description, and photo gallery, in a single pop-up window.
   c. Filter & Search Features: The system must provide a filter function based on project status (Active/Done) and a search function based on project name.
   d. Navigation Integration: The system must provide a direct link to Google Maps for route navigation to the project location.
   e. Tracking & Communication: The system must integrate Meta Ads Pixel for analytics and WhatsApp API for direct communication for research purposes.
2. Non-Functional Requirements
   a. Responsiveness: The system interface must be adaptive (mobile-friendly) when accessed from various devices
   b. Security: API data must be protected from direct directory access using server configuration.
   c. Performance: Data retrieval via JSON must be efficient so that maps can load quickly (low latency).

B. Usecase Diagram

The Zee Studio Web-GIS system involves two actors with different access rights. Users interact with the system to obtain information, while Admins are responsible for managing the integrity of project data.

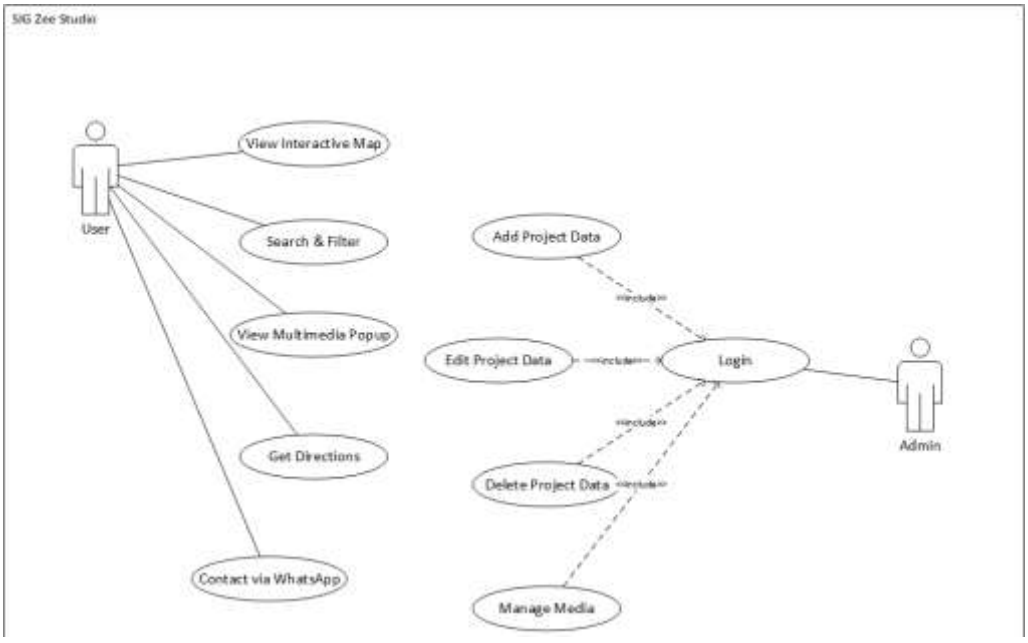

Figure 2 Usecase Diagram of Zee Studio Project Mapping Graphic Information System

Actor	Usecase	Description
User	View Interactive Map	Explore the spatial distribution

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		map of projects.
	Search & Filter	Filter projects by name or status.
	View Multimedia Popup	View gallery photos and project descriptions.
	Get Directions	Get route navigation to a location via Google Maps.
	Contact via WhatsApp	Contact admin for business consultation.
Admin	Login	Perform authentication to log in to the management panel.
	Add Project Data	Input new projects, coordinates, and upload photos.
	Edit/Update Data	Change project details, status, or replace photos.
	Delete Project Data	Deleting project data that is no longer relevant.
	Manage Media	Manage photo assets stored on the server.

Table 1 Scenario Usecase Diagram Geographic Information System Mapping Project Zee Studio

C. System Architecture

Sistem ini menggunakan arsitektur Client-Server berbasis web yang terbagi menjadi tiga lapisan utama:

1. Data Layer: MySQL sebagai penyimpanan database proyek.
2. Logic Layer (API): PHP yang berfungsi sebagai jembatan untuk mengubah data MySQL menjadi format JSON.
3. Presentation Layer: HTML, CSS, dan JavaScript (Leaflet.js) sebagai antarmuka interaktif yang diakses oleh pengguna.

Database dirancang secara efisien dengan satu tabel utama yaitu proyek yang memiliki skema sebagai berikut:

Column Name	Data Type	Description
id	INT (Auto Increment)	Primary Key / Project Identity
nama_proyek	VARCHAR (255)	Project name or title
latitude	VARCHAR (50)	Latitude coordinates
longitude	VARCHAR (50)	Longitude coordinate points
status	ENUM ('Berjalan', 'Selesai')	Project work progress
gambar	VARCHAR (255)	Main photo file (thumbnail)
deskripsi	TEXT	Detailed explanation of the project
foto_lain	TEXT	Collection of gallery photo file names (comma-separated))

Table 2 Geographic Information System Database Mapping Zee Studio Project

IMPLEMENTATION

The system was implemented using a Client-Side Rendering (CSR) architecture, where the server provides data through an internal PHP-based API. Project data stored in a MySQL database is converted to JSON (JavaScript Object Notation) for efficient data exchange. On the client side, the Leaflet.js library is used to process the data into interactive markers on the digital map layer. This technology enables the rapid synchronization of database changes made by the admin with the visual display accessed by users in real time. The system was implemented on a web server environment with the following software specifications:

1. Programming Language: PHP 8.x and JavaScript (ES6).
2. Database Management System: MySQL.
3. Mapping Library: Leaflet.js version 1.9.4.
4. Web Server: Apache (Litespeed) with .htaccess configuration support.
5. UI Framework: Bootstrap 5.3 to ensure interface responsiveness.

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The system interface is implemented with a responsive design using the Bootstrap framework, dividing the display into two functional areas: the statistics control panel (sidebar) and the main map canvas. Multimedia features are implemented in the marker popup function that has been modified to support descriptive narrative elements and a horizontal photo gallery. This implementation allows users to browse the project's visual documentation via an interactive scroll mechanism without leaving the map page, creating a seamless user experience (Single Page Experience). Here is the appearance of WEB SIG ZEE STUDIO :

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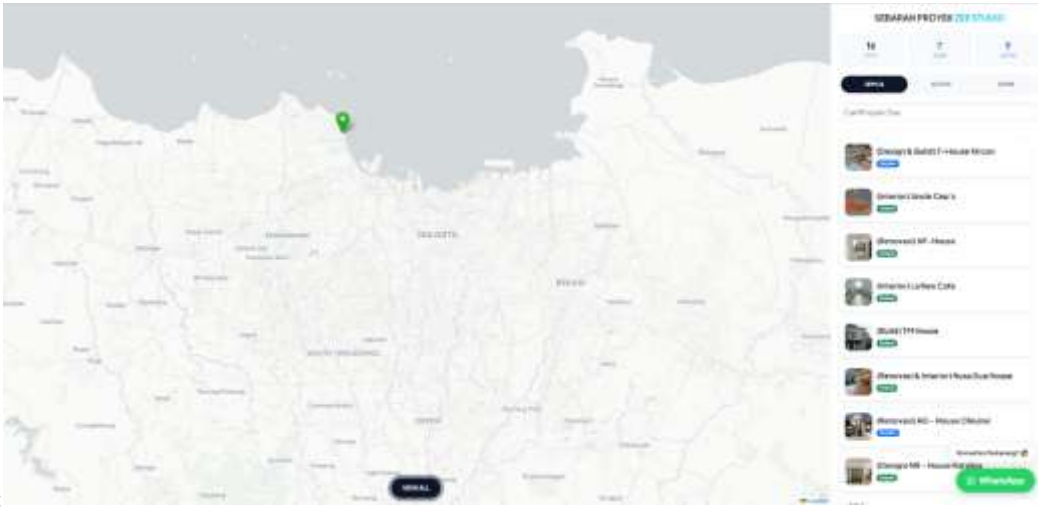

Figure 3 Zee Studio Project Mapping Geographic Information System User Page

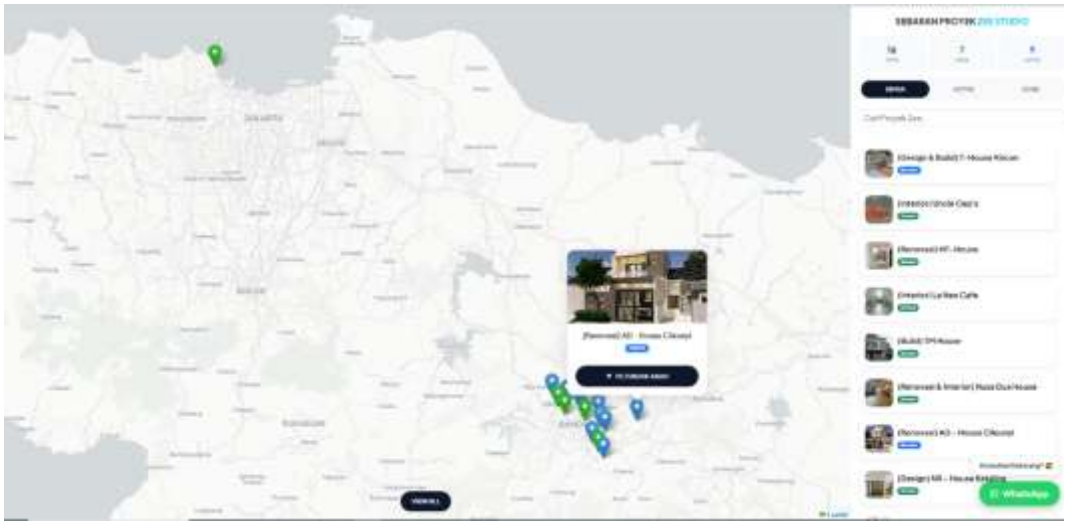

Figure 4 Zee Studio Project Pop-Up and Direct Navigation View

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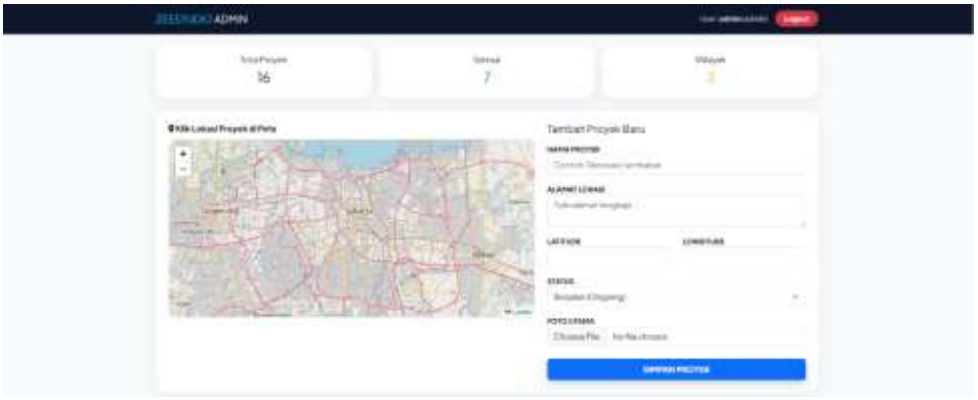

Figure 5 Zee Studio Project Mapping Geographic Information System Admin Page

In the final stage, security layers and marketing tools were implemented. Data security at the server level was strengthened using .htaccess file configuration to restrict direct access to sensitive directories and the use of Prepared Statements in PHP code to prevent SQL Injection attacks. Meanwhile, the digital marketing aspect was realized through the integration of Meta Ads Pixel tracking in the system header and the provision of a floating WhatsApp API button. This integration aims to transform the spatial information system into a strategic company asset in converting visitors into potential clients.

CONCLUSIONS AND SUGGESTIONS

This study concludes that implementing the Agile Scrum development method has proven highly effective in accelerating the development of a Smart Web-GIS system that is adaptive to the needs of the dynamic multimedia industry. Through a series of sprint cycles, the system successfully integrated geographic data with multimedia elements, resulting in a Zee Studio project portfolio that is not only informative but also interactive for users. The successful integration of mapping features with project status indicators, horizontal photo galleries, and digital marketing tools such as Meta Ads Pixel and the WhatsApp API demonstrates that this system has evolved from a mere data-collection tool into a strategic platform capable of significantly increasing credibility and business conversion potential. From a technical perspective, implementing security standards in the PHP architecture and server configuration has ensured data integrity and provided adequate protection against cyberattacks in the production environment.

Although the system has been successfully implemented, several aspects can be further developed to improve performance and functionality. It is recommended that future development focus on providing a more comprehensive data management module (Admin Dashboard) to allow users to manage content independently without relying on direct database access. Furthermore, as data volume increases, the use of marker clustering techniques becomes highly relevant to maintain a neat map display when zooming out. Implementing additional spatial analytics features, such as mapping project density levels via heatmaps, can also serve as a management tool for evaluating work area coverage and determining future business expansion strategies.

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