

Prototype of Ayolink Website to Improve Transportation Accessibility at Yogyakarta International Airport

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Abstract

AyoLink is a website developed to help people easily access information about different types of transportation to and from Yogyakarta International Airport. This study aims to (1) analyze the needs, (2) design, and (3) evaluate the feasibility of the AyoLink website as an information platform for multimodal transportation at Yogyakarta International Airport. The research follows a system development method using the waterfall model (Requirement, Design, Implementation, Verification, and Maintenance). Data collection was conducted using the PIECES framework through observation, interviews, and questionnaires. Instrument validity and reliability were tested using SPSS. Qualitative data were analyzed using an interactive model, while quantitative data were analyzed using descriptive statistical analysis. The development results are as follows: (1) The website successfully integrates various modes of transportation at Yogyakarta International Airport based on a needs analysis involving passengers, transport agents, and airport operators. (2) The website was designed using Google Sites with an attractive and user-friendly interface. (3) Feasibility testing showed that AyoLink received a total score of 87% from experts and airport representatives, indicating that the system is feasible for use. Usability testing by user respondents showed excellent results, with an average score of 91.07%, especially in aspects such as ease of finding transportation, clarity of language, and completeness of information. Therefore, it is concluded that the AyoLink website can be used without revision and is beneficial as an information platform for multimodal transportation in the Yogyakarta area.



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1 INTRODUCTION

Yogyakarta International Airport was established in Kulon Progo to address the capacity constraints of Adisutjipto Airport and to enhance Yogyakarta's status as a major tourism destination following Bali. Conceived under the Airport City concept, YIA is designed to handle up to 20 million passengers annually. However, its location approximately 42 kilometers from the city center necessitates the development of a well-integrated transportation system. This requirement aligns with the Regional Spatial Plan (RTRW) of the Special Region of Yogyakarta, as outlined in Regional Regulation No. 5 of 2019, which mandates multimodal integration to achieve efficient, safe, and sustainable mobility [1].

Despite these strategic provisions, transportation accessibility at YIA remains below expectations. The transportation service accessibility index stands at 0.44, categorized as "less supportive" for multimodal integration [2]. Challenges include limited

coordination among transportation operators, the absence of integrated digital information systems, and insufficient data on passenger flows, resulting in inefficiencies for travelers. These shortcomings contravene Government Regulation No. 8 of 2011 and Ministry of Transportation Regulation No. 8 of 2012, which emphasize intermodal integration through mechanisms such as unified ticketing, coordinated route management, and real-time information sharing [3].

Integrated transportation systems play a pivotal role in fostering tourism development by providing convenience, reducing travel costs, and enhancing visitor satisfaction. Conversely, inadequate connectivity can impede regional economic growth and diminish the overall tourist experience. Existing regulations underscore the necessity of intermodal synergy and service integration to ensure accessibility and quality [4]. Consequently, the establishment of a seamless transportation network at YIA is essential for reinforcing its function as a strategic gateway to Yogyakarta.

Although app-based ride-hailing services such as Gojek and Grab have experienced rapid growth, government-operated public transportation remains poorly integrated. Previous studies have primarily focused on digital mobility solutions in urban environments, leaving airport-centric integration largely underexplored. At YIA, the lack of a centralized digital platform offering real-time information on various transportation modes—such as buses, trains, taxis, and ride-hailing services—creates significant challenges for passengers, particularly tourists who prioritize efficiency and reliability [5]. [6]. This gap underscores the need for a web-based solution to unify transportation services.

To address these challenges, this study proposes AyoLink, a web-based platform designed to integrate diverse transportation modes and enhance accessibility at YIA. The platform will deliver real-time data on routes, schedules, and service availability, thereby improving user convenience and supporting the advancement of smart mobility initiatives. By closing existing service gaps and aligning with sustainable transportation objectives, AyoLink aims to position YIA as a modern, interconnected airport while contributing to Indonesia's broader agenda for digital transformation in the transportation sector [7].

2 METHOD

In this study, the research approach falls under applied research using the R&D (Research and Development) method with the Waterfall development model. R&D is a research method aimed at producing a specific product and evaluating its effectiveness [8]. The Waterfall model is a sequential software development process consisting of five stages: Requirements, Design, Implementation, Verification, and Maintenance. This model is suitable for projects requiring a clear structure and systematic execution.

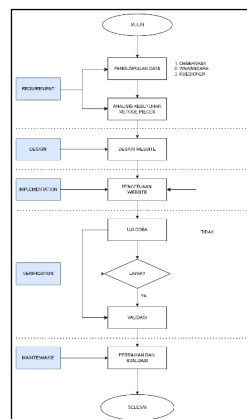


Figure 1. Research Design Flow

The following are the stages of system design in this study using the prototype method:

- 1) Requirement
 - a. Initial Analysis, in this stage, the researcher conducted observations and interviews with stakeholders at Yogyakarta International Airport to identify transportation accessibility challenges. This process also included reviewing the current conditions of transportation modes and integration issues [9].
 - b. Needs Analysis, to analyze the needs related to the system to be built, the researcher interviews with transportation operators, passengers, and airport management identified key requirements for the AyoLink website, including transportation schedules, multimodal integration (bus, taxi, train, ride-hailing), and real-time updates. These needs were analyzed using the PIECES framework to ensure the system design enhances both operational efficiency and user experience [10].
- 2) Design
 - a. In the design phase, the AyoLink website was developed to include structured page layouts, navigation flow, and interface design emphasizing readability, accessibility, and ease of use. Core content consists of transportation schedules, routes, and fares presented in a clear and user-friendly format.
 - b. The website structure comprises menus such as Home, Airport Profile, Transportation Modes, Hotels, Tourist Attractions, and Vouchers & Promotions, with submenus providing detailed information including schedules, fares, and ticket booking guidelines. Three types of users are involved: Administrators (responsible for managing data), Airport Operators (providing real-time updates), and Travelers (accessing transportation and tourism

information).

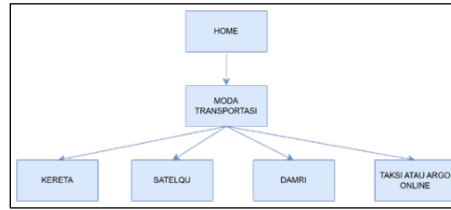


Figure 2. Menu Structure Design

3) Implementation

The implementation phase utilized Google Sites to develop the website without coding, chosen for its ease of use, time efficiency, and visual content organization [11]. This stage involved integrating the planned design into the platform, including menu placement, uploading transportation information, adding links, and visualizing routes, while ensuring consistency with the original design for optimal functionality.

4) Verification

The Verification phase is conducted to ensure that the AyoLink website is suitable for use through a series of tests involving user trials and expert validation. This evaluation encompasses the assessment of functionality, accessibility, feature alignment with objectives, and interface quality. The primary goal is to guarantee that all system elements meet user requirements and operate optimally in accordance with the designed concept.

The Verification phase is implemented through two main techniques: validity testing and usability testing. Validity testing is performed by IT experts from Politeknik Penerbangan Surabaya using questionnaires to evaluate the alignment of features with user needs, calculated using the formula [12]

$$NP = \frac{R}{SM} \times 100$$

Meanwhile, usability testing involves general users through a Likert-scale-based questionnaire to measure the level of ease of use, calculated using the formula [13]

$$\text{Feasibility Percentage} = \left(\frac{\text{Observed Score}}{\text{Expected Score}} \right) \times 100\%$$

If the validation score exceeds 61%, the website is categorized as valid and feasible for implementation; if deficiencies are identified, revisions are made to enhance the system's overall quality.

Table 1. Validity Criteria

No.	Interval	Criteria
1	0% – 20%	Not Valid
2	21% – 40%	Less Valid
3	41% – 60%	Fairly Valid
4	61% – 80%	Valid
5	81% – 100%	Highly Valid

5) Maintenance

Subsequently, during the Maintenance phase, continuous evaluation and improvements are carried out on the website. Although the website has been deemed feasible for use, ongoing monitoring remains essential to accommodate changes in transportation data, update content, and address any issues related to display errors or broken links. By utilizing Google Sites, the maintenance process can be performed directly by the administrator without requiring advanced technical expertise, ensuring that the website remains relevant and responsive to user needs.

3 RESULTS

Research Results

1) Analysis Results

The needs analysis for the development of the AyoLink website was conducted using three primary methods: observation, interviews, and questionnaires involving relevant stakeholders at Yogyakarta International Airport. The analysis revealed that, despite the availability of various transportation modes such as DAMRI buses, airport trains, shuttles, and taxis, several challenges remain, including insufficient fleet capacity during peak hours, non-real-time schedule information, and lack of integration between modes. In-depth interviews with airport operators, transportation agents, and passengers indicated that transportation management is still conducted manually through direct communication or applications such as WhatsApp, often resulting in information delays. The questionnaire results reinforce these findings, with an average score above 88%, indicating that users strongly require an integrated transportation website to improve travel efficiency and service reliability.

a. Observation Results

Observations at Yogyakarta International Airport revealed that while transportation facilities and services are generally adequate, weaknesses exist in information integration across modes, limited fleet capacity during peak hours, and reliance on manual coordination. Schedule information is not fully real-time, making it difficult for users to make quick and accurate travel decisions.

Table 2. Observation Results

Aspect	Key Findings	Status
Performance	Multiple modes available, but capacity is insufficient during peak hours	Needs improvement
Information	Information is available but not real-time	Needs enhancement
Economy	Affordable fares; non-cash payment available	Satisfactory
Control	Transfers between modes not yet integrated	Suboptimal
Efficiency	Rapid modes are relatively on time; shuttles/buses occasionally delayed	Fair
Service	Good facilities and accessibility for persons with disabilities	Satisfactory

b. Interview Results

Interviews with three respondents (an airport operator, a transportation agent, and a passenger) revealed that current transportation information management remains manual, relying on information boards, social media, and direct communication, which often causes delays in updates. All respondents agreed that an integrated digital platform is urgently needed to provide real-time schedule information, seamless reservation services, and multi-modal integration, supplemented by features such as hotel and tourist recommendations to enhance the travel experience.

Airport Operator:

“The system is still manual; information is shared through announcement boards, WhatsApp, and social media. Updates are often delayed. We need an integrated digital platform for real-time schedules and cross-mode communication.”

Transportation Agent:

“It is difficult to check vehicle availability because the information is scattered. Required features include real-time schedules, quick booking, and hotel/tourist recommendations.”

Passenger:

“It is often confusing to find shuttle/taxi pickup points. Schedule information is unclear and not integrated.”

c. Questionnaire Results

A questionnaire distributed to 56 respondents using a Likert scale revealed that all aspects were rated as highly necessary, with scores exceeding 88%. The highest score was recorded for Performance (95.83%), underscoring the importance of fast access and comprehensive transportation information.

Table 3. Questionnaire Results

No	Aspect	Percentage	Category	System Requirement Analysis
1	Performance	95.83%	Highly Necessary	Lightweight website displaying all transportation modes
2	Information	92.52%	Highly Necessary	Real-time schedules, routes, and fares presented clearly
3	Economy	90.18%	Highly Necessary	Discount menu and promotional fares
4	Control	88.39%	Highly Necessary	Secure system, easy to manage via Google Sites

5	Efficiency	90.29%	Highly Necessary	Integration of all transportation modes in a single platform
6	Service	91.52%	Highly Necessary	Recommendations for hotels and tourist attractions near YIA

2) Design Results

Based on the needs analysis, the AyoLink prototype website is highly essential as a source of transportation information that is fast, efficient, and integrated. The website incorporates key features such as a homepage, airport profile, transportation mode information, recommendations for nearby hotels and tourist attractions around YIA, and discount vouchers. Collectively, these features support an integrated system and enhance the overall user experience. A detailed explanation of these features is provided in the following section.

a. Home Page

The AyoLink homepage showcases Yogyakarta's integrated transportation system, connecting buses, commuter rail, taxis, and shuttles within a unified platform. Featuring the slogan "AYO, Lintas Integrasi Kota Yogyakarta!" and navigation to airport information, transportation modes, hotels, tourist attractions, and promotional offers, the site emphasizes travel convenience, digital payment solutions, and AyoLink's branding as an optimal urban mobility solution.

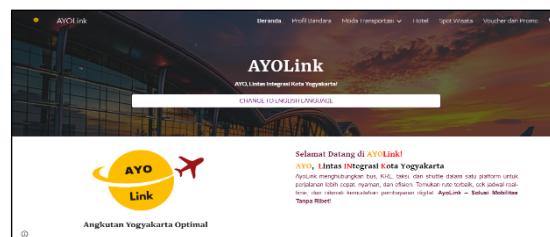


Figure 3. Home Page

b. Airport Profile Page

The "Airport Profile" page on AyoLink provides a terminal map, location via Google Maps, the airport's vision and mission, and an introductory video to help users understand facilities and services in an informative and interactive manner.

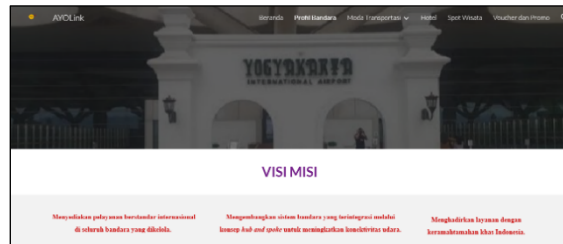


Figure 4. Airport Profile Page

c. Mode of Transportation Page

The "Transportation Modes" page on AyoLink presents various options to and from YIA Airport, including DAMRI buses, trains, taxis, and shuttles. It features an illustrative video and provides links to detailed pages with schedules, fares, and booking instructions, enabling users to plan their trips efficiently.

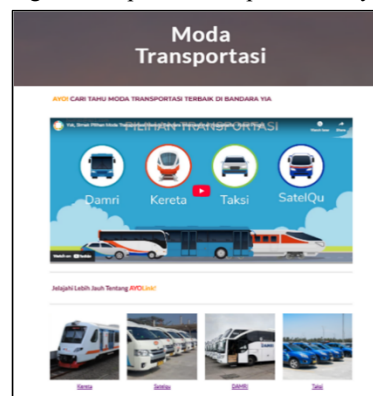


Figure 5. Mode of Transportation Page

d. Hotel Page

The “Hotel” page on AyoLink offers the top five recommended hotels near Yogyakarta International Airport, featuring facility descriptions, review videos, interactive maps, and direct booking options. Examples include Cordia Hotel and Novotel YIA, complete with distance details, service highlights, and interior views, enabling users to choose accommodations quickly and conveniently.

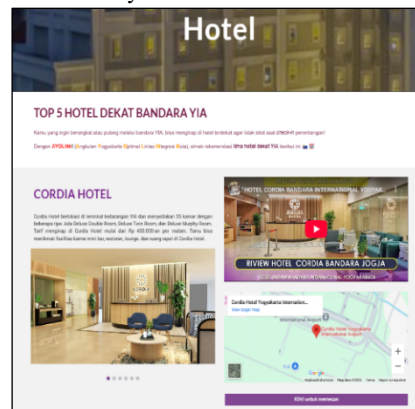


Figure 6. Hotel Page

e. Tourist Spot Page

The “Tourist Spots” page showcases Yogyakarta’s top 10 attractions, featuring AyoLink services for easy travel. Highlighted sites, such as Borobudur Temple, include brief descriptions, interactive maps, and sunrise images, with a link for more details, making it an appealing starter guide for visitors.

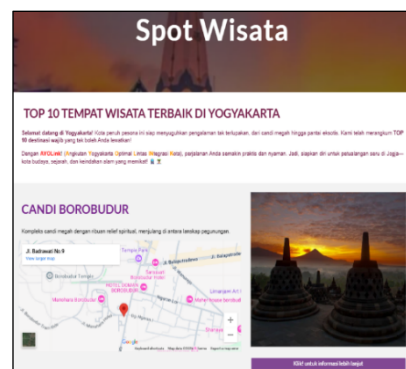


Figure 7. Tourist Spot Page

f. Vouchers and Promotions Page

The “Vouchers and Promotions” page on AyoLink features attractive offers supporting travel in Yogyakarta, including discounts from PT Kereta Api Indonesia and up to 50% off Bluebird taxi services for airport trips. It also provides visual information on additional services like car rentals, adding value for users seeking cost-efficient travel.



Figure 8. Vouchers and Promotions Page

3) System Test Results

a. Material Expert Test

Expert testing on AyoLink was conducted to ensure the website's content and features meet user needs and are easy to use. Five experts participated: three IT lecturers (Mrs. Lady, Mr. Musadek, and Mr. Yudhis) and two airport representatives (Mr. Doni and Mr. Risman). They evaluated information structure, feature usefulness, content clarity, and system suitability for integrating various transportation modes in Yogyakarta. The results are presented in the following table.

Table 4. Material Expert Test

Assessment Aspect	Mrs. Lady	Mr. Musadek	Mr. Yudhis	Mr. Doni	Mr. Risman	Maximum Score	Remarks
System Functionality	17	18	15	20	19	20	Feasible for use
Interface & User Friendliness	17	15	15	20	18	20	
Total Score	34	33	30	40	37	40	
Score Percentage (%)	85.0	82.5	75.0	100.0	92.5	100.0	
Cumulative Score Percentage	87.0						

Table 5. Expert Advice

No	Expert	Position	Suggestions and Feedback
1	Yudhis Thiro Kabul Yuniar, ST., M.Kom	IT Expert Assistant	Satisfactory
2	Lady Silk Moonlight, S.Kom, MT.	Head of MTU Program	The website should be more dynamic and provide real-time updates in the future, such as for the transportation schedule menu.
3	Ahmad Musadek, ST, M.MT	IT Expert Lecturer	Improve the website interface to make it smoother and more visually appealing.
4	Risman Noermansyah	Airport Representative	Add a barcode feature to facilitate quick and practical access to transportation information.
5	Aldony Nerroviisy	Airport Representative	Future research should consider developing a smartphone application.

b. Small Scale User Test

Usability was measured by calculating respondents' score percentages, with a total of 1,020 out of a maximum 1,120, resulting in a feasibility rate of 91.07%. According to Matondang (2009), this falls within the 81–100% range, indicating that AyoLink is highly feasible for use. User feedback, including from passengers, suggests that the website's interface and features effectively support access to transportation information in Yogyakarta, though further development is recommended to better meet user needs.

Table 6. Small Scale User Test

Statement	Score Obtained	Maximum Score	Percentage (%)
AyoLink website can serve as a transportation information platform in Yogyakarta	216	224	96.43
Searching for transportation modes on AyoLink is easy	201	224	89.73
The language used on AyoLink is easy for users to understand	202	224	90.18
The information provided by AyoLink (schedule, routes, fares) is very helpful	198	224	88.39
Users feel benefited and gain advantages from the AyoLink system	203	224	90.62
Total	1,020	1,120	91.07

3.2 Discussion of Research Results

1) Benefits of the AyoLink Website

Based on data collection and analysis, the AyoLink transportation information system is highly needed to support

integrated transportation services at Yogyakarta International Airport. This finding is reinforced by the PIECES framework (Performance, Information, Economy, Control, Efficiency, Service), commonly applied in information system evaluations [14].

From the Performance perspective, AyoLink is designed for fast access, lightweight usability across devices, and efficient display of transportation options. Speed and ease of navigation are critical for user satisfaction [15], particularly for air travelers who require quick access to information in urgent situations.

In terms of Information and Economy, AyoLink provides accurate and regularly updated details such as schedules, routes, and fares, ensuring clarity and reliability [16]. Additionally, features like promotional fares and discounts reflect a value-based approach, offering economic benefits to users—a factor that increases adoption likelihood [17].

For Control, the system utilizes Google Sites for content management and secure access via Google authentication, ensuring robust control and data integrity [18]. Regarding Efficiency and Service, AyoLink integrates multiple transportation modes—buses, shuttles, taxis, and airport trains—into one platform, streamlining the process of finding and comparing options [19], while also providing hotel and tourism recommendations as added value [20]. Overall, AyoLink received positive feedback for addressing fragmented information and transportation integration issues, aligning with prior studies on user-focused web-based systems improving mobility and user experience.

2) Obstacles to Creating the Ayolink Website

During the development of AyoLink using the waterfall model, several challenges emerged at each stage, providing key insights into evaluating this approach. The waterfall method, as described by Perdana & Setyorini [21], is a sequential process where each phase must be completed before proceeding to the next.

In the Requirement phase, the main issue was incomplete data collection due to limited access to stakeholders, view that active user involvement is crucial for accurate system requirements [22]. To address this, online surveys and interviews with accessible parties were conducted. During the Design phase, creating a simple yet comprehensive interface posed challenges, reflecting the principles of user-centered [23]. Google Sites' design limitations were mitigated by prototyping in Canva for preliminary testing.

The Implementation phase encountered technical issues such as inconsistent data formats from multiple sources, emphasizing the importance of standardization in system integration [24]. Additional challenges included integrating Google Forms with Google Sheets while maintaining data security. In the Verification phase, delayed stakeholder feedback through WhatsApp extended the evaluation timeline, reinforcing Patton's recommendation for data triangulation to ensure validity. Expert signatures were obtained for validation, and usability testing involved 56 users, though some feedback remained incomplete.

Finally, in the Maintenance phase, the key challenge was ensuring timely updates for schedule and service changes [25], adaptive information system theory, which emphasizes continuous content maintenance. A routine update schedule, dedicated admin roles, and data backups were implemented to maintain accuracy and reliability. These challenges provide valuable lessons for refining AyoLink and serve as a reference for future transportation information system development.

4 CONCLUSION

The AyoLink website was developed using the waterfall model, which consists of sequential stages including requirement analysis, design, implementation, verification, and maintenance. A quantitative research approach was applied, with data collected through observation, interviews, and questionnaires conducted in the airport environment. The PIECES framework was used in the needs analysis to ensure the system addresses issues related to performance, information, and ease of use.

1. The needs analysis revealed that users highly require an integrated digital system such as AyoLink to overcome fragmented information, lack of intermodal connectivity, and the need for practical, comprehensive travel services. This underscores the importance of developing a platform that centralizes transportation information for better accessibility and efficiency.
2. The prototype design of AyoLink, developed using Google Sites, demonstrated that the platform can provide a simple yet functional interface with easy navigation. It includes transportation information such as train, bus, shuttle, and taxi services, along with additional features like booking links, location maps, and tourist information. The design ensures smooth accessibility across both desktop and mobile devices.
3. System feasibility testing indicated that AyoLink achieved an overall feasibility score of 87% as assessed by IT experts and airport representatives. Additionally, usability testing by respondents resulted in an excellent average score of 91.07%, covering ease of searching transportation modes, clarity of language, and completeness of information. These results confirm that AyoLink effectively provides accessible and useful transportation information to users.

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