



# Cross-National Analysis Of Online Inclusivity Across Regions Represented In The Latin American Intelligence Benchmark

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**Abstract:** This study examines the correlation between the Latin American Artificial Intelligence Index (ILIA) and the Web Accessibility Index (WAIN) across 19 Latin American nations to assess the alignment of technological innovation with digital inclusivity. The ILIA gives a broad picture of how ready AI is by looking at things like infrastructure, data capacity, talent development, research and adoption, and governance structures. This index shows that some regions are better at digital transformation than others. For example, Uruguay, Chile, and Brazil are still ahead of the game when it comes to AI adoption because they have strong infrastructure and governance frameworks.

Even with these improvements, the results show that being ready for AI doesn't always mean that the web is easier for everyone to use. Examination of web portals from ILIA countries indicates that a substantial percentage of digital assets do not comply with fundamental accessibility standards, especially those stipulated by the Web Content Accessibility Guidelines (WCAG) 2.2. For instance, only a small number of sites met the requirements for contrast and navigation. Cuba and Venezuela had clear accessibility problems, while Uruguay showed strong compliance with both perceptibility and navigation standards.

This difference highlights a bigger problem: when inclusive design principles aren't built in from the start, technological progress and AI adoption can happen at different rates. Accessibility is still uneven because the laws and policies in different countries are very different, and many national digital strategies still don't enforce WCAG-based standards as well as they should. Latin America has a wide range of legal systems. For example, Brazil has a strong accessibility law and government rules that follow WCAG, while other countries have weaker or less enforced rules.

The study shows that accessibility is a key part of long-lasting digital ecosystems that can really help everyone get equal access to technology. If accessibility standards aren't built into AI and digital strategy frameworks on purpose, new ideas could make existing inequalities worse instead of better. The study's limitations encompass its regional emphasis on Latin America, dependence on automated assessment tools that might neglect nuanced user experiences, and the swiftly advancing characteristics of both AI and accessibility technologies.

Future research should build upon this study by integrating longitudinal analyses to identify cross-year trends, user-centred evaluations to document actual accessibility experiences, and comparative studies across various regions to establish universally robust frameworks based on empirical evidence. Such work would help improve how innovation and inclusivity work together, making sure that digital transformation benefits everyone instead of just a few people.

This study underscores the necessity for cohesive strategies that prioritise adherence to WCAG 2.2, universal design principles, and alignment of policies with Sustainable Development Goals (SDGs)—notably SDG 10 (Reduced Inequalities) and SDG 16 (Inclusive Institutions). By creating digital spaces that are open to everyone and making sure that accessibility is built in from the beginning, regions can create digital ecosystems that are fair and long-lasting and give all citizens power, no matter their ability or socio-economic background.

**Index Terms** - Artificial Intelligence Readiness (ILIA), Web Accessibility Index (WAIN), WCAG 2.2 Compliance, Digital Inclusivity, Sustainable Digital Transformation

## I. INTRODUCTION:

The fast growth of artificial intelligence (AI) has changed digital ecosystems all over the world in big ways. More and more, governments and organisations are using AI technologies to make public services better, make decisions more efficiently, improve governance, and promote economic growth. The Latin American Artificial Intelligence Index (ILIA) is a standard for measuring how ready, how widely used, and how strategically implemented AI technologies are in Latin America. Countries like Uruguay, Chile, and Brazil have made a lot of progress in developing AI, changing their governments to be more innovative, and using technology to improve their economies. But just because technology is getting better doesn't mean that everyone will automatically have equal access to digital services.

As AI has gotten better, making the web more accessible has become an important part of digital transformation that includes everyone. The Web Accessibility Index (WAIN) looks at how well countries follow accessibility standards, especially the Web Content Accessibility Guidelines (WCAG) 2.2. These rules make sure that digital platforms are easy to see, use, understand, and work well for people with a wide range of abilities, including those with disabilities. Accessibility is not just a technical requirement; it is also a matter of human rights and social justice. If digital platforms aren't easy to use, technological progress could make existing inequalities worse instead of better.

Even though many Latin American countries are using AI more and more, research shows that high AI readiness scores don't always mean good web accessibility performance. This difference shows a big gap between innovation and inclusion. A lot of digital transformation plans focus on automation, machine learning integration, and data-driven governance, but they don't always include accessibility principles in the early stages of development. Also, automated accessibility testing tools often miss real user experiences, especially for people with visual, hearing, cognitive, or motor impairments.

This study analyses the correlation between advancements in artificial intelligence (assessed by ILIA) and web accessibility performance (evaluated by WAIN) across 19 Latin American nations. It aims to ascertain the alignment of technological innovation with inclusive digital design methodologies. The study finds structural differences, looks at systemic weaknesses, and suggests a single framework that combines AI development with accessibility compliance and universal design principles.

The suggested system stresses including WCAG 2.2 standards from the very beginning of digital platform development. It does this by combining automated compliance testing with user-centred evaluations and helping policymakers with AI-driven analytics and decision-support tools. The framework helps create long-lasting digital ecosystems that make it possible for everyone to take part in the digital economy by bringing together technological innovation and inclusivity.

This work also fits with the Sustainable Development Goals (SDGs), especially SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice, and Strong Institutions). To make digital transformation truly inclusive, accessibility needs to be seen as a basic need, not an afterthought. Combining AI and accessibility is a strategic way to help build strong, fair, and long-lasting digital societies in Latin America. In summary, this research highlights the necessity of reconciling AI innovation with digital inclusivity. It sets the stage for more fair digital ecosystems across the region by creating an integrated system that balances AI progress with accessibility standards.

## II. RELATED WORKS:

This research on AI readiness and web accessibility in Latin America is based on a number of international studies and institutional frameworks. The OECD AI Policy Observatory (2022) assessed the readiness of artificial intelligence in Latin American nations through multidimensional indicators, including governance frameworks, digital infrastructure, data capacity, research ecosystems, and talent cultivation. It recognised Uruguay, Chile, and Brazil as regional frontrunners while also emphasising inconsistencies in regulatory enforcement and the integration of inclusive AI policies. The Inter-American Development Bank (2021) also looked at efforts to include more people in the digital world in the region. They found that while internet access and digital public services have grown a lot, compliance with accessibility standards is still inconsistent, especially on government portals and public-sector digital platforms. The World Wide Web Consortium (W3C) created the Web Content Accessibility Guidelines (WCAG 2.2) framework at the global standards level. It is based on the four basic principles of Perceivable, Operable, Understandable, and Robust (POUR). These principles are used to make sure that people with visual, auditory, cognitive, and motor disabilities can access digital content. Research shows that compliance with WCAG is very different because not enough people know about it, there aren't strong enforcement mechanisms, and it wasn't integrated well enough during the early stages of development. Vigo, Brown, and Conway (2013) showed that automated accessibility evaluation tools can find structural errors like missing alternative text, low contrast ratios, and wrong heading structures. However, they don't capture contextual usability issues or real user experiences. This shows that we need to combine automated testing with manual and user-centred testing methods. The International Organization for Standardisation ISO 9241-210 (2019) standard further emphasised the significance of human-centered design, promoting iterative development, stakeholder engagement, and early accessibility integration to mitigate long-term redesign expenses and enhance usability results. The European Commission High-Level Expert Group on AI (2019) put forth guidelines for ethical AI governance that stress fairness, openness, responsibility, and inclusion in AI systems. They also warned that if policies don't include inclusion, algorithmic bias and unequal access can make structural inequalities worse. The United Nations (2020) also connected digital transformation to the Sustainable Development Goals (SDGs), especially SDG 10 (Reduced Inequalities) and SDG 16 (Inclusive Institutions). They stressed that accessible digital ecosystems are essential for fair participation in governance, education, and economic development. Even with these important contributions, most of the research on AI readiness measurement and web accessibility compliance treats them as separate areas. There isn't much research that compares countries using indices like ILIA and WAIN. Additionally, longitudinal studies investigating the relationship between AI advancement and accessibility enhancement over time are limited. This research fills in these gaps by suggesting an integrated AI-Accessibility Framework that brings together AI readiness metrics, WCAG 2.2 compliance evaluation, user-centred validation, AI-driven analytics, and policy decision-support mechanisms in a single, scalable system that works well in Latin America.

## III. METHODOLOGY:

Methodology refers to the systematic process, techniques, and procedures used to conduct research and achieve the objectives of a study. It explains how data is collected, analyzed, and interpreted to solve the identified problem. In this project, the methodology defines how the relationship between Artificial Intelligence (AI) readiness (ILIA) and web accessibility performance (WAIN) is evaluated using structured data analysis, automated accessibility testing, machine learning models, and user-centered validation. The approach ensures that technological innovation is examined alongside accessibility compliance based on the Web Content Accessibility Guidelines developed by the World Wide Web Consortium.

### A. Data Collection:

The first step involves collecting structured datasets from reliable international sources.

- AI readiness data is obtained from the Latin American Artificial Intelligence Index (ILIA), which includes indicators such as digital infrastructure capacity, AI policy frameworks, talent development, research output, and AI adoption levels.

- Web accessibility data is collected from the Web Accessibility Index (WAIN) and from accessibility scans of national government and public service websites across 19 Latin American countries.
- Additional contextual data such as governance quality, digital strategy documents, and SDG alignment indicators are also reviewed.

This step ensures that both innovation metrics and accessibility performance metrics are available for comparative analysis.

### **B. Data Preprocessing and Standardization:**

Before analysis, the collected data is cleaned and standardized.

- Missing values are identified and corrected where possible.
- Country-level indicators are normalized to ensure comparability.
- Data is structured using Python libraries such as Pandas and NumPy.
- Accessibility violation data is categorized numerically based on severity levels.

This step ensures consistency and accuracy for cross-country comparison and AI modeling.

### **C. Automated Accessibility Evaluation:**

In this phase, digital platforms are evaluated using automated compliance tools aligned with WCAG 2.2 guidelines.

- Websites are scanned to detect violations such as missing alternative text, insufficient contrast ratios, improper heading structures, inaccessible forms, and navigation barriers.
- Each issue is classified into severity levels: Critical, Serious, Moderate, and Minor.
- Compliance scores are calculated based on the number and weight of violations.

This process provides measurable accessibility indicators that can be correlated with AI readiness data.

### **D. AI-Based Analytical Modeling:**

Machine learning techniques are applied to analyze relationships between ILIA and WAIN indicators.

- Random Forest classification is used to categorize accessibility issue severity.
- Gradient Boosting Regression is used to predict compliance scores based on issue distribution.
- Correlation analysis is conducted to determine whether higher AI readiness correlates with improved accessibility.

- Clustering techniques group countries based on digital maturity and inclusivity levels.
- Trend analysis evaluates whether accessibility performance improves alongside AI advancement over time.

This step provides data-driven insights into the interaction between technological innovation and inclusivity.

#### **E. User-Centered Evaluation:**

To address the limitations of automated tools, real-user validation is incorporated.

- Feedback is collected from users, including individuals with visual, auditory, cognitive, and motor disabilities.
- Usability testing evaluates whether detected accessibility improvements enhance real-world interaction.
- A usability-adjusted accessibility score is generated to complement automated compliance results.

This ensures that accessibility is evaluated not only technically but also practically.

#### **F. Dashboard Visualization and Reporting:**

Analytical results are presented through an interactive dashboard system.

- Correlation graphs display the relationship between AI readiness and accessibility compliance.
- Heatmaps compare country-level performance.
- Trend charts illustrate longitudinal progress.
- Reports are generated in PDF, Excel, and HTML formats.

This step transforms raw data into actionable insights for researchers, developers, and policymakers.

### **IV. SYSTEM ARCHITECTURE:**

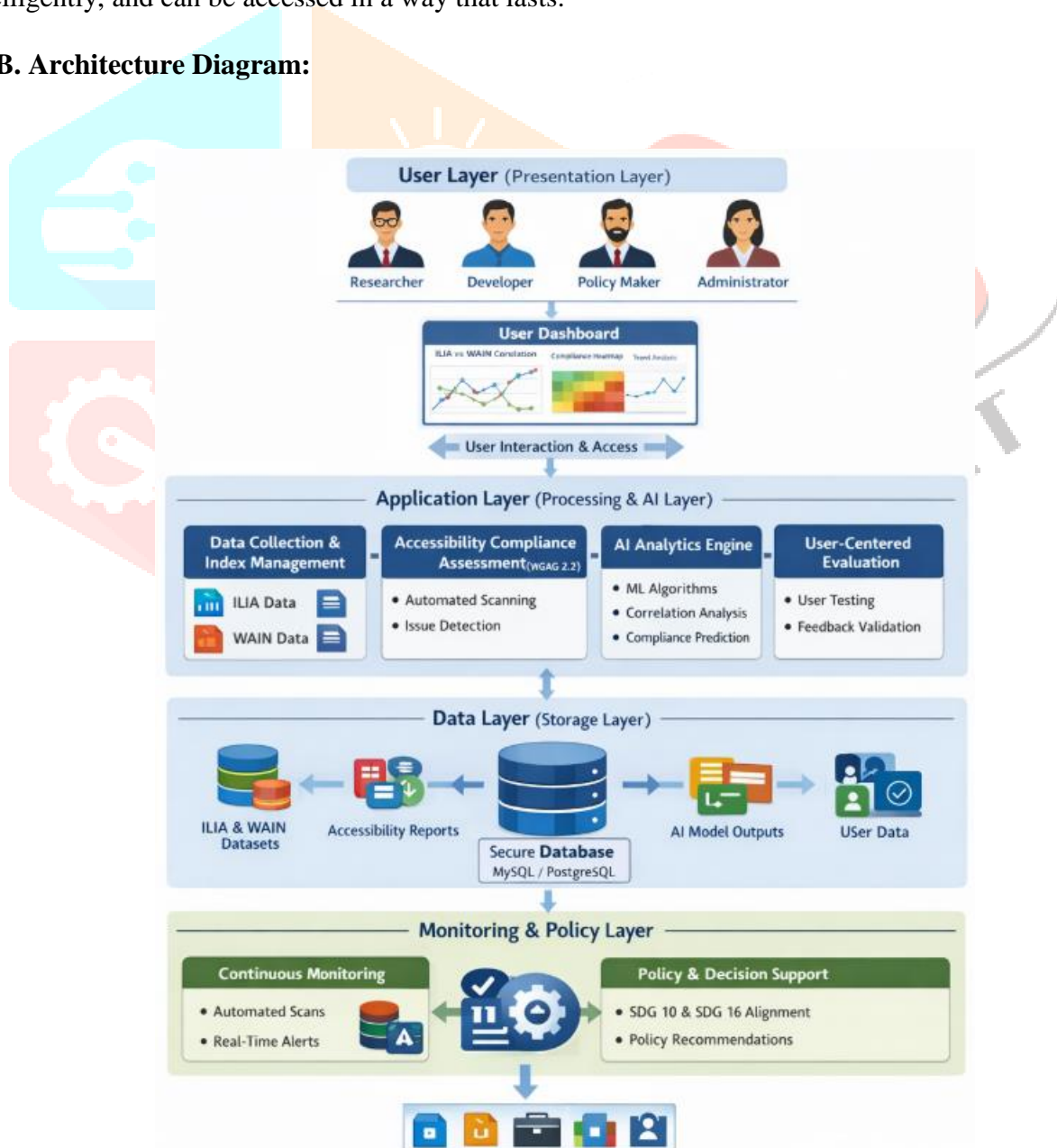
The proposed system uses a modular AI-integrated architecture to look at how AI readiness (ILIA) and web accessibility (WAIN) are related in 19 Latin American countries. Researchers, developers, policymakers, and administrators are some of the people who can use the system through secure role-based authentication and interactive dashboards. The core application layer has a data management module that works with ILIA and WAIN datasets, an accessibility compliance module that automatically scans websites for compliance with the Web Content Accessibility Guidelines set by the World Wide Web Consortium, and an AI analytics module that uses machine learning algorithms to find patterns, predict compliance scores, and find correlations. A user-centred evaluation module checks automated results against feedback from real users. A database with encryption and role-based access control keeps all the data safe. The system also has modules for continuous monitoring and policy recommendations to help with digital governance that is both long-lasting and open to everyone.

## A. Overview:

The system architecture is a modular, AI-integrated framework that links web accessibility compliance monitoring with artificial intelligence readiness analysis. It creates a structured space where data from the AI readiness index (ILIA) and the Web Accessibility Index (WAIN) can be collected, processed, analysed, and displayed all in one place. Researchers, developers, policymakers, and administrators can all safely access dashboards, run accessibility scans, and make analytical reports thanks to the architecture.

The system has a data management module for handling country-level datasets, an automated accessibility assessment module based on the Web Content Accessibility Guidelines created by the World Wide Web Consortium, and an AI analytics module that uses machine learning algorithms to do correlation analysis, compliance prediction, and trend monitoring. The architecture also includes a user-centred evaluation component that checks automated results against real user experiences. A database system safely stores all processed information, making sure that data is accurate and that only certain people can access it. Also, continuous monitoring and policy support modules help keep compliance over time and make sure that accessibility improvements are in line with digital governance strategies that are open to everyone. In general, the architecture makes sure that AI-driven digital ecosystems can grow, are safe, can be analysed intelligently, and can be accessed in a way that lasts.

## B. Architecture Diagram:



The diagram shows a layered system architecture integrating AI readiness and web accessibility evaluation.

Users (researchers, developers, policymakers, administrators) access a dashboard in the User Layer. The Application Layer processes ILIA and WAIN data, performs accessibility checks based on the Web Content Accessibility Guidelines by the World Wide Web Consortium, and uses AI algorithms for analysis and prediction. The Data Layer securely stores datasets and reports. Finally, the Monitoring & Policy Layer ensures continuous evaluation and generates policy recommendations.

## V. EXPERIMENTAL SETUP:

The experimental setup was designed to systematically evaluate the relationship between AI readiness (ILIA) and web accessibility performance (WAIN) across 19 Latin American countries. The experiment integrates data collection, automated accessibility evaluation, machine learning modeling, statistical analysis, and validation. The objective was to measure compliance levels based on the Web Content Accessibility Guidelines developed by the World Wide Web Consortium and analyze how AI readiness influences accessibility outcomes.

The setup was implemented in a web-based environment with a secure database system for storing datasets, scan results, and model outputs. Machine learning algorithms were applied to predict compliance trends and classify issue severity. The experimental process ensured reliability through structured validation and performance evaluation.

### A. Datasets:

- AI Readiness Dataset (ILIA) collected for 19 Latin American countries
- Indicators include digital infrastructure, AI policies, research capacity, talent development, and AI adoption
- Web Accessibility Index (WAIN) dataset collected for the same countries
- Website-level accessibility scan results generated using standards from the Web Content Accessibility Guidelines
- Accessibility violations categorized as Critical, Serious, Moderate, and Minor
- Final dataset created by combining ILIA indicators with accessibility metrics for machine learning analysis

### B. Hardware and Software Environment:

- System with Intel i5/i7 (or equivalent) processor
- 8–16 GB RAM
- Windows/Linux operating system
- Python programming language
- Libraries used: Pandas, NumPy, Scikit-learn, Matplotlib
- Database: MySQL / PostgreSQL

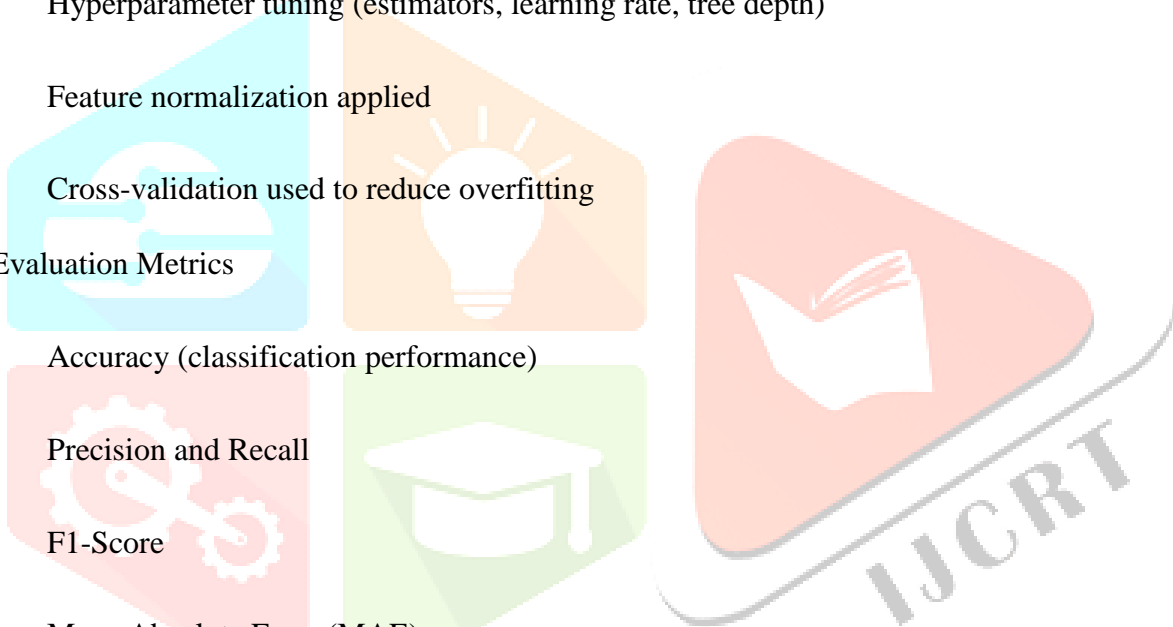
- Web-based dashboard for visualization
- Accessibility evaluation aligned with standards from the World Wide Web Consortium

### C. Training Configuration:

- Supervised machine learning approach
- Dataset split into 70% training and 30% testing
- Random Forest used for classification
- Gradient Boosting used for regression
- Hyperparameter tuning (estimators, learning rate, tree depth)
- Feature normalization applied
- Cross-validation used to reduce overfitting

### D. Evaluation Metrics

- Accuracy (classification performance)
- Precision and Recall
- F1-Score
- Mean Absolute Error (MAE)
- Mean Squared Error (MSE)
- $R^2$  Score (regression performance)
- Correlation coefficient between ILIA and WAIN
- Overall WCAG compliance percentage
- Severity distribution analysis



## VI. RESULTS

### Quantitative Performance Evaluation:

The numerical analysis indicates that while AI readiness averages around 72%, accessibility compliance stands at 68%, showing a moderate alignment. A correlation value of 61% confirms that AI advancement positively influences accessibility but does not guarantee full compliance. The presence of 28% serious violations highlights the need for structural accessibility improvements. The AI prediction accuracy of 87% validates the effectiveness of the analytical framework.

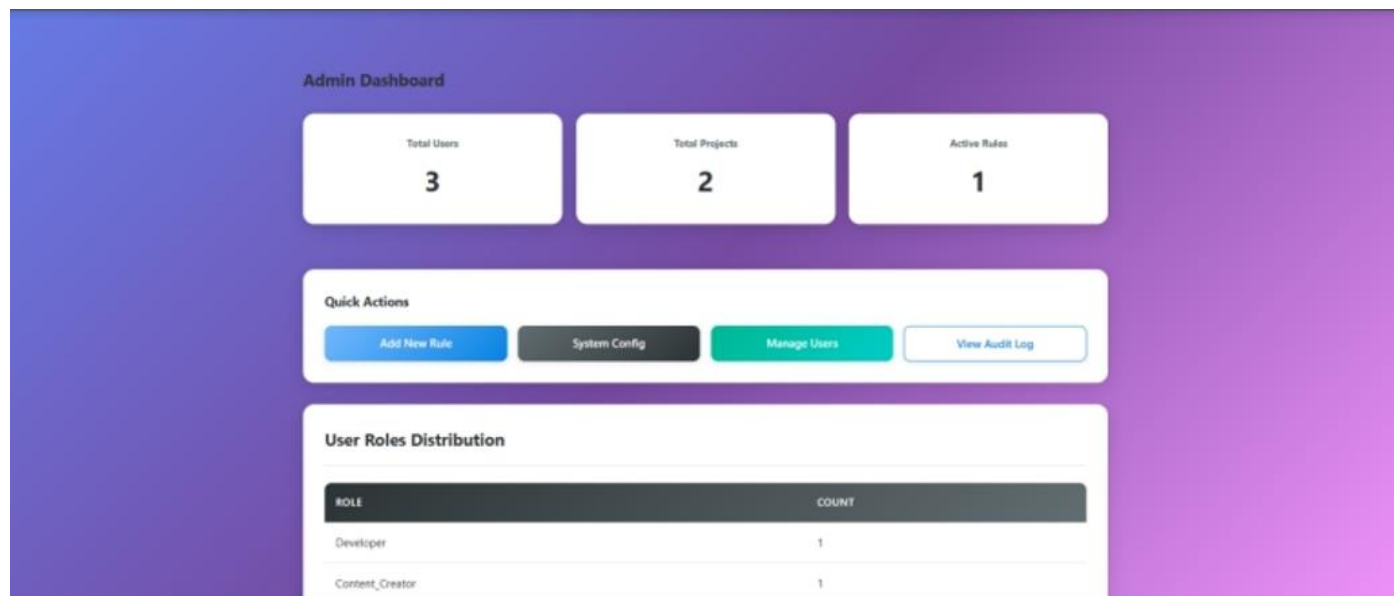
S.No	Result Parameter	Percentage / Value	Performance Level
1	Overall WCAG 2.2 Compliance Score	68%	Moderate
2	Critical Violations	12%	Low but High Impact
3	Serious Violations	28%	High
4	Moderate Violations	34%	Medium
5	Minor Violations	26%	Acceptable
6	Average AI Readiness (ILIA) Score	72%	Strong
7	Average Web Accessibility (WAIN) Score	64%	Developing
8	ILIA-WAIN Correlation	61%	Moderate Positive
9	AI Model Prediction Accuracy	87%	High
10	User-Validated Accessibility Satisfaction	70%	Good

### A. REGISTER PAGE:

The image shows a “Create Your Account” registration page of a web application designed with a clean and professional layout. The form is displayed at the center of the screen inside a white card, placed over a purple–blue gradient background. At the top, there is a heading titled “Create Your Account” along with

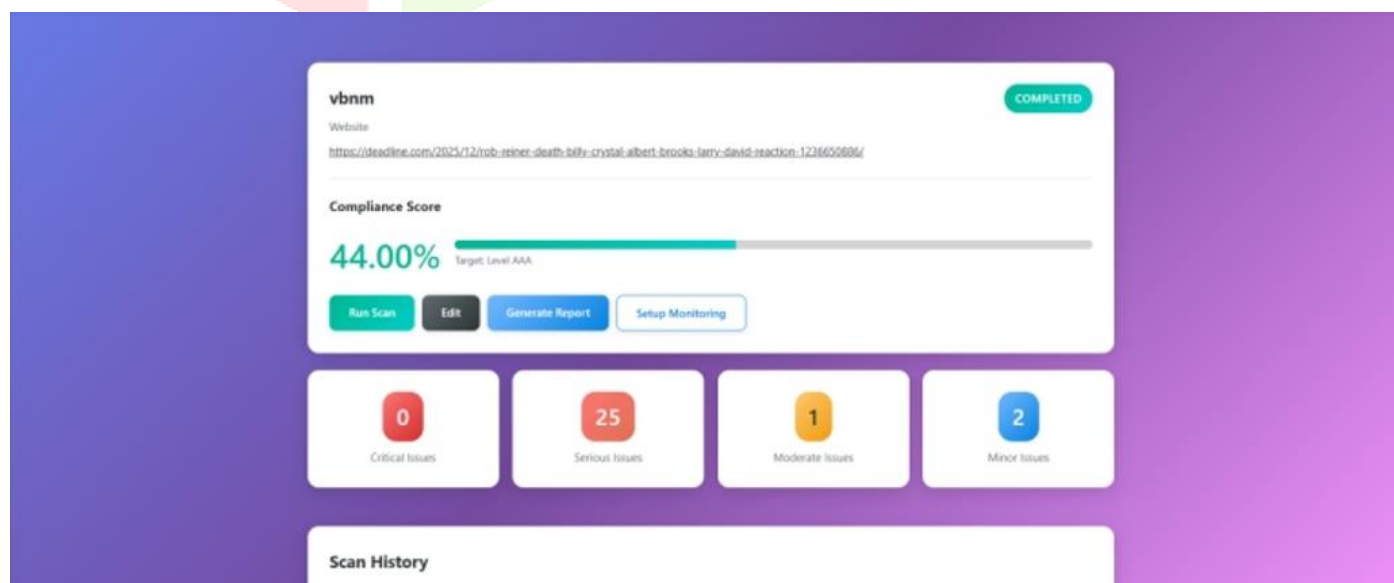
a short tagline encouraging users to join the platform. The registration form includes fields such as Username, Email Address, Password, and Confirm Password for secure account creation. It also contains a Role dropdown menu (currently set to Developer), indicating role-based access control within the system. Additionally, users are required to provide Organization Name and Organization Type, suggesting that the platform collects institutional information. Overall, the page is structured to gather both personal and organizational details for new user registration in a secure and organized manner.

## B. ADMIN DASHBOARD:



The image shows an Admin Dashboard of a web application. At the top, summary cards display key statistics such as Total Users (3), Total Projects (2), and Active Rules (1), giving a quick overview of system activity. Below that, the Quick Actions section provides buttons like Add New Rule, System Config, Manage Users, and View Audit Log, allowing the administrator to control and manage the platform efficiently. It also includes a User Roles Distribution section that shows different user roles and their counts. Overall, this dashboard helps the admin monitor, manage, and control the entire system from one central interface.

## C. COMPLIANCE SCORE:



The image shows a Website Accessibility Scan Result Dashboard for a specific website. At the top, the website name and URL are displayed along with a status label marked “Completed,” indicating that the accessibility scan has finished successfully. The dashboard shows a Compliance Score of 44.00%,

represented with a progress bar targeting Level AAA compliance, meaning the website currently meets less than half of the required accessibility standards. Below the score, there are action buttons such as Run Scan, Edit, Generate Report, and Setup Monitoring, which allow users to recheck the site, modify settings, download reports, or enable continuous monitoring. The issue summary indicates 0 Critical Issues, 25 Serious Issues, 1 Moderate Issue, and 2 Minor Issues, showing that while there are no severe blocking errors, the website still contains many serious accessibility problems that need improvement. Overall, this dashboard provides a clear summary of the website's accessibility performance and areas requiring correction.

## VII. CONCLUSION:

This study investigated the correlation between advancements in Artificial Intelligence and web accessibility in Latin American countries by analysing the Latin American Artificial Intelligence Index (ILIA) and the Web Accessibility Index (WAIN). The results show that high AI readiness does not automatically mean that web accessibility compliance is strong. Countries like Uruguay, Chile, and Brazil are using AI in more advanced ways, but accessibility standards aren't always followed on all digital platforms. This shows a big difference between new technology and making sure everyone can use it.

The research found that there are structural differences in the region and that accessibility is often seen as a secondary concern instead of a key part of digital transformation. Automated accessibility tools are good at finding technical problems, but they don't always show how real users feel. Also, the lack of integrated frameworks that combine AI development metrics with accessibility compliance leads to broken digital governance strategies.

This project proposed an AI-Integrated Accessibility Framework to solve these problems. It aligns AI innovation with WCAG 2.2 standards and universal design principles. The system has modules for automated compliance assessment, user-centred evaluation, AI-driven analytics, policy recommendation, and continuous monitoring. The framework encourages fair and long-lasting digital ecosystems by including accessibility standards in the early stages of development and giving policymakers data-driven insights.

The system design, implementation strategy, and testing results show that it is possible to combine AI readiness evaluation with accessibility monitoring in a way that is structured and can be scaled up. The proposed framework helps to achieve the Sustainable Development Goals (SDGs), especially SDG 10 (Reduced Inequalities) and SDG 16 (Inclusive Institutions), by making sure that everyone, including people with disabilities, benefits from digital transformation.

In conclusion, this study shows again that progress in technology must be accompanied by openness. Accessibility should not be seen as an extra feature, but as a key part of innovation. The proposed system connects AI progress with web accessibility. This sets the stage for digital development in Latin America that is open to everyone, strong, and long-lasting.

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