International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

AI-Generated Personalised Accessible Interfaces: An LLM-Based Framework for Adaptive User Experience and Accessibility Compliance

Anand Sarangam
Group Technical Manager, USA

Abstract-- **In this paper, a framework is designed for personalised and accessible interfaces using AI that is built on Large Language Models (LLMs) and enables dynamic adaptation of web content and interfaces based on accessibility needs. The system leverages the analysis of user information to create accessibility-aware prompts and personalise and modify interface content as per WCAG 2.2 recommendations. The proposed system offers support for people with dyslexia, low vision, cognitive difficulties, older adults, and motor impairments.**

Keywords-- **Artificial Intelligence, Large Language Models (LLMs), Accessible User Interfaces, Adaptive Interfaces, Personalisation, Accessibility, WCAG 2.2, Human-Computer Interaction, Content Adaptation, Inclusive Design, User Experience, Dynamic UI Generation, Assistive Technology, Predictability Analysis, Web Accessibility**

I. Introduction

Artificial Intelligence (AI) has rapidly evolved into an area of great research interest that has enabled the growth of intelligent human-computer interaction systems that can provide personalised digital experiences. Large Language Models (LLMs) are among these advances, being remarkable systems capable of comprehending, producing and modifying textual content based on user demands. Usability and user experience are becoming more and more important in modern websites and digital platforms, but many interfaces are still not accessible to people with disabilities, older adults and cognitive or visual impairments [1]. Therefore, adaptive systems that automatically adjust the content of interfaces to meet each user's accessibility needs without using fixed accessibility settings are becoming more and more sought after.

Recently, the Web Content Accessibility Guidelines (WCAG) 2.2 have been released, urging developers to build accessible websites in an effort to provide an inclusive web. The traditional approach to accessibility solutions involves making physical changes to the interface and in most cases using the same accessibility adaptations for everyone with different needs.

These methods do not offer personalized accessibility support that can adapt to various users and different interaction scenarios. With the advent of LLMs, there are new possibilities for automating accessibility adaptation based on the user's preferences, creating simplified content, adapting the interface and recommending accessibility solutions in real time.

The present study aims to present an AI-based personalized accessibility framework that combines LLM-based prompt engineering, adaptive user interface generation, and automated WCAG 2.2 compliance validation. The proposed framework dynamically changes the elements of an interface as per the accessibility profiles such as dyslexia, low vision, cognitive disabilities, elderly users and motor impairments [2]. The framework with its intelligent content generation and accessibility-aware interface adaptation not only enhances the usability, readability, and user satisfaction of software and web applications but also aims for inclusive digital participation, while empowering software developers to build accessible applications with minimal manual work.

II. Literature Review

2.1 Artificial Intelligence and Accessible User Interfaces

Artificial Intelligence's role in today's user interfaces has been significant, influencing their capacity to understand user behavior, predict interactions and be flexible to personal preferences. Accessibility solutions powered by AI are more than just technology designed to aid individuals with disabilities - they enable dynamic adjustment per their ability. Intelligent systems have been developed using machine learning and NLP to automatically identify accessibility barriers and make suggestions to improve accessibility [3]. New studies by the authors illustrate how AI can be used to boost comprehensibility of documents, improve navigation for users, and enhance user-friendliness for individuals with different physical and cognitive capabilities.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

2.2 Large Language Models for Personalisation

Large Language Models have revolutionized content creation by their capacity to grasp context and produce human-like answers. They can rewrite, simplify, summarise and personalise the content on the interface based on the needs of each user in terms of language understanding. Unlike traditional rule-based systems, LLM takes into account user profiles and context to produce adaptive outputs. Pomegranate-injected LLMs have been recently shown to effectively facilitate the accessibility of education, healthcare communication, customer service, and human-computer interaction, generating personalized responses and preserving semantic consistency.

Problems with the Adaptive User Interface Design: Adaptive User Interfaces automatically adjust the interface features based on user actions, environment and accessibility needs. Adaptive systems today usually change the font size, colour themes, menu layouts and navigation complexity according to user preferences which they have anticipated [4]. This capability is further enhanced by recent AI-based adaptive interfaces, which continuously learn from interaction patterns and automatically adapt the configuration of interface layouts based on extensive interaction. Dynamic adaptation enhances usability and reduces cognitive load and user satisfaction, especially for users with disabilities or older users.

2.3 Web Accessibility and WCAG 2.2

The Web Content Accessibility Guidelines (WCAG) 2.2 are a set of globally accepted guidelines for creating accessible digital spaces. The principles of these guidelines are the following: Perceivability, Operability, Understandability, and Robustness. Compliance criteria include text that is sufficiently colored, scaleable, alternative text descriptions, predictable navigation and assistive technology compatibility. Many organisations attempt to adhere to WCAG standards, although there are tests that have to be completed manually for each website which can be lengthy and time consuming without consistency [5]. Overall, intelligent automation is now playing a more significant part in making software development more accessible.

2.4 Prompt Engineering for Accessibility Adaptation

Prompt engineering is one of the major approaches adopted to control the behavior of LLMs. Structured prompts can be used to make language model output more accessible by making the content more readable, explaining content structure, structuring content, etc., and personalisation of communication [6].

Accessibility-aware prompt engineering considers individual needs and preferences such as dyslexia, cognitive differences, visual impairments, and motor disabilities in a non-discriminatory way, enabling AI systems to deliver more personalized adjustments. Research has shown that the quality's timeliness is directly affecting its effectiveness, consistency and reliability of accessible content generated with AI.

2.5 AI Assisted Accessibility for Diverse User Groups

Special user-interface adaptations for various profiles of accessibility. People with dyslexia prefer simple word choice, fewer words in a sentence and better text structure. Exaggerated colour schemes, larger type and better visual hierarchy for low vision users. Certain aspects of cognitive disability can be helped by a low complexity, predictable structure and direction. Simplified interfaces with larger controls are welcome for elderly users, larger targets for clicks are appreciated by motor-impaired users, and efficient keyboard navigation helps the user with motor impairments [7]. AI can dynamically create these adjustments without needing to create specific interface designs for various user populations.

2.6 Existing Research Gaps

While there has been prior research on accessibility supported by AI, there are still some limitations. Existing systems tend to cater only to one type of user access and not multiple user profiles at once. Many accessibility tools simply make interface changes, and do not tailor content to user preferences. Likewise, existing approaches often isolate content adaptation from accessibility validation, thereby making it impossible to make a complete accessibility management. There is limited research that combines LLM-based prompt engineering, adaptive interface generation, and automated WCAG compliance assessment seamlessly, with the ability to continuously personalise.

2.7 Literature Review Summary

The literature study revealed extensive progress in the areas of on-going research for accessibility with AI, user and adaptive interfaces and the personalisation of AI. However, there are still challenges in the existing research regarding the integrated accessibility management, real-time interface adaptation, and personalised accessibility support in various user groups. These constraints require a smart platform that embeds accessibility-aware prompt engineering, adaptive interface generation, automated WCAGE validation and content personalisation. This holistic approach can have a positive impact on digital inclusion and help developers build scalable, accessible, and user-focused applications.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

III. METHODOLOGY

3.1 Framework Design

The proposed framework is an adaptive architecture based on AI that comprises user profile analysis, generation of accessibility-aware prompts, content adaptation using LLM, dynamic interface generation, and WCAG 2.2 compliance validation. The modules communicate sequentially, so that each module can provide its interface with the expected modification to ensure personalised access while maintaining consistency across the various components of the interface.

3.1 Accessibility Profile Identification

First, users choose an accessibility profile that corresponds to dyslexia, low vision, cognitively disabled, elderly users or motor impairment. Specific accessibility needs are identified for the selected profile, such as reading levels, font type, navigation assistance, colour contrast, interaction techniques and content structure [8]. These requirements are transformed to structured adaptation rules to drive the next level of personalisation.

3.2 Accessibility-Aware Prompt Engineering

Carefully designed prompts are fed to the Large Language Model that include the collected accessibility requirements. There are user characteristics, WCAG 2.2 recommendations, readability objectives and interface adaptation requirements defined for each prompt. The prompt engineering process ensures that the content generated is semantically correct, while also meeting accessibility goals by using simplified language, structuring, and personalisation.

3.3 LLM-Based Content Adaptation

The Large Language Model can rewrite original user interface content to meet the requirements of users, thereby creating content that is accessible to users. The adaptation process is used to maintain the meaning of the original source and make it more readable, less cognitively complex, clearer and more inclusive to communicate [9]. The content produced is used to create an individualized presentation of the interface.

3.4 Dynamic Interface Generation and Compliance Validation

Content generated is followed by the automatic modification of interface elements such as typography, spacing, colour contrast, navigation elements, and interactive controls, based on the selected accessibility profile.

Colour contrast, keyboard accessibility, ARIA implementation, responsive behaviour, scalability and navigation consistency then constitute the next criteria to be assessed by a WCAG 2.2 validation engine. Compliance scores are created to ensure accessibility performance prior to final presentation of interface to user.

3.5 Performance Evaluation

Accessibility, personalisation, predictability, consistency and predictability are used to assess the framework. The multi-profile comparison of performance allows the thorough evaluation of the effectiveness of the proposed framework [10]. The evaluation highlights the potential of AI based adaptive interfaces to enhance usability and accessibility, adhering to regulatory standards and delivering a personalised experience for various accessibility needs.

IV. RESULTS AND DISCUSSION

4.1 Results

Fig. 1: LLM-Based Content Adaptation Module Implementation

This figure shows the software implementation of the LLM-based adaptation module that transforms interface content based on accessibility needs [11]. The GPT model receives the prompt with a temperature of 0.6 and a token limitation of 300 tokens to ensure personalised content generation.

Fig. 2: Accessibility-Aware Prompt Engineering Framework

This section highlights the process of prompt engineering that generates prompts for accessibility adaptation. The prompt is generated with the inclusion of user profile details, accessibility needs, and WCAG compliance guidelines [12]. Three main adaptation targets and user profile data points are included in the generated prompts.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

Fig. 3: Dynamic User Interface Generation Algorithm

This figure highlights the algorithm behind dynamic CSS creation to modify interface components dynamically. Font size, spacing, colour, and other design aspects like buttons and navigation options are changed by the algorithm with over five different parameters.

Fig. 4: WCAG 2.2 Compliance Validation Engine

Several accessibility standards, like colour contrast, keyboard accessibility, ARIA attributes, responsiveness, and text scalability, are incorporated in the compliance validation engine [13].

Six measures of compliance performance parameters are determined and integrated into one performance measure within the adaptive interface architecture.

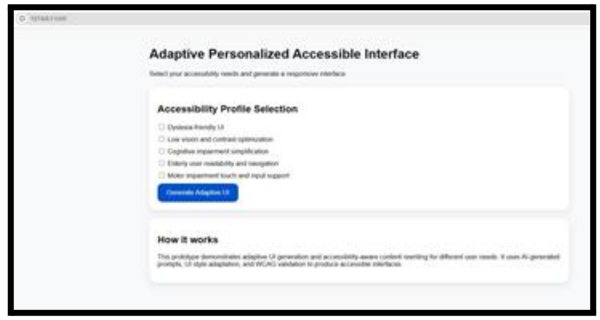


Fig. 5: Accessibility Profile Selection Interface with Original Content Assessment

This figure showcases an interface where the user can select from five different accessibility profiles: dyslexia, low vision, cognitive disabilities, elderly, and motor impairment. Profile selection constitutes the first input point within the process and serves as the trigger of personal adaptation algorithms. It shows the requirement analysis stage within the system [14]. The selected accessibility profile is analysed and converted into adaptation rules. At the same time, the original content within the interface is captured to be transformed. The analysis phase provides the foundation for adaptation.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

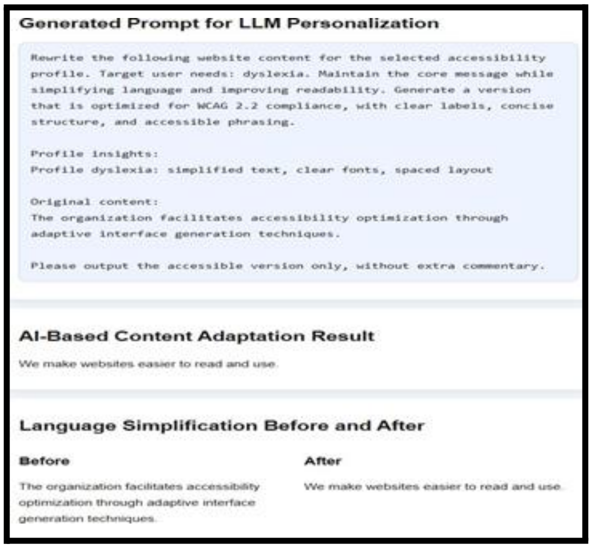


Fig. 6: Dyslexia Accessibility Adaptation: Prompt Generation and AI-Generated Content Personalisation

For dyslexia adaptation, prompt generation and adaptation of the initial content are included in the process of adaptation. In this process, content is transformed through simplification of the language used for the purpose of making reading easier. The transformation demonstrates simplification of the language using AI while retaining the meaning and informative values.

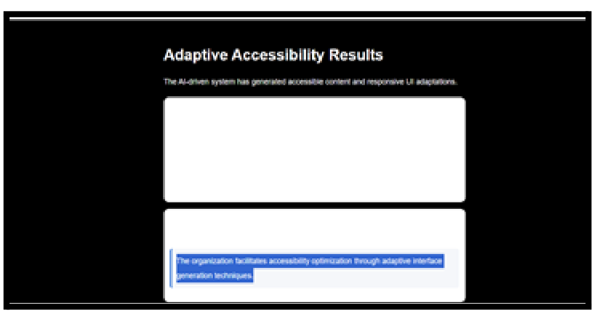
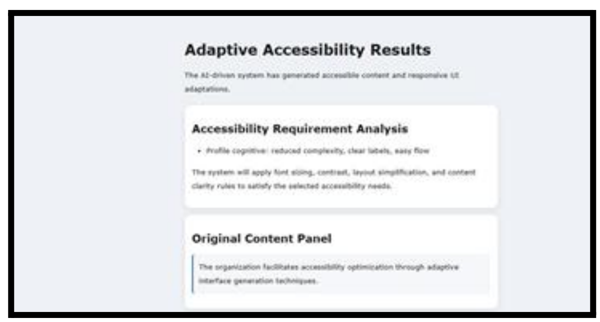


Fig. 7: Low-Vision Accessibility Adaptation: Prompt Generation and High-Contrast Content Personalisation

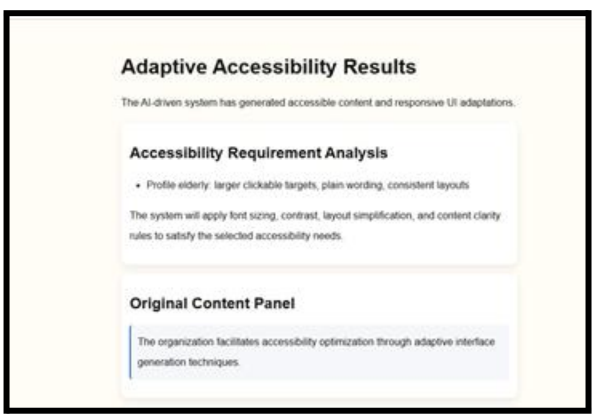
This figure showcases access adaptation for visually impaired users. Recommendations produced by the AI algorithm include higher contrast, bigger fonts, and simpler structuring of the page content. The adapted version highlights how the visuals on the page are made clearer and more readable.



International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

Fig. 8: Cognitive Accessibility Adaptation: Prompt Generation and Simplified Content Transformation

AI is used to achieve cognitive accessibility by minimising the content complexity [15]. This process is realised through the inclusion of cognitive support needs in the prompt to produce clear and simple outputs.



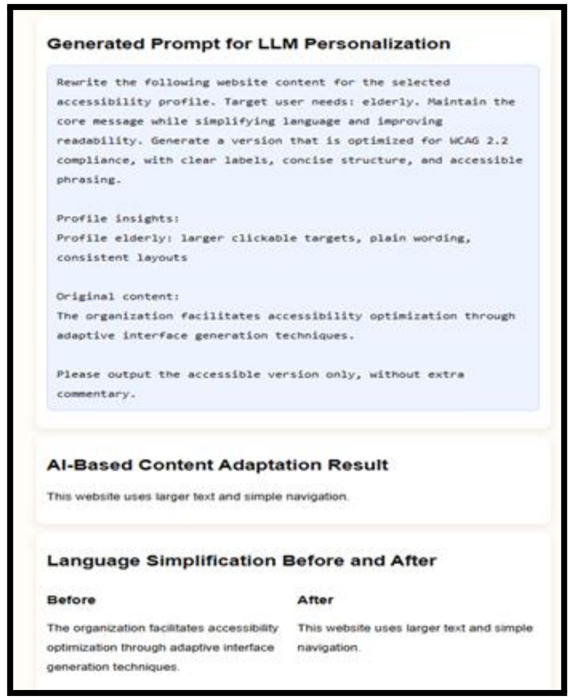


Fig. 9: Elderly User Accessibility Adaptation Results

This specific process produces larger texts, easy navigation, and simplified structures. This way, accessibility is enhanced for senior citizens having problems seeing and comprehending complicated content.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

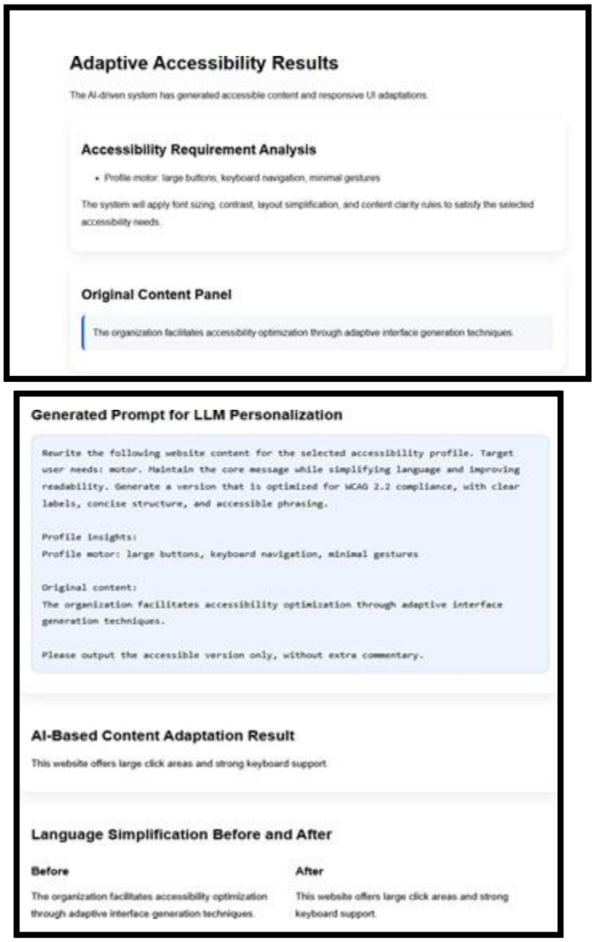


Fig. 10: Motor Impairment Accessibility Adaptation Results

This figure illustrates how an accessible interface is designed for people with motor impairments using the AI algorithm [16]. Recommendations focus on designinglarge clickable elements, improving keyboard controls, and minimising the number of gestures required.

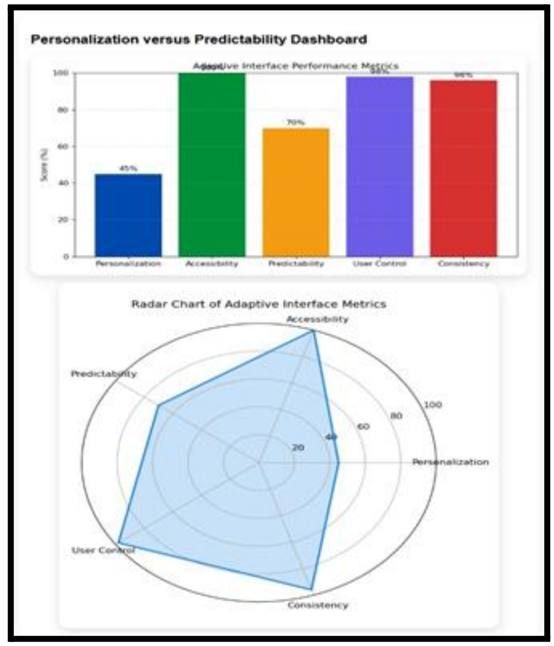


Fig. 11: Personalisation versus Predictability Performance Dashboard

This performance dashboard of motor impairment accessibility achieved the best score at 100%. The lowest score is obtained by personalisation at 45%, followed by predictability at 70%. User control achieved 98%, while consistency at 96%.

4.2 Discussion

The experimental results prove that the proposed AI based personalised accessibility framework is effective in incorporating into it Large Language Models (LLMs), accessibility-aware prompt engineering, adaptive interfaces generation and WCAG 2.2 compliance testing, thus achieving personalised user experience for users with different accessibility needs. Implementation results verify that the framework is able to dynamically change the content and design of the interface, as per the selected accessibility profile, resulting in enhanced usability without the need for manual re-design of the user interface.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

Implementation of LLM-based content adaptation module shows that the personalisation with prompts successfully helps to generate simplified versions of original content that are more accessible and retain the same semantic meaning. The prompt engineering framework is of key importance because the user properties and/or accessibility needs are directly integrated into the prompt, which allows the language model to produce the output that meets specific accessibility goals [17]. This shows that, with thoughtful design, prompts have a profound impact on accessibility adaptations generated by AI.

The result of the accessibility profile evaluation also shows that the proposed framework successfully supports various categories of users by making changes to their profiles. Generated content is more understandable with less complexity and word choice for Dyslexics. In addition to larger fonts, better information contrast and readability for low-vision users, cognitive accessibility adaptations simplify and break down information into more digestible forms. Likewise, user interfaces are simplified and made easier to navigate for elderly users, larger interface elements for those with motor impairments, and larger keyboard keys for those who are hard of vision. The findings show that a single, AI-based framework can deliver personalised support for various accessibility needs without having to maintain multiple independent interface designs.

Moreover, the WCAG 2.2 compliance validation engine plays a very vital role to the efficacy of the framework [18]. The validation module isn't just about adapting the interface content, it will ensure important criteria for accessibility such as colour contrast, keyboard navigation, ARIA implementation, responsive layout, text scalability and consistency are met. By incorporating accessibility validation into the adaptation process, the accessibility of personalisation can be ensured and the likelihood of additional accessibility problems being created during interface manipulation is minimised.

There's more evidence of the effectiveness of the framework in the performance dashboard [19]. The proposed approach showed a best possible score of 100 for accessibility, meaning that it was successful in fulfilling the first goal of providing accessible digital content. The results for user control and consistency were 98% and 96% respectively, showing that adaptive modifications do not vary over users' interactions. The score for predictability was 70%, indicating that the generated adaptations are generally consistent, but further optimisation may contribute to increase the consistency of behaviour across the different user scenarios [20].

However, when it comes to personalisation, the result was the lowest of 45%, suggesting that using more context, ongoing user feedback, and accumulated user preferences can improve the accuracy of personalised content generation.

V. CONCLUSION

This research proposed an AI Personalised Accessibility Framework, which combines LLM, Accessibility-aware Prompt Engineering, Adaptive UI Generation, and WCAG 2.2 compliance validation to enhance the accessibility of digital products and user experience. The proposed framework adapts dynamically the web content according to the individual accessibility needs and adapts the interface elements, for providing personalised support to web users with dyslexic, low vision, cognitive disabilities, elderly users and motor impairments. The proposed approach is based on dynamically generating the content and interface modifications based on user profiles, without changing the meaning and functionality of the original content, as opposed to conventional accessibility solutions that rely on static configurations.

The results of the implementation showed that the framework is able to successfully carry out accessibility-aware content transformation, adaptive interface generation and automated compliance validation. The performance evaluation also demonstrated high accessibility, accessibility consistency and user control, suggesting the proposed framework has the potential of being reliable and scalable in supporting the accessibility for various user groups. The personalisation score was not as effective as the other evaluation scores but the results showed that other factors beyond ushi among others more contextual information and the introduction of continuous learning mechanisms could be implemented to improve further developments in adaptive content generation.

Finally, the proposed framework serves as a valuable example on how LLM can be incorporated into an intelligent accessibility adaptation system, giving insights into the future directions for research and implementation efforts. In the future, books could be presented through a multimodal approach that offers greater inclusion and accessibility in a digital context; could assist with continuing learning of user preferences within a digital environment; and could present a multitude of ways to interact through a variety of web and digital applications.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

REFERENCES

[1] Shvetsova, O., Katalshov, D. and Lee, S.K., 2025. Innovative Guardrails for Generative AI: Designing an Intelligent Filter for Safe and Responsible LLM Deployment. Applied Sciences, 15(13), p.7298.

[2] Filipović, A.M., Fastić-Pajk, I., Puljiz, H. and Šabić, I., 2025, October. AI-Driven Customization of Adaptive Learning Content: Lessons from Applying LLMs. In Proceedings of the Digital Transformation in Education and Artificial Intelligence Application: Third International Conference, MoStart (p. 67).

[3] Aljedaani, W. and Mollik, R.H., 2026, April. Large Language Models for Web Accessibility: A Systematic Literature Review. In Proceedings of the 23rd International Web for All Conference (pp. 160-171).

[4] Bhavana, B.R., Ankolekar, K. and Usha, B.H., 2024. Artificial Intelligence for Accessibility: A Comprehensive Systematic Review and Impact Framework for Assistive Technologies.

[5] Trong, M.P., Son, N.T., Giang, V.T., Viet, B.H., Hai, L.N. and Tung, D.T., 2026. A process-centric review of large language models in graphical user interface testing: architectures, lifecycle impact, and challenges. PeerJ Computer Science, 12, p.e3695.

[6] Kundu, R.K., Ahmed, I. and Hoque, K.A., 2025, October. Pilar: Personalizing augmented reality interactions with llm-based human-centric and trustworthy explanations for daily use cases. In 2025 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct) (pp. 273-280). IEEE

[7] Lopez-Gazpio, I., 2025. Integrating large language models into accessible and inclusive education: access democratization and individualized learning enhancement supported by generative artificial intelligence. Information, 16(6), p.473.

[8] Tran Truong, T.P., Le, K.T., Ha, S., N Nguyen, P., Nguyen, C.G., Khanh, V.H., Lam, P.T., Nguyen, M.T. and Le, K.H., 2025. Generative AI for User Experience: A Holistic Taxonomy of Tools across the Design Thinking Framework.

[9] de Pinho Souza, G., Melo, G. and Schneider, D., 2025, October. Human-Centred LLMs in Personalized Healthcare: A Survey. In International Conference on Computer-Human Interaction Research and Applications (pp. 414-431). Cham: Springer Nature Switzerland.

[10] Ordoumpozanis, K., Konstantakis, M., Zoi, S. and Caridakis, G., 2025, September. Generative AI: A Systematic Review of Related Interfaces and Interactions. In Proceedings of the 3rd International Conference of the ACM Greek SIGCHI Chapter (pp. 39-47).

[11] Liu, J., 2025. AI in Automated and Remote UX Evaluation: A Systematic Review (2014–2024). Advances in Human-Computer Interaction, 2025(1), p.7442179.

[12] Stelea, G.A., Robu, D. and Sandu, F., 2025. Accessilearnai: an accessibility-first, ai-powered e-learning platform for inclusive education. Education Sciences, 15(9), p.1125.

[13] Hyder, S. and Kittur, J., 2025. Designing intelligent chatbots with ChatGPT: a framework for development and implementation. Frontiers in Artificial Intelligence, 8, p.1618791.

[14] Jecha, J., Igwean, C.C. and Banaras, A., 2026. Generative AI and Adaptive Systems for Customising Help-Seeking Scaffolds: A Systematic Review.

[15] Dao, S., 2025. Beyond Usability, Trust, Explainability, and Organizational Adoption of LLM-Driven AutoML Systems.

[16] Alier, M., Pereira, J., Garcia-Penalvo, F.J., Casan, M.J. and Cabré, J., 2025. LAMB: An open-source software framework to create artificial intelligence assistants deployed and integrated into learning management systems. Computer Standards & Interfaces, 92, p.103940.

[17] González-Sanz, E.L., Cantador, I. and Bellogín, A., 2025. LLM-based Generation of Personalized, Context-aware City Tourist Itineraries: A User Study with GPT Trip Planner.

[18] Ghahraei, G., 2025. AI Chatbots in Software and IT Companies: Exploring User Needs and Characteristics of Advanced LLM Chatbot systems.

[19] Mandapati, S.V., Kummetha, V.C., Concas, S. and Staes, L., 2025. Optimizing Access to Interoperability Resources in Mobility Through Context-Aware Large Language Models (LLMs). Electronics, 15(1), p.152.

[20] Sun, L., Qin, T., Hu, A., Zhang, J., Lin, S., Chen, J., Ali, M. and Prpa, M., 2025, April. Persona-L has entered the chat: Leveraging LLMs and ability-based framework for personas of people with complex needs. In Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (pp. 1-31).