



## **AI-Driven Adaptive UI in Insurance Applications: A Personalized Experience Across Age Groups**

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### **Abstract:**

Development of an intuitive and inclusive user interface that serves the different age groups of the audience is vital in the digital transformation of the Insurance sector. However, the common user experience fails to meet the distinct needs of elderly users, tech-savvy users, and different demographics. This paper introduces a novel insurance web application framework that utilizes AI for the dynamic rendering of user experience and interaction model based on the user's digital usage proficiency. By engaging conversational AI, speech interfaces, smart form filling via digital uploads, and personalized workflow based on usage, the system guarantees an accessible and effective digital experience. This experience can change the reluctance to use digital services by a different range of people and provide them with confidence in using the digital capabilities for their needs. We describe the technical architecture, user flow designs, adaptive & dynamic UI strategy, and important benefits, laying down the preliminaries for a human-centric digital insurance model.

## **1. Introduction**

In recent years, there has been a greater inclination observed towards digital engagement in the insurance industry. These services include self-service frontend portals for claims filing, policy management, and new insured onboarding. Even now, most of the applications still consider tech-savvy users as their majority users and neglect the elderly people who are afraid of using digital services. These digital platforms don't take into consideration the specific challenges faced by senior citizens, new digital users, and minors. Insurance is a product that needs catering to all ranges of people, starting from 18-year-olds buying car insurance to an 80-year-old buying or managing health insurance.

In this paper, we present a responsive, smart insurance application platform that adapts its workflows and features based on the user's age and familiarity with digital services. This explores how adaptive UI, speech recognition, conversational virtual agents, and computer vision technologies can change the Insurance experience to something

personalized, adaptive, inclusive, robust, and effective.

## **2. Literature Review and Related Work**

There's been some interesting work recently on how user interfaces can adapt to people in real time, particularly in virtual reality environments. One piece of research that was particularly interesting used AI to change the interface as users were using it, taking into account what they were doing and what was happening around them. The researchers carried out a trial involving 50 users and found that users who used the adaptive interface finished tasks faster, committed fewer errors, and were more satisfied with the experience as a whole. In fact, they expressed almost 35% higher satisfaction, with almost 48% fewer errors. Furthermore, the findings revealed that users felt less stressed and more engaged as a whole. Even though this was done in VR, the core idea—changing the UI based on the user—makes a lot of sense in other areas too. In our case, we're applying a similar concept to digital insurance tools, but we're focusing on different age groups. We're using AI to personalize how the

interface looks and works, whether that's through voice controls, smart forms, or chatbot-based guidance, to make things easier for everyone, no matter their tech comfort level [1].

Building on this, another space where adaptive interfaces are making their presence felt is the space of mobile app design. Mobile apps have witnessed a sharp increase in usage, and user experience (UX) has become the make-or-break factor in the success or failure of an app. Describing how AI-powered personalization and adaptive learning allow apps to respond in the moment to behavior from users with more relevant content and simpler-to-use interactions. Developers now must design experiences that are accessible to a wide range of users and devices. AI delivers the solution by learning user behavior and preferences over time, allowing apps to stay relevant and useful long after the initial download. This emphasis on user-sensitive, dynamic design is highly relevant to our own activities in digital insurance, where user expectations and degrees of digital comfort are so diverse. While mobile apps attempt to activate users with personalization, our system adjusts its interface and interaction model by age segment so that all users, from digitally native young people through to older seniors, have a more intuitive, pleasant experience [2].

The broader effect of AI on UI/UX design is similarly more evident across industries. As design tools and processes evolve, AI is becoming a central player in transforming how user research, prototyping, and customization are managed. Recent research illustrates how AI can make user research easier by analyzing data automatically, uncovering patterns, and even predicting behavior, tasks otherwise labor-intensive and reliant on human effort. In addition, the use of generative algorithms is accelerating the prototyping phase, in which designers can rapidly test and iterate through different interface possibilities. In addition to accelerating the development phase, this shift facilitates more customized and reactive user interactions. These technologies benefit our adaptive insurance platform objectives directly, in which the behavior and preferences of the user are to be known. Through converging the same AI disciplines, our system is then capable of personalizing interaction and interface alike to each individual's specific needs, providing an enhanced, thoughtful, and user-centered experience—a concern particularly pressing in an industry where trustworthiness, comprehensibility, and accessibility matter so greatly [3].

As increasingly deep deployment of AI in digital infrastructures advances, how web applications powered by AI are engineered as UI is also

changing. Latest research emphasizes that in addition to integrating next-generation AI capability into UI design, the latter should also be done with continuous user understanding, control, and trust. Such is a particularly critical factor within such an application as insurance, where transparency as well as ease of access need to continue as paramount. The study canvases several best practices for designing responsive AI-augmented web front-ends, including presenting personalized content, recommendation engines, and adaptive layouts responding to user actions. These conclusions reinforce the necessity of a user-centered design ethic—responsive in real time but open and simple. Our actions are deeply aligned with these principles, the aim being to ensure that our age-adjusting insurance platform not only individualizes the experience but does so in a way that is intuitive, empowering, and morally correct for users across generations [4].

The FinTech sector is a very strong case study of the transformative power of AI on user interface and user experience design. A study conducted recently into integrating AI in FinTech UX/UI showed that personalization was not only a fashion but also a common strategy, with more than three-quarters of the apps surveyed employing AI to personalize user interfaces. This practice has seen tangible success—AI-enhanced apps saw a 41% increase in daily user engagement. These findings highlight the tangible benefits of constructing systems that can respond to user behaviors and preferences in real time. At the same time, the study also highlights the importance of addressing ethical concerns such as data privacy and algorithmic bias, concerns equally relevant in the insurance sector. Our work builds on these learnings by implementing AI-based personalization in a way that honors user autonomy and transparency. As FinTech is utilizing adaptive design to foster trust and engagement, our age-sensitive insurance platform is designed to make digital experiences personal while upholding ethical standards and encouraging accessibility across a wide user base [5].

Following on from the role of artificial intelligence in creating adaptive and intelligent user interfaces, further recent research has explored how AI technologies can be effectively combined with adaptive design principles to create more intelligent, tailored applications. Examining real-world applications such as recommendation systems, voice recognition programs, and intelligent search tools, the study shows how AI can enhance functionality and user interaction when integrated into close harmony with thoughtful UI design. These case studies point out that the

synergy between AI and adaptive interfaces is not just automation but creating user experiences that are context-aware and responsive. This approach fits well with the goals of our proposed insurance platform, where AI is being used not just to automate but to personalize the interface based on user behavior and demographics. With ever-smarter application design, our effort adds value by applying such principles to a normally inflexible domain, with adaptive methods for making digital insurance services more people-centric and participatory [6].

Additionally, past human-computer interaction (HCI) studies have focused specifically on building age-friendly UIs. These studies show that older adults often face both cognitive and motor limitations that make traditional web interfaces difficult to navigate. As a result, interfaces need to feature simpler navigation, larger UI components, and auditory cues to accommodate the needs of the elderly [7]. These age-specific needs further reinforce the value of our adaptive system, which directly addresses such usability challenges through thoughtful interface personalization.

Finally, recent research into the use of AI and chatbots in the insurance sector—specifically in auto claims—underscores how emerging technologies can significantly improve the service experience. Based on user interviews, the study identified how AI-powered chatbots allow policyholders to submit claims, upload images, ask questions, and receive updates without needing human intervention. This not only enhances user satisfaction but also streamlines the claims process. The research emphasizes both the benefits and limitations of such systems while offering practical suggestions for improvement. Importantly, it highlights how AI and chatbot technologies are being adopted in real-world insurance scenarios, supporting our direction of integrating conversational AI, voice input, and smart automation in a way that modernizes insurance services and makes them more accessible and user-friendly [8].

To meet the existing need for user experience design in digital insurance platforms, our system encompasses a series of innovations. To begin with, it features an age-adaptive user interface whose layout and mode of interaction depend on the user's age category to be able to support young and old users. Second, conversational AI is applied by the platform to guide users through complex workflows more intuitively through a dialogue-driven process. Further, speech aid and voice control functions are incorporated to improve hands-free navigation and ease of use by users with digital literacy or accessibility needs. Finally, optical character

recognition (OCR) combined with AI is leveraged to enhance document processing for the purpose of allowing users to upload documents which the platform auto-interprets and pre-populates into relevant forms. In aggregate, these components of software enable a more accessible, more efficient, and more user-friendly digital experience.

### 3. Proposed System Architecture

#### 3.1 User Segmentation and Mode Switching

At the start of the user journey on the website, the application will collect the user's proficiency in using digital apps. Based on that, the website starts rendering the UI.

There can be three different modes of the application.

1. Tech Savvy – Users who are experts & understand the digital experience. Mostly, the 18-35 age group falls under this category.
2. Intermediate/ Balanced mode – Users who are familiar with digital experience, but a little hesitant to use the application. 40-60 age group people fall under this category.
3. Novice/Senior Mode/Youth mode – Users who are new to digital experience or who are reluctant to use digital experience. 60+ and under 18 age group people fall under this category.

There will always be exceptions to this category, like a new generation kid who is an expert using the digital experience; in those scenarios, they can always switch the modes based on their preference and expertise.

These preferences will be saved in history, the user's interaction history, and each time the same information is rendered, unless they make changes to their preferences.

#### 3.2 Conversational AI Layer

The user is greeted and welcomed by the virtual digital assistant when they land on the website. Below is a sample conversation.

“Hi LoremIpsum! What can I help you with today?”

Are you looking to:

- Buy a new policy
- Renew an existing one
- File a claim
- Talk to support?”

Based on the above question's response, the Natural language processing algorithm interprets the user's intentions and redirects them to the specific workflow. This conversation layer removes the click and scroll usage for novice users and

allows them to use the application effectively and efficiently.

### 3.3 Voice Assistance and Speech Interaction

This is very critical and vital for elderly users and those with disabilities. The system will help with the below

- **Text-to-speech:** Read aloud the policy details, frequently asked questions, instructions, etc.
- **Speech-to-text:** Conversion of responses that were conveyed using speech to fill the form input details or replying to chatbot.
- **Voice Command Triggers:** Performing the specific tasks based on the voice commands, E.g., “Help me upload my documents” or “How to initiate a claim.”

These features are powered by libraries like **Web Speech API**, **Amazon Polly**, or **Google Cloud Text-to-Speech**.

## 4. Intelligent Document Upload and Pre-Filling

Manual form filling can be tedious and confusing for new or elderly users. To minimize this cognitive effort, the system offers image-to-text processing options.

System asks -“Would you like to upload your driver’s license or health ID? I’ll fill in the details for you.”

This helps the user to avoid the time-consuming, error-prone process and allows systems to work for them.

The image is processed using **OCR tools** like Tesseract, Textract, or Google Vision, and entity extraction models to populate fields and PII data like Name, Date of Birth, Policy Number, License number, etc.

When the information is filled, the backend logic will check the details. If any human validation is needed, it will prompt the user. If all the details are added correctly, then use can proceed in the workflow.

## 5. Dynamic Workflow Rendering

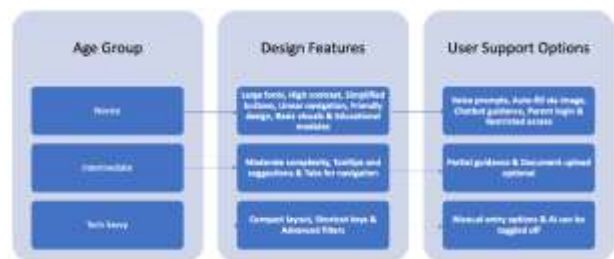
Once the user’s intent is clear to the system, it loads the necessary workflow dynamically based on the user’s context. If the new insurance buyer visits the website and they are a novice, then the application will only show the simple plan options, explaining the benefits via audio or video, ask for their identification to upload, auto-fill all the mandatory details, and confirm the operation.

On the other hand, if the user is a returning user and wants to file a car claim, then show the option to initiate the claim, ask to upload the images of the accident, ask them to record what happened during the accident, auto-fill the form based on the voice recordings, and submit the claim.

The modular frontend(built in React) communicates with a rules engine at the backend that selects the suitable form components and UI workflows based on the user’s confidence in using the digital service, intent, past interactions, and uploaded document types.

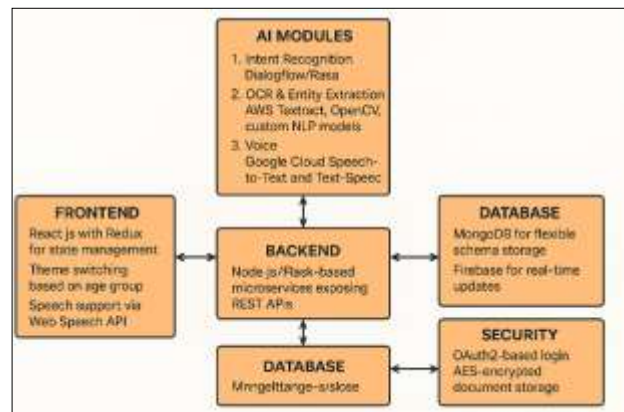
## 6. UI/UX Design by Age Group

The system is designed so that it can cater to the needs of all age groups and digital proficiency.



## 7. Technical Implementation Details

Below is the technical implementation diagram for the process.



## 8. Benefits and Outcomes

- 1. Accessibility** - The app bridges the digital gap for older and underserved consumers, facilitating equitable access to insurance products.
- 2. Customer Satisfaction** - Less time is spent by users searching, completing forms, or requesting support, resulting in improved Net Promoter Scores (NPS) and engagement metrics.
- 3. Operational Efficiency** - With pre-filled forms, fewer dropped sessions, and an AI-powered workflow, the app lowers manual interventions and

call center volume.

**4. Scalability** - Microservice and component-based architecture allow scalability for future user modes (e.g., sight-impaired, multi-language users).

## 9. Challenges and Future Enhancements

- **Voice Recognition Accuracy:** The model requires continuous iterations for training to accommodate accents, noise, and disabilities. As each demographic region accent is different for the same language, that needs to be addressed.
- **Bias in AI:** The age-based User interface segmentation must avoid conventionalization. Dynamic learning systems can evolve user personas over time, which helps the model in the long run.
- **Privacy Compliance:** The document uploads need clear consent and acknowledgement, as it is PII data. There should be a data governance setup for this. Additionally, audio data should be handled securely as it reveals the personal information of a person and can be misused if not handled properly.

### 9.1 Future Work

The future work should focus on below.

- Multi-language support when using the application to cater large variety of audiences.
- Emotion detection through webcam analysis can help people quickly and promptly.
- Integration with government insurance databases for real-time validation, which can help avoid fraud.
- Federated learning for privacy-preserving user behavior analysis.
- Sentimental analysis needs to be done for a better user experience.

## 10. Conclusion

The different demographics and age groups of users must be catered to effectively in the digital evolution of insurance systems. An AI-powered digital insurance app that segments the customer based on their digital use efficiency provides all demographics with fair, effective, and customized experiences. The additional integration of voice interaction, adaptive user interface, smart document processing, and Artificial Intelligence-powered workflow automation, this workflow establishes the

benchmark and clearly shows the need for future inclusive digital insurance platforms.

## Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
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