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Abstract-- Given the growth in the elderly population in recent years, there is a need for technological solutions that help bridge the digital divide and reduce inequality among older adults**.** This paper describes the development of Custos, a user-centered mobile application for fall monitoring and detection. The main objective was to develop an inclusive and optimized interface that minimizes technological exclusion and improves incident notifications. Through the implementation of the Flutter software architecture, visual adaptability modules and a high-priority notification system were established to centralize immediate decision-making. The application was developed in accordance with the usability principles of ISO 9241-110. It is concluded that a system based on universal design provides safety and autonomy, facilitating communication with family members or caregivers in the event of a fall and improving quality of life within the connected health ecosystem.

Keywords: Older adults, Digital divide, Universal design, Connected health.

Abstract-- Given the growth of the elderly population in recent years, there is a need for technological solutions to help mitigate the digital divide and inequality among older adults. This paper describes the development of Custos, a user-centered mobile application for monitoring and fall detection. The main objective was to develop an inclusive and optimized interface that minimizes technological exclusion and improves incident notifications. Through the implementation of the Flutter software architecture, visual adaptability modules and a high-priority notification system were established to centralize immediate decision-making. The application was developed in accordance with the usability principles of the ISO 9241-110 standard. It is concluded that a system based on universal design provides security and autonomy, facilitating communication with family members or caregivers in the event of a fall and improving quality of life within the connected health ecosystem.

Keywords: Older adults, Digital divide, Universal design, Connected health,

INTRODUCTION

Internationally, the growth of the older adult population is a phenomenon that demands immediate technological solutions. According to data from the World Health Organization (2025), it is estimated that by 2030 the number of people aged 60 and older will reach 1.4 billion, making it a

a clear and rapid trend in developing regions. In this regard, the UNAM Gazette features an article by Diana Robles (2022) presenting the warnings of expert Verónica Montes de Oca, who notes that the growth of new technological and cyber platforms is creating a significant digital divide and inequality within this segment of the population.

Likewise, Quinde Barcia et al. (2020) note that the lack of technical knowledge and the complexity of current tools make the integration of older adults into the digital society ineffective. This paper describes the development of Custos, a mobile application designed to mitigate barriers through user-centered design, which helps reduce the digital divide and improve the notification of critical events. To this end, the following objectives were set:

- Design a software architecture in Flutter that enables cross-platform access.
- Implement a visual adaptability module for typographic adjustment.
- Structure a high-priority notification system that focuses attention on immediate decision-making in the event of an incident.
- Analyze the interface according to the usability principles of ISO 9241-110.

DEVELOPMENT

Given the global trend of an aging population, developing software that implements interfaces to bridge the digital divide is a solution that provides safety and autonomy. A system based on universal design and automatic notifications enables an immediate response to a fall, facilitating timely communication with family members. By minimizing the complexity of the software, we help reduce technological resistance and the physical consequences resulting from events not addressed in a timely manner, thereby improving quality of life and providing greater security within the connected health ecosystem.

Methodology

The development of the Custos app was based on a mixed-methods approach that integrated literature review, applied research, and field research, with the primary objective of creating intuitive software for older adults. In the initial phase of the project, a literature review was conducted to analyze various studies on the design of adaptive interfaces, establishing that this type of emergency tool must be simple and straightforward. Subsequently, a field study was conducted through interviews with healthcare personnel and surveys of caregivers and family members, with the aim of establishing the application's basic functional requirements. In the case of

applied research, a fully functional mobile application was developed using all the information collected.

The results from the interviews with healthcare personnel revealed that the system's effectiveness depends not only on detection but also on the immediacy of assistance; experts emphasized that reducing response time plays a critical role in the patient's prognosis for recovery. On the other hand, data from the 50 surveys of caregivers and family members show that 85% of participants expressed concern during periods when older adults were unsupervised, identifying the smartphone as the preferred channel for alerts due to its portability and ease of access in daily life.

The Flutter environment was used to develop the Custos app as a digital inclusion strategy aimed at mitigating barriers to mobile health access. Owoade et al. (2024) explicitly state that the implementation of cross-platform tools such as Flutter is a strategic and effective option for developing health-focused applications, maintaining functionality on both iOS and Android systems. This allows the alert ecosystem to function seamlessly on any device, synchronized with the cloud database, ensuring that smartphone brand preference does not become a barrier to using the app.

In developing the Custos interface, the focus was on eliminating visual and cognitive barriers by using the highly legible Arial font with the option to adjust its size. This approach is based on the findings of Álvarez-Rodriguez et al. (2015), who establish that the legibility of textual elements and the implementation of specific designs are key factors in preventing older adults from abandoning the application. By establishing an adjustable font size, the software fulfills the principle of flexibility, a component of real importance for the best user experience.

Similarly, the intuitive nature of the application aligns with the methodology of Archundia et al. (2016), who state that software development for older adults should be based on universal design; they note that a truly accessible interface must not only facilitate navigation but also reduce operational complexity to ensure safety. To complete this accessibility in Custos, a color palette based on visual ergonomics criteria was applied. Black and white were used to maximize the clarity of instructions and input fields; on this basis, blue was used generically for navigation elements and

to convey trust and reduce technology anxiety. According to Heller (2004), blue is the color that generates the greatest feelings of trust, serenity, and loyalty, which helps reduce the user's technology anxiety. Finally, the user-system interaction process was based on the principles of the ISO 9241-110 standard, which emphasize the importance of usability and user acceptance.

ANALYSIS AND DISCUSSION.

Access and authentication interface.

Interface objective: To establish a secure entry point to the monitoring ecosystem in the simplest way possible, designed to minimize user resistance to technology. The design focused on ensuring that authentication does not become a technical barrier, allowing the user to access monitoring functions in the shortest possible time, while excluding complex protocols that overwhelm operational capacity in emergency situations. As a result of this process, the login interface shown in Figure 1 is presented.

Figure 1. *Custos login interface*.

Source: Author's *own work* (2025).

Analysis: The interface meets the requirements set forth for functional software; the layout of the elements on this screen avoids excessive use of decorative components to focus attention on the validation fields, thereby mitigating visual overload for the user from the moment the Custos application launches.

Visual Adaptability and Readability Module

Interface objective: To provide a mechanism with the option to adjust the system's font size according to the user's sensory capabilities. The goal is to eliminate reading barriers and reduce cognitive effort, ensuring that information is accessible to any user. As an example of this, Figure 2 shows the options menu that includes the font size adjustment feature.

Figure 2. *Options interface with access to the Custos font parameter adjustment module.*

Source: Author's *own work* (2025)

Analysis: The interface establishes adaptability requirements through the integration of a feature dedicated to controlling readability. Adding the "Adjust Font Size" option mitigates the detected digital exclusion barrier, validating the effectiveness of the Custos interface, which meets the accessibility criteria necessary for a mobile healthcare environment.

Alert notification system.

Interface objective: To generate an immediate incident alert using an alert notification to mitigate the damage caused by an accident that is not attended to in time. The purpose is to present a clear and direct warning, reducing response time in the event of a potential fall. As a result, the alert notification shown in Figure 3 is displayed.

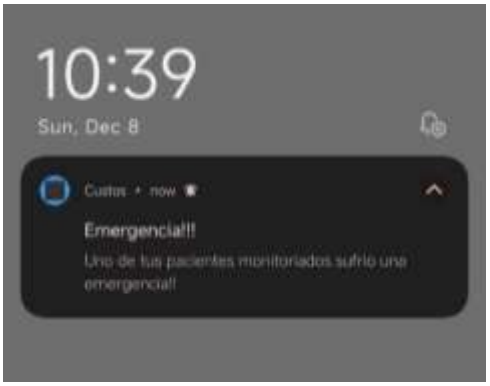

Figure 3. *Emergency push notification sent to the caregiver's mobile device*.

Source: Author's *own work* (2025).

Analysis: The Custos interface establishes a notification window with high visual priority, maintaining a simple structure by eliminating secondary information to focus the user's attention on the emergency message. In this way, it helps mitigate delays in decision-making during critical moments.

CONCLUSIONS

The development of the Custos system confirms that the effectiveness of technological solutions in the field of gerontechnology depends on the harmonious integration of technical precision and interface simplicity. Eliminating operational friction from the moment the system is accessed ensures that the platform is a resource that benefits the user, thereby reducing the technological resistance that often affects users in this sector.

It was established that the capacity for visual customization, specifically typographic adjustment, is an important factor in achieving digital inclusion. By focusing on the development of a visually clear interface and the omission of distracting elements, direct emergency communication is guaranteed, optimizing response times in the event of incidents while offering the adaptability to integrate with multiple monitoring devices.

FUTURE WORK

Future plans include establishing a real-time geolocation module and incorporating voice assistance, which will strengthen the connected health approach. The goal is to ensure an inclusive interface that optimizes response times, thereby reducing the digital divide in the care of older adults.

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