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PROTOTYPE OF A MOBILE APPLICATION OF DOMOTIC SYSTEM TO IMPROVE THE MOVEMENT PROCESS OF PEOPLE WITH DISABILITIES

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Abstract. *Currently, the lack of advanced technologies in healthcare facilities hinders accurate diagnoses. People with physical disabilities face daily challenges in mobilizing and performing daily activities due to physical limitations. The main objective of the study was to develop a prototype of home automation system for people with disabilities, using the Scrum methodology for flexibility and quality. The result obtained after the research was a prototype of a home automation system with a mobile application for people with disabilities, with a friendly and functional design that facilitates the access of people with disabilities to total control of their homes. To determine prototype quality, obtain a mean on the Likert scale after the evaluation of 10 experts, meeting high-quality criteria. In conclusion, it was possible to develop a prototype to improve the movement process of people with disabilities, with good functionality and design. It was also concluded that the home management system has a positive effect in helping people with disabilities to move around the home and help with some basic tasks.*

Keywords: Domotic system, Disability, Mobile application, Prototype, Displacement

1. **Introduction.** In recent years, technology has evolved by leaps and bounds from cellular equipment [1] and the use and evolution of artificial intelligence in different areas, which leads to changes somehow the way people lead their lifestyle or their day-to-day lives, and this form of evolution of technologies leads to improvement in the quality of life of its users. Mainly highlighting the technological advances for housing [2,3], is where the term home automation appears, as a set of systems that control a house making it intelligent, which makes the management of certain parts of the house much simpler, thereby seeking to give the person a new and better quality of life, and home automation currently has several functions such as welfare, energy saving, security, and entertainment. Technological progress today reaches every corner of every country, which simplifies its use, nowadays you do not need to have to search for books to get information, just go online and type a sentence and you will have hundreds of answers, which is why the home automation system is simpler to use, since mobile devices with the passage of time and the evolution they have had have become part of each person. Therefore, the installation of an application developed and installed in these devices makes them become an intelligent control of the home automation system without the need of any other supports, such a system would be of great help for people and especially for people with some kind of disability to which doing housework that is usually easy can be difficult. Disability is currently on the rise due to the exponential growth of the world's population. The World

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Health Organization (WHO) [4] estimates that 15% of the world's population, i.e., 1 billion people, have some type of disability, and 3.8% suffer from severe disabilities that make it difficult for them to move around independently. [5] indicates that 80% of people with disabilities live in developing countries and that they also face violence, mistreatment and disrespectful attitudes from third parties because of their disability. Given this, people with disabilities need medical care like anyone else, to enjoy the highest possible standard of health without discrimination, but the reality is that few countries can provide the quality of services that are necessary for their health. Disability is defined as a condition of both the body and the mind, which prevents certain activities and prevents them from interacting with the rest of the people [6], reflects an analysis of the theoretical and normative changes in disability and how it has been transformed to a conception based on a rights-based approach to ensure full and equal enjoyment and thus promote respect for their inherent dignity [7]. This indicates that people who have some type of disability tend to be more likely to experience adverse socioeconomic outcomes, such as poor education, health, and level of employment in society, and consequently have a higher rate of poverty. Therefore, one of the ways to help people with disabilities is to improve their lifestyle somehow, through the home automation system, as it can be implemented in their homes and turning them into smart homes and can be controlled by an application, so those people with disabilities or physical limitations can control certain parts of their homes, so this research aims to make a home automation system in the homes of people with some kind of limitation.

2. **Bibliographic Review.** [8] proposes a smart home system design, which consists of automating the entire lighting system with a proximity sensor, to turn on when the user approaches or off when the user leaves. To this was added an intelligent control of windows and doors to have greater security; on the other hand [9] proposes the same system, but making use of the Arduino system and thus has, in addition to it, control of various household appliances, which is scalable over time and multifunctional, and above all, with a low cost of development using cheap microcontrollers that have Arduino as motion detection sensors (PIR).

The study conducted in [10] proposes a better quality of life for people with disabilities, a control and automation system for lighting, heating, ventilation, air conditioning, and security with the use of Arduino controlled with Wi-Fi on a mobile device for greater convenience, thereby making it scalable and accessible to most people. On the other hand, [11] proposes a wireless drive system using Android to serve people with motor and visual disabilities, based on the interaction between a Smartphone and Arduino via Bluetooth to control housing systems remotely using sensors from an Android system.

In [12], the authors presented a system capable of linking the intelligent system to the wheelchair of the user with severe motor disability, which does not allow him to operate the wheelchair in confined spaces; a hierarchical semi-autonomous control strategy is then proposed to overcome difficult circumstances, it was proposed to use a laser rangefinder and a Kinect sensor, and the safety map of the wheelchair is determined by using the device to measure its distance from the ground, which demonstrates its feasibility through experimental results.

In the area of feeding and object recognition of a visually impaired person [13], an intelligent food recognition system helps the person to know what food is being held, which implements the recognition of the nominal values of the bills, to make the payment of a product efficiently, all this in a mobile application that can be obtained in both Android and iOS. [14] studies some aspects of the use of mobile devices and applications, which are related to the social inclusion of people with intellectual disabilities, the results obtained after the investigation concluded that mobile technology among adults with disabilities is incorporated positively with social inclusion and family members.

3. Methodology.

3.1. Fundamentals of development.

The research work investigated the various existing agile methodologies, and the size of the information was considered when choosing the appropriate methodology, as an understanding of a process leading to adaptability and flexibility for the application. For this reason, it is detailed in the following table with a rating from 1 to 5 (Table 1). Scrum [15] stands out as the best methodology for mobile prototyping due to its agile and iterative approach, with short cycles (Sprints) that allow us to quickly adapt to changing requirements and customer feedback. Unlike other methodologies such as Mobile-D [16], Extreme Programming (XP) [17], Kanban [18], or R.U.P. [19], Scrum combines flexibility, continuous collaboration, and incremental deliverables, which is ideal for rapidly iterating on the design and functionality of mobile applications. Its clear structure and ability to prioritize tasks in a backlog ensure efficient, user-focused development.

Table 1. Methodology selection

Methodologies	Information management	Knowledge	Adaptation	Flexibility	Points
R.U.P.	4	3	3	4	14
Mobile D	4	3	3	2	12
XP	3	2	3	2	10
Scrum	5	4	4	5	18
Kanban	2	3	3	2	10

The choice of Scrum for the development of the home automation application prototype is based on its iterative and user-centered approach, particularly relevant for solutions aimed at people with disabilities. As pointed out by Schwaber and Sutherland in [20], this agile methodology allows incorporating continuous feedback from stakeholders, which is crucial to adjust features such as accessible login and automation controls to specific needs. Short sprints (2-4 weeks) facilitate prioritization of critical features and early detection of usability barriers. In addition, the Scrum framework promotes multidisciplinary collaboration between engineers, UX designers, and accessibility specialists, aligning perfectly with the complex nature of this project. As demonstrated in [21], this iterative approach has proven to be particularly effective in the development of home automation solutions for people with reduced mobility, allowing rapid adaptations to changing requirements. Transparent daily meetings and sprint reviews ensure that the final product meets the highest standards of accessibility and functionality.

Currently, the Agile Scrum method is the most widely used for software project development by organizations, taking consideration of the efficiency of its use [22]. A transparent framework is a process with specific rules and actions that govern interactions, with the use of collective intelligence, thus achieving a more practical and agile work [23]. The Scrum methodology provides the following advantages, basic principles, and key requirements:

- Details well-defined deliverables within the timelines established at the outset.
- Present clear results to the client for decision making as appropriate.
- Constant collaborative communication with the client and the team.
- Return on investment, the maximum benefit of the project for the client, is studied.

In Scrum [24], there are work roles: Product Owner, the Scrum Team, and the Scrum Master. The first is the person who must work closely with the Scrum Team and coordinates all activities defined throughout the project cycle; the Scrum Master has the role of guiding all Scrum project participants and external stakeholders to understand and correctly apply the Scrum framework; and the development team is made up of a collection of people to accomplish the tasks established within the framework. With these points defined, presented in Figure 1, there are tasks that each team member must perform in the steps of the Scrum method, such as handing over a project to the Product Owner, the definition and development of each sprint, and planning meetings for proper implementation of Scrum.

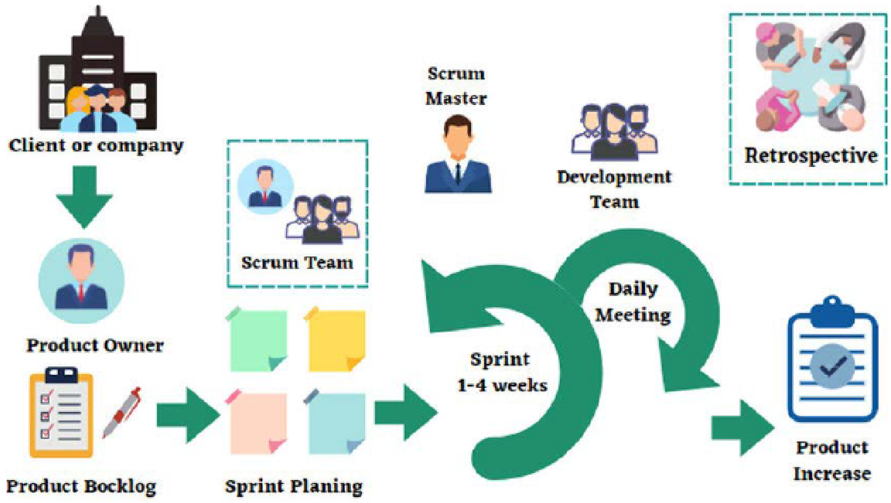


FIGURE 1. Scrum workflow

5 work phases are considered for the Scrum methodology [25], which are (Initiation, Planning and Estimation, Implementation, Review and Retrospective, and Launching). For the present project, the work will be carried out with three phases of development, which are described below.

3.2. **Case study.** In this phase, the development of the methodology and information for each Scrum phase to be used in the project is carried out. The domotic system for the disabled is to improve the movement process of people with disabilities in their daily lives. Figure 2 shows the details of the application architecture of the proposed application, where a user uses the application to control their entire home, such as lights, doors, windows, fans, and garage.

The user will have a mobile application connected to their home for better automation, and with it, in the app, will have a login to start with their credentials. This will have a series of information on the management of the app.

Start

In the first phase of development, first, the vision of the project is created for the focus and direction of the project. With the 3 roles mentioned above [24], we proceed to the definitions of the priority list of the product backlog, which helps us to estimate and evaluate each launch sprint. The vision of the project is to implement a domotic system to improve the process of movement in people with motor disabilities.

Planning and estimation

In this section, each Sprint is developed and defined, the user stories are then sorted in order of the highest value to the organization and with this, the time and effort estimation

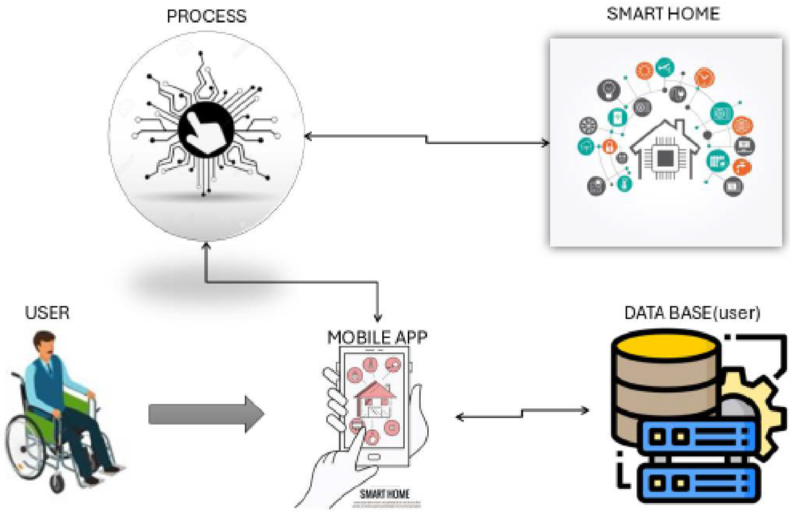


FIGURE 2. System architecture

for their correct development is made and transformed into task lists, to later define the development time of each task in team meetings; next, the Sprint Backlog process (which includes all the tasks to complete each Sprint) is defined. After creating the backlog, the product history map was created, and the project development time was determined.

- Estimation and prioritization of stories: In this section, the prioritization of the information was analyzed based on the most important aspects of the topic, and then the estimation of different tools was evaluated of the capacity required for each user story [26]. When evaluating and prioritizing user stories, they are determined according to the distribution of story points, to ensure that the evaluation is correctly determined.
- Planning deliverables: After determining the estimate and preparing the user comments, the classification of the product was done for the product sprint, and the user opinion was selected in the meetings held with the team. After that, the product backlog is defined in detail in Table 2, user stories are sorted by estimate and priority, if applicable [15] and details the team's performance on the project, divided into 9 stories and divided into 5 sprints that were observed and analyzed.

Regarding automation and control, it is important and necessary to consider the importance of its implementation. According to [27], people with motor or visual impairments rely heavily on automation for everyday tasks (e.g., adjusting lights, temperature, or opening doors), as it reduces the need for physical interaction with devices.

[28] found that voice- or gesture-based automation significantly improves the independence of users with mobility limitations.

Accessible home automation can reduce physical and cognitive fatigue in people with disabilities by minimizing repetitive strain [29].

Visually impaired people have highlighted the usefulness of integrations with voice assistants (Alexa, Google Assistant) to control home automation devices without the need for touch screens [30].

Implementation

Continuing with the Scrum methodology, this third phase is where the deliverables are used to implement the assigned tasks and create prototypes of home automation projects and systems, which is important and is estimated by categories according to the information [31]. In this section, all tasks assigned by the Product Owner must be

TABLE 2. Product backlog

No.	User history	Priority	Estimate
1	As a user, the application icon should be eye-catching and appropriate for the application.	3	3
2	As a user, I want to have a secure login to the mobile application with my credentials and a user-friendly interface.	2	4
3	As a user, the app allows me to interact with my data.	1	3
4	As a user, I want to have the option to recover my account if I forget my credentials.	2	3
5	As a user, I want the application to be able to give me the option to create my data for login with credentials.	1	3
6	As a user, I want the application to be user-friendly and didactic.	1	7
7	As a user, I want to be able to synchronize the connection to the home automation system for full control of the objects previously installed.	1	5
8	I want to have good control over all synchronization objects for the automation.	1	3
9	As a user, I want to be able to view today's weather in applications and functions such as emergency calls.	2	4

completed within the time specified, divided into 4 sprints of 31 days duration. According to [32] it indicates that a Sprint is a container for the rest of the indicated Scrum events, for which an order of greater to less importance for the customer has to be kept. For this reason, a Sprint is a container for the rest of the events indicated in Scrum [33] mentioning the use of a larger number of sprints for better management of your project.

- First sprint: As shown in Table 3, user stories 1 and 2 were taken from the product backlog for the first sprint; the iteration and time taken to develop can be observed in the user stories, as well as indicating the user who will use it and what acceptance criteria it should have. Figure 3 shows the prototype of the user stories.

The user access prototype shown in Figure 3 proposes a "secure login" feature because people with disabilities (especially those with reduced mobility or visual impairment) may

TABLE 3. First sprint

	Description
User History 1	As a user, the application icon should be eye-catching and appropriate for the application.
User	Disabled
Time estimation	1 day
Acceptance criteria	The icon should be clear and consistent with the overall design style of the application.
User History 2	As a user, I want to have a secure login to the mobile application with my credentials and a user-friendly interface.
User	Disabled
Time estimation	3 days
Acceptance criteria	As a user, I want to have a secure login to the mobile application with my credentials and a user-friendly interface.

(a) (b)

FIGURE 3. Sprint Backlog 1: User access prototype: (a) Friendly access, and (b) secure access

be more vulnerable to unauthorized intrusions into home automation systems, which could affect their physical and digital security. A study by [34] notes that users with disabilities prefer systems with accessible authentication (such as voice recognition or fingerprint) to avoid reliance on complex passwords, which can be difficult to enter.

A report from the World Health Organization – WHO [29] highlights the importance of privacy in assistive technologies, as many people with disabilities manage sensitive data (home routines, medical schedules, etc.).

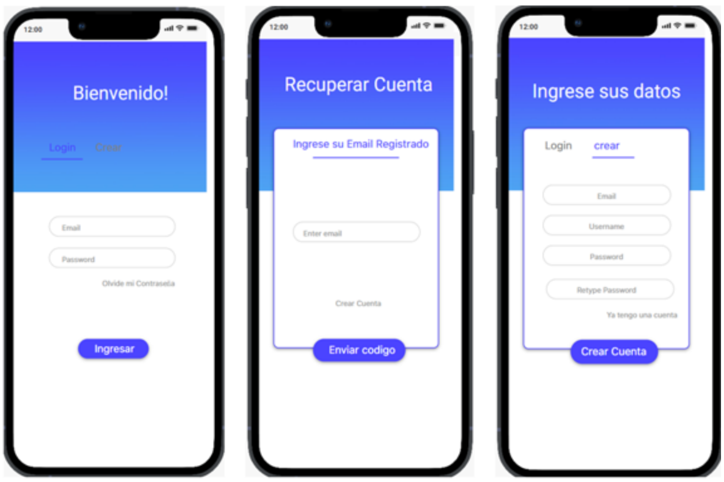
Some visually impaired users have reported difficulties with CAPTCHAS or alphanumeric passwords, so alternatives such as voice authentication or simplified access tokens are recommended [35].

- Second sprint: As shown in Table 4, user stories 3, 4, and 5 were taken from the product backlog for the second sprint, the iteration, and the time it takes to develop, as well as indicating the user who will use it and what acceptance criteria it should have. Figure 4 shows the prototype of the user stories.
- Third sprint: As shown in Table 5, user stories 6 and 7 were taken from the product backlog for the third sprint, the iteration and the time taken to develop can be observed in the user stories, as well as indicating the user who will use it and what acceptance criteria it should have. Figure 5 shows the prototype of the user stories.
- Fourth sprint: As shown in Table 6, user stories 8 and 9 were taken from the product backlog for the fourth sprint; the iteration and time taken to develop can be observed in the user stories, as well as indicating the user who will use it and what acceptance criteria it should have. Figure 6 shows the prototype of the user stories.

3.3. **Architectural simulation of a domotic house.** In this section, a mock-up was generated simulating a domotic house (Figure 7), where you can see an automated garage with an elevator and the different functionalities that the application has for its automation.

Table 4. Second sprint

	Description
User History 3	As a user, the app allows me to interact with my data.
User	Disabled
Time estimation	3 days
Acceptance criteria	The application must display a login mode, which allows the user to log in with their email and password.
User History 4	As a user, I want to have the option to recover my account if I forget my credentials.
User	Disabled
Time estimation	3 days
Acceptance criteria	The application must have the option to recover an account by sending a validation code to the Gmail account entered by the user and thus change their password.
User History 5	As a user, the application must show me the option to create my login credentials.
User	Disabled
Time estimation	3 days
Acceptance criteria	The application has to offer the customer the option to create his account by entering his data for the correct login.



(a) (b) (c)

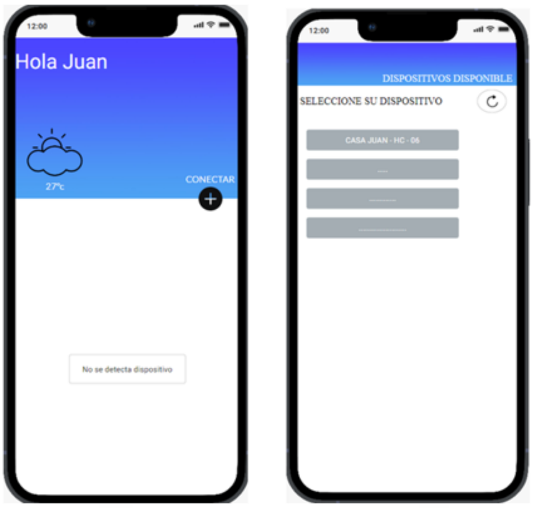
Figure 4. Sprint Backlog 2: User login prototype: (a) Friendly access, (b) prototype for account recovery and new password generation, and (c) prototype to create an account

4. Results.

4.1. Selection of experts. To validate the prototype using the Likert scale, 10 experts were selected who meet at least two of the following criteria: 1) experience in home automation or IoT (minimum 3 years), 2) knowledge in accessibility and disability (therapists, inclusive designers), 3) experience in UX/UI for accessible mobile applications, 4) academic background or certifications in assistive technologies, or 5) previous participation in prototype validations. Priority was given to professionals with publications or projects related to reduced mobility and usability.

TABLE 5. Third sprint

	Description
User History 6	For the user, the application must be easy to use and didactic.
User	Disabled
Time estimation	2 days
Acceptance criteria	The user will have the functions that are available for the control of the objects.
User History 7	It must be possible to synchronize the connection with the home automation system in order to have total control over the elements previously installed.
User	Disabled
Time estimation	3 days
Acceptance criteria	The application must have the option to connect to the domotic house, generating the search and selection of the house.

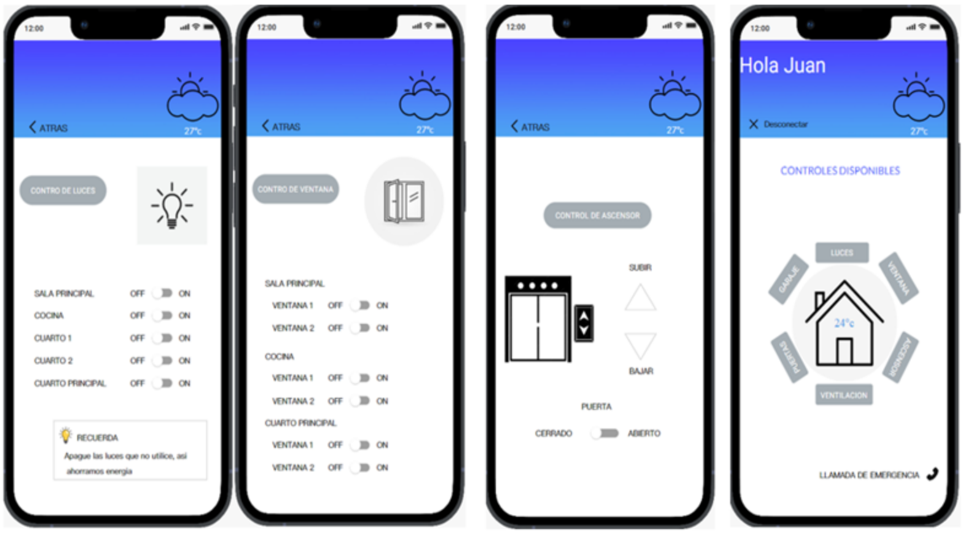


(a) (b)

FIGURE 5. Sprint Backlog 3: (a) Prototype of user-friendly and didactic object control, and (b) domotic handle access prototype (search and selection)

TABLE 6. Fourth sprint

	Description
User History 8	I must have control over all the synchronization things for automation.
User	Disabled
Time estimation	4 days
Acceptance criteria	The user will have access to all the devices connected for automation from the application.
User History 9	As a user, I must be able to see today's weather in the app and functions such as emergency calls.
User	Disabled
Time estimation	2 days
Acceptance criteria	The application must show the emergency call option.



(a) (b)

FIGURE 6. Sprint Backlog 4: User login prototype: (a) Access to synchronized objects, and (b) an emergency call option

FIGURE 7. Architecture of a domotic house

4.2. **Justification.** The validation of the prototype by 10 experts is based on quality and representativeness criteria, following common standards in applied research. Studies such as [36] point out that, for validations using the Delphi method or Likert scales, between 5 and 15 experts are sufficient to achieve consensus and reliability in specialized evaluations, provided that they meet strict selection criteria. In this project, disciplinary diversity (home automation engineers, occupational therapists, accessible UX designers) was prioritized over quantity, ensuring that each expert brought unique and complementary perspectives.

While a larger sample size could increase the generalizability of results, work such as [37] demonstrate that, in early stages of development (such as prototyping), small panels of highly qualified experts are more efficient in identifying critical issues. However, it is recognized that this limited number may not capture all variations in disability needs (e.g., differences between users with reduced mobility vs. visual impairment). To mitigate this, it was supplemented with further user testing.

4.3. **Required qualifications.** The experts had to achieve a minimum score of 4/5 on the Likert scale in at least two technical criteria. In the case of academics, at least one indexed publication on relevant topics was required. The selection was made through specialized databases (LinkedIn, ResearchGate) and collaborations with disability institutions, ensuring that the evaluators had proven competence in accessible domotics.

4.4. **Validation process.** After identifying the candidates, their credentials were verified by means of CVs and a self-assessment questionnaire. The selected experts signed a consent form to participate in the evaluation, guaranteeing confidentiality. This method is aligned with standards such as ISO 9241-210 and previous studies on assistive technology validation, ensuring reliable and evidence-based results.

In summary, the choice of 10 experts balances methodological rigor and feasibility, although it is recommended that the sample be expanded in future iterations to cover more disability profiles.

The results of the level of design quality assessment performed by 10 experts using the criteria are presented below (Design, Performance, Usability, Efficiency, Innovation) and its questions were based on the Likert scale (option 1 = Very Bad, option 2 = Bad, option 3 = Fair, option 4 = Good, and option 5 = Very Good). The purpose of this tool is to measure the degree of satisfaction of the experts. On the other hand, the following shows the criteria used for validation (Table 7), as well as the use of different questions and the level of quality achieved by calculating the standard deviation (SD) and the mean, thus we can see that the total average result is 4.60, being "Very Good" its final quality level.

To determine the quality of the prototype, an evaluation was carried out by taking the average of the selection criteria previously exposed before it can be seen in Figure 8 the detailed result of each criterion: Efficiency, Usability, Design, Functionality, and Innovation, which has an average score of 4.43, 4.68, 4.70, 4.53, 4.63, respectively. Therefore, the results obtained show that the quality of the home automation system with a mobile application is acceptable. On the other hand, the total result of the average is 4.60, which shows that it is viable, since for the prototype to be viable, a score higher than 4 is required.

Continuing with the results, it can be observed that design is the best-rated acceptance criterion, with a score of 70% Very Good. With this, usability results in 67.5% of Very Good, followed by Innovation with 66.7% of Very Good. This graph (Figure 9) allows us to understand, according to each of the previously evaluated criteria strengths and areas for improvement of the prototype.

4.5. **In-depth study on evaluation criteria from a disability perspective.**

Usability: Beyond "ease of use"

Usability in home automation systems for people with disabilities must address specific challenges:

- Motor disability: Difficulty with precise gestures on touch screens. Solutions: voice controls, recognition of large movements (such as nodding), or adaptation to specialized input devices (e.g., push buttons).
- Visual impairment: Barriers in graphic interfaces. Require auditory feedback (screen readers such as Talkback) and intuitive sound design (e.g., differentiated tones for actions).
- Cognitive disability: Need for simplified interfaces, with universal icons and avoiding complex menus.

[38] highlights that 40% of Parkinson's users abandon standard home automation apps because they require interactions that are too precise.

Table 7. Expert validation

Criteria	Questions	Media	SD	Quality
Usability	Is there an optimal loading time when logging into the application?	4.4	0.52	Good
	For non-technical users, is the application easy to use?	4.8	0.42	Very Good
	For users to better understand how the application works, is it divided into sections?	4.7	0.48	Very Good
	Does the application have a user-friendly interface?	4.8	0.42	Very Good
Design	In the interface, is the order of the functions clear, and does it provide good user experience?	4.8	0.42	Very Good
	Are the visual elements, such as icons, buttons, and graphics, used in the program attractive and consistent?	4.7	0.48	Very Good
	Does it follow a visual style that matches the purpose of the project?	4.6	0.52	Very Good
Functionality	Would the app help improve the travel process for people with disabilities?	4.5	0.53	Good
	Regarding the variety of options available in the application, how satisfied are you?	4.7	0.48	Very Good
	Does the application allow people with disabilities to improve the process of moving around in their daily lives?	4.4	0.52	Very Good
Efficiency	Does the application have very good information for a disabled person?	4.7	0.48	Very Good
	Is the response from the application immediate?	4.3	0.67	Good
	Does it deliver consistent results?	4.3	0.67	Good
Innovation	Does the application offer a solution with current technology to improve the quality of life of people with disabilities?	4.8	0.42	Very Good
	Does the control of a dwelling bring security to the disabled?	4.2	0.63	Good
	Does it show full control of all appliances connected to a home?	4.9	0.32	Good
	Total average and final quality level	4.6		Very Good

Design: Focus on proactive accessibility

Based on Universal Design (UD) principles, the design of home automation systems for people with disabilities must address specific challenges:

- Perceptibility: high contrast ($>$ 4.5:1 according to WCAG 2.1), adjustable font size options.
- Error tolerance: Confirmation of critical actions (e.g., "Are you sure you want to turn off all lights?") for users with tremors or a lack of precision.

Integration of voice assistants (Alexa, Google Assistant) should support alternative commands (synonyms) for users with dysarthria [39].

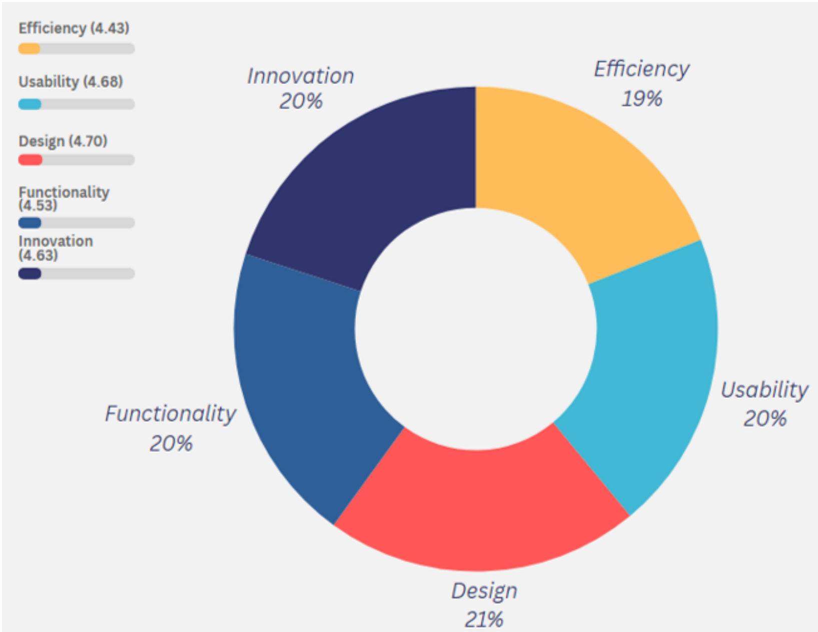


FIGURE 8. Criteria evaluation

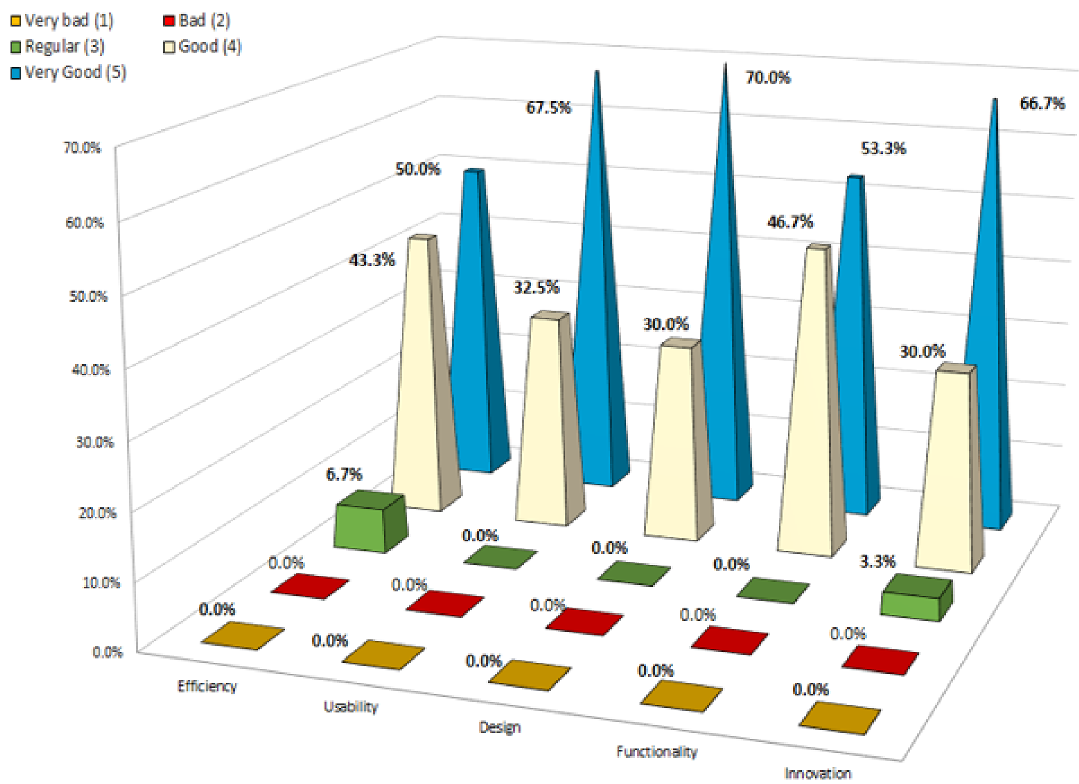


FIGURE 9. Criteria summary

Functionality: Adaptation to real needs

Functionality in home automation systems for people with disabilities must address specific challenges:

- Customization: Allow you to configure "access profiles" according to the type of disability (e.g., "low vision" mode with extra-large icons).

- Contextual automation: Use of sensors to predict needs (e.g., turning on lights when detecting movement in a wheelchair).

Efficiency: Minimizing user effort

Efficiency in home automation systems for people with disabilities must address specific challenges, such as

- Step reduction: Frequent tasks (such as opening doors) should be executed in ≤ 3 interactions (e.g., a programmable physical button + voice command).
- Latency: Response in < 1 second to avoid frustration in users with anxiety or attention limitations (requirement supported by *ISO 9241-11*).

Innovation: Inclusive emerging technologies

Efficiency in home automation systems for people with disabilities must address challenges, including

- Facial gesture control: For users with quadriplegia, using 3D cameras (Kinect) or AI algorithms in smartphones.
- Haptic feedback: Differentiated vibrations to confirm actions in deafblind users.

5. **Discussion.** The design of a domotic house with an application was developed to improve the mobility process of people with disabilities using the Scrum method. On the other hand, using the XP methodology and the C programming language for the construction in Arduino Uno and App Inventor for the creation of the mobile application. Likewise [40], seeks to improve the quality of life and security of a home by providing automated control through video surveillance that allows the user to give orders through it. On the other hand, in [41] the authors presented a system capable of linking the intelligent system to the user's wheelchair without the need for modifications to the wheelchair chassis and generating independence from the care of a person at all times.

For its part in [42], it is proposed to have full control of a house and alarms through an application for Android devices via Zigbee communication and thus give the user manipulation of all the house based on its evaluation regarding electricity consumption. On the other hand, [43] proposes a Wi-Fi-based and Internet of Things (IoT) smart home automation system to monitor and control home appliances using the Virtuino mobile application (Android-based). In addition, a variety of sensors are employed to track temperature, humidity, and motion in the home.

6. **Conclusion.** In conclusion, the research managed to develop a prototype home automation system to improve the process of displacement for people with disabilities, thus allowing a better quality of life for a disabled person, and thus not depend on the whole day of a second person and give the disabled greater independence. The main objective of the prototype is to determine the influence of a domotic system on improving the displacement process for people with disabilities. The results show that the home automation system and the mobile application have an easy-to-use and flexible user-level interface. In doing so, it is important to demonstrate that the use of the Scrum method is necessary for the successful development of the prototype, allowing adequate documentation and progress for the proper development of the prototype. The evaluation of the prototype was carried out using an expert judgment, where the result was that it is viable and accepted with evidence of the total average of 4.60 in aspects of Usability, Design, Functionality, Efficiency, and Innovation.

The developed prototype not only represents a viable solution for people with motor disabilities, but its modular and accessibility-focused design allows adaptations for different regional contexts and user groups. In regions with limited Internet connectivity, an offline version with basic local control functionalities could be implemented, while in urban environments with more technological infrastructure, advanced IoT systems could be integrated. The solution could also be extended to the visually impaired through an enhanced auditory interface with detailed descriptions of the environment, or to hearing-impaired users through more intensive haptic and visual notifications. The inclusion of customizable profiles would allow the application to be adapted to different cultures and languages, ensuring its relevance in different markets. Future iterations should incorporate field testing in different regions to evaluate factors such as implementation cost, cultural acceptance, and compatibility with local technologies, thus ensuring a truly universal and scalable solution.

To conclude the limitations identified, we find the limitation of information concerning specialists in the use of domotic systems for the disabled. For future work, it is suggested to complement the study by including emerging technologies, such as artificial intelligence, with the aim of further improving the use of home automation systems.

Technological limitations and prospects for improvement

While the prototype offers a significant advance in home automation accessibility, it faces key technological challenges such as compatibility with heterogeneous devices (e.g., variability in IoT protocols such as Zigbee vs. Matter) and the risk of software obsolescence due to the rapid evolution of mobile platforms and APIs. To mitigate these issues, it is proposed to 1) adopt open standards (such as the recent Matter 1.2) to ensure interoperability between manufacturers; 2) implement a modular architecture that allows gradual upgrades without requiring complete redesigns; and 3) develop a continuous feedback system with users to prioritize compatibility with emerging technologies (e.g., gesture control with AI in inexpensive devices). These measures, combined with partnerships with standardization organizations, could extend the lifetime of the solution and reduce access gaps. Future research should evaluate the use of software containers (such as Docker) to isolate critical dependencies and facilitate migrations.

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