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Design Proposal for a Virtual Shopping Assistant for People with Vision Problems Applying Artificial Intelligence Techniques

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Abstract: Accessibility is an increasingly important topic for Ecommerce, especially for individuals with vision problems. To improve their online experience, the design of a voice assistant has been proposed to allow these individuals to browse and shop online more quickly and efficiently. This voice assistant forms an intelligent system that can understand and respond to users' voice commands. The design considers the visual limitations of the users, such as difficulty reading information on the screen or identifying images. The voice assistant provides detailed product descriptions and ideas in a clear, easy-to-understand voice. In addition, the voice assistant has a series of additional features to improve the shopping experience. For example, the assistant can provide product recommendations based on the user's previous purchases and information about special promotions and discounts. The main goal of this design is to create an accessible and inclusive online shopping experience for the visually impaired. The voice assistant is based on a conversational user interface, allowing users to easily navigate an eCommerce website, search for products, and make purchases.

Keywords: artificial intelligence; accessibility; eCommerce

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1. Introduction

Electronic commerce has taken an incredible leap, evolving so that most companies generate different solutions to automate several processes. In addition, with the pandemic caused by the coronavirus disease 2019 (COVID-19), companies or ventures found it necessary to generate a means that initiates them into eCommerce, for example, a web page or social networks that allow them to increase sales purchases or attract new customers. As a result of the change in how things are carried out in society, by using information and communication technologies (ICTs), researchers have shown through their studies that people currently prefer to shop online. By using a medium such as the internet, the process is considered highly agile and implies a reduction in time by not having to go to a place to make a purchase, as well as the ease in searching for the product and selecting it and buying it. In addition, there are other advantages of using eCommerce for both customers and organizations, as well as the possibility of having a business with a global incidence, with availability for anyone with an internet connection to access the products and services and be willing to cover shipping costs [1].

According to [2], one of the most important advantages for customers is that most physical stores have specific opening hours while an online store is available 24 h a day. This offers customers the ease of shopping at the hours they want; in addition, the staff is not needed to process orders at night. The study by [3] states that an eCommerce channel is one of the most used tools and can be integrated with data analysis. Collecting user information allows companies to design loyalty and brand recall strategies more effectively. In [4], it is reported that, at present, electronic commerce has become an integral part of the global economy and is a constantly growing industry. According to data from the Argentine

Chamber of Electronic Commerce (CACE) [5], in Argentina, online sales increased by 124% year-on-year in 2020, driven by the COVID-19 pandemic that has accelerated the trend towards electronic commerce worldwide. Despite this growth, access to online shopping remains a challenge for many people, especially those with visual impairments. According to data from the World Health Organization (WHO) [6], an estimated 253 million people worldwide are visually impaired, of which at least 36 million are blind. These people often find navigating websites and mobile apps difficult due to a lack of accessibility and inclusive design.

The accessibility of online activities is essential to allow people with visual disabilities to make purchases online [7]. A voice assistant for eCommerce could be a solution to address the online accessibility challenges faced by these people. A voice assistant allows users to interact with a website or mobile app using voice commands instead of having to navigate web pages and menus. Additionally, a voice assistant for eCommerce could provide a more personalized shopping experience tailored to the needs of visually impaired users. For example, the voice assistant could provide detailed descriptions of available products and services and information on prices, sizes, and colors [8]. It could also provide personalized recommendations based on the user's purchasing preferences.

Another advantage of a voice assistant is that it simplifies the checkout process. Visually impaired people often have difficulty finding and completing payment forms online, but a voice assistant could guide them through the checkout process using voice commands. In addition, conversational AI (artificial intelligence) is considered a beneficiary eCommerce voice assistant for online retailers [9]. Retailers can use voice technology to reach a broader audience and make the online shopping experience more engaging and accessible for visually impaired consumers. Additionally, retailers can collect valuable data on users' shopping habits by analyzing the voice commands they receive.

This work proposes the development of a voice assistant for eCommerce for people with vision problems to significantly improve the online shopping experience; this is a sector of the population who has faced difficulties in this area. This proposal seeks to identify how implementing a virtual shopping assistant with artificial intelligence affects the shopping experience of people with vision problems and what implications this has regarding the accessibility, autonomy, and empowerment of users. In addition, online retailers can use this technology to publicize their products and improve their sales and services to the mentioned population.

The design of voice assistants for electronic commerce that adapts to the needs of people with vision problems is an innovative proposal for this population, considering that there are several points that a traditional eCommerce system cannot solve and limits its use to all sectors of society. Among the innovative issues considered in the design of the voice assistant for eCommerce is a simplified and easy-to-use user interface that best suits individual needs. This includes simple voice commands, a precise vocabulary, and an intuitive navigation structure, in addition to considering the personalized service by the system to adapt to the individual needs of people with vision problems [10]. For example, users can specify their preferred font size or screen contrast.

As a result of the voice assistant, an improvement in accessibility is obtained since people with vision problems can navigate through Ecommerce websites in a more accessible way. Instead of relying on sight to read content on the screen, voice assistants can provide an easy-to-use, aural browsing experience [11]. Another significant result is greater independence; people with vision problems can make purchases and browse websites without having to rely on the help of others. This increases their independence and improves their quality of life. The voice assistant generally makes the online shopping experience more convenient and easier for everyone. Instead of searching and clicking buttons on the screen, users can say what they want, and the voice assistant runs the entire purchase process.

2. Materials and Methods

For the development of the method, several concepts and comparisons were established, based on the review of previous works.

2.1. Review of Previous Works

Currently, the design of voice assistants is a very active area of research; it includes tools such as Amazon Alexa or Google applications, which have greater penetration in the activities carried out by people [12,13]. Under this concept, the review of previous works considers two groups; in the first group, the factors and concepts established in the works that address voice assistants are analyzed. In the second group, an analysis is carried out on the articles that include voice assistants designed for the use of people with vision problems.

Among the works that address the design of voice assistants is "Designing Voice User Interfaces: Principles of Conversational Experiences" [14]; this book introduces the design of user interfaces by voice. The author presents a detailed guide on designing voice assistants and provides examples of good practices and common mistakes. The paper "Hey Siri: An On-device DNN-powered Voice Trigger for Apple's Personal Assistant" [15] describes the architecture used by Siri, Apple's voice assistant, to be activated by detecting the keyword "Hey Siri". The work focuses on using deep neural networks to implement the keyword detection model and its deployment in mobile devices. The authors of [16] provide a practical and accessible guide to designing voice user interfaces. The paper covers topics such as understanding natural language, creating effective voice commands, and evaluating the usability of voice-based user interfaces.

Another paper [17] describes an innovative approach to training a voice assistant using reinforcement learning and self-talk. The learning model can learn new tasks simultaneously and outperform previously trained models on a larger data set. For its part, [18] describes the advances in conversational conversation research through the Alexa Prize social bot challenge. The challenge is to develop a voice assistant capable of sustaining conversations naturally and effectively for 20 min or more.

Other works stand out for their proposals that include the creation of effective and intuitive voice user interfaces, such as [19]; this work describes a scalable approach to train and deploy conversational agents, using user feedback to improve model performance. The approach was tested in a healthcare application, significantly improving the model's understanding of user needs. In [20], the authors describe an approach for building scalable and effective voice user interfaces using dialogue act classification. The approach was tested in a hotel reservation application and significantly improved the model's efficiency.

In the second group of works, those that include voice assistants in an eCommerce environment and cover the needs of the users they present are considered. The authors of [21] propose a voice assistant for visually impaired users that uses natural language processing technology to understand users' voice commands better. The proposed design also incorporates a user-friendly navigation structure and clear auditory feedback. The authors of [22] describe the development of a voice assistant for visually impaired users in Ecommerce applications. The proposed design uses a question-and-answer-based dialog structure to help users perform specific tasks on the website. Another paper [23] is a case study that examined the effectiveness of a voice assistant for visually impaired users on an Ecommerce website. The proposed design used simple voice commands and a simplified user interface to help users perform tasks on the website.

The reviewed studies suggest that a voice assistant can be valuable in helping visually impaired people interact with eCommerce websites. The proposed designs include intuitive voice commands, a clear navigation structure, and audio feedback to help users complete online tasks. In works such as [24], a voice assistant design is proposed to help visually impaired users to make purchases online. The design is based on Google's virtual assistant technology and uses a conversational voice interface, so the assistant can better understand the user's needs. Similarly, in [25] a survey was conducted with visually impaired users to

better understand their needs for a voice user interface for electronic commerce applications. The results suggest that users value a clear and easy-to-use voice user interface that can help them navigate Ecommerce websites and shop online effectively.

Other studies, such as [26], propose a user-centered approach to designing voice assistants to help visually impaired people make purchases online. The design is based on user feedback and uses a simplified user interface and intuitive voice commands. In [27], the effectiveness of a voice assistant design for visually impaired users on an Ecommerce website was examined. The design included clear auditory feedback, simplified voice commands, and a clear navigation structure to help users' complete tasks online. These studies highlight the importance of user-centered design for voice assistants for visually impaired users in eCommerce. Clear auditory feedback, intuitive voice commands, and a simplified user interface are common features in the proposed designs.

2.2. Comparison between the Main Voice Assistants in eCommerce

In general, all these voice assistants have been integrated in some way with eCommerce, allowing users to make purchases, search for products, and receive recommendations quickly and conveniently. However, the depth and breadth of these integrations vary between different voice assistants and online retailers [11,28]. It is important to consider which retailers have integrated with the voice assistant that is being considered and establish the desired specific features to ensure choosing the right voice assistant for user needs; Table 1 presents a comparison between the main applied voice assistants in eCommerce.

Table 1. Comparative table between existing voice assistants in eCommerce.

Voice Assistant	eCommerce Integration	Platform
Amazon Alexa	Full integration with Amazon; allows users to make purchases directly through Amazon; package tracking; price verification; obtains product recommendations.	Commercial
Google Assistant	Integration with Google Shopping Actions, which allows retailers to sell products directly through the Google platform; product search; price verification; receives product recommendations.	Open and commercial
Apple Siri	Integration with Apple's shopping app, Apple Store; allows users to make purchases directly through the application; product search; price verification; receives product recommendations.	Commercial
Samsung Bixby	Integration with Samsung's shopping app, Samsung Pay; allows users to make purchases directly through the application; product search; receives product recommendations.	Commercial

According to the comparison of the platforms that offer voice assistants, it has been determined that even though these systems are very robust. They have several limitations, the main one being their costs that the user ultimately must cover if the service is desired and even improved. In addition, this can be a determining factor for retail companies that want to integrate their products or services into eCommerce and even more so to a specific population. The information obtained from the comparison allows for determining the proposal's guidelines in the design of the voice assistant applied to eCommerce that adjusts to the needs of people with vision problems.

2.3. Method

For the design of the method, several parameters are considered that are general in the design of a voice assistant applied to eCommerce that aligns with the needs of people with vision problems; these parameters are the following:

- Assistive technology compatibility: The voice assistant must be compatible with assistive technology, such as screen readers and speech recognition software. This will ensure that people with vision problems can use the voice assistant effectively and without hindrance.
- Intuitive voice commands: Voice commands should be simple and intuitive so that users can perform tasks without having to memorize specific commands. Additionally, the voice assistant must provide clear auditory feedback to confirm the actions performed by the user.
- Accessible conversation design: The voice assistant's conversation structure should be easy for people with visual impairments to follow and understand. The design should avoid complex or overly long conversations and allow users to always know where they are in the conversation.
- Easy access to information: The voice assistant should be able to provide clear and concise information about products, including details such as prices, descriptions, and availability. The design should allow users to easily navigate through product options and perform specific searches.
- Experience personalization: The voice assistant should allow users to personalize their shopping experience, such as adding items to a wish list, saving their search, and shopping preferences, and receiving relevant product recommendations.
- Respect for privacy: The voice assistant should be designed to respect the privacy of users and comply with applicable data protection regulations. The design should allow users to control what information is collected and how it is used.

It is important to consider that designing an effective and accessible voice assistant for the visually impaired should focus on clarity, simplicity, and ease of use to ensure a seamless shopping experience [29]. The phases are established in Figure 1, where the flowchart that guides the design of the voice assistant is presented. The phases considered are general for the design of any voice assistant model and must include accessibility parameters.

The diagram shows the general stages of designing a voice assistant. The process begins with defining the wizard's purpose, followed by identifying the users and their needs. Next, the tasks and functions that the assistant must be able to perform are defined, and the dialogue and interaction with the user are designed [30]. After, the assistant's voice and personality are designed, its functionality and usability are developed and tested, and finally, the voice assistant is implemented. Continuous evaluation and improvement are important to ensure that the voice assistant continues to meet the needs and expectations of users.

For the development of the assistant, it is necessary to have a development methodology that allows organizing each stage of work within the development of the voice assistant used to make purchases online. The agile Scrum methodology is used, which is perfectly aligned to implement solutions and materialize them based on continuous learning and adjustments [31]. According to one of the customization parameters the wizard must meet, the application must give it a name. By including the assistant's name, the user feels a level of personification in the interaction with the tool, which facilitates its use; in this case, the assistant has been called Zuri.

For the design of the virtual shopping assistant for people with vision problems, several data sources are considered, such as interviews with the population considered for the study; with this, valuable information is identified about their current shopping experiences and the barriers they face. This helps to identify the users' specific needs and desires that they should consider when designing the virtual shopping assistant. Additionally, web accessibility data can provide insight into the barriers that visually

impaired people face when browsing websites and purchasing online. These data can help ensure the virtual shopping assistant is accessible to all users. Other sources to consider are online user behavior data; this information lets us know how users interact with websites and applications, what features they value, and how they behave during purchase. In the same way, data from AI technology are integrated, which provides information on how artificial intelligence techniques can be applied to improve users' shopping experience. This includes natural language processing, speech recognition, personalization, and product recommendation data.

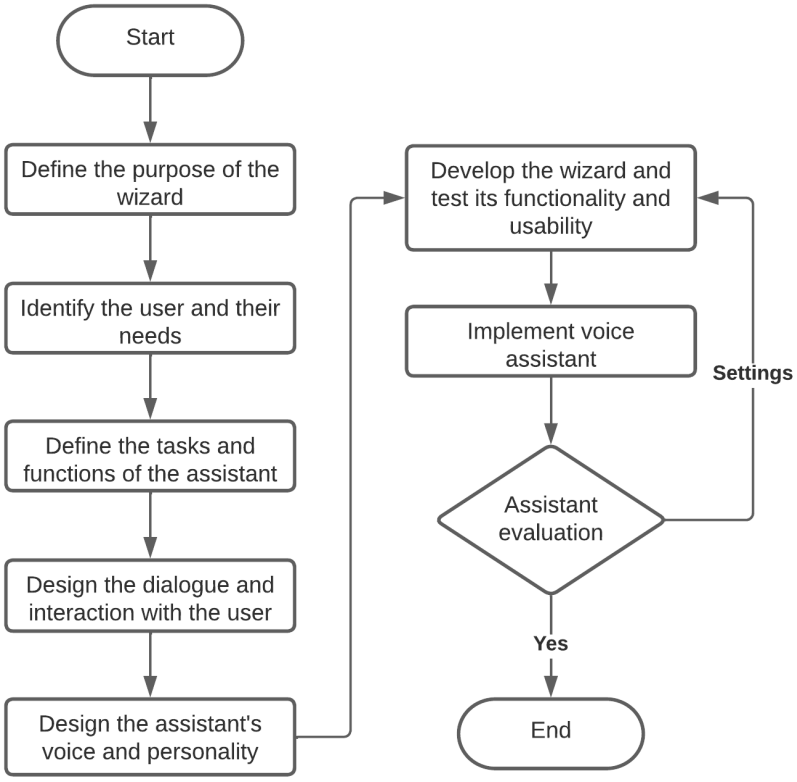

Figure 1. Flowchart of the general stages for the design of a voice assistant.

Once the data from the above sources have been collected, the interview data are analyzed using content analysis techniques to identify patterns and emerging themes. The information is categorized to find similarities and differences between users and identify the problems and barriers that users experience when buying online. Web accessibility data are analyzed using specialized tools to identify the barriers visually impaired people face when browsing websites and purchasing online. This includes accessibility issues with site navigation, color contrast, and compatibility with screen readers.

Online user behavior data are analyzed by identifying and analyzing user behavior patterns when making online purchases. This helps to better understand how users interact with shopping websites and apps and which features are most valued by users. The data from the artificial intelligence technology are analyzed using machine learning techniques to identify patterns in user behavior and train the artificial intelligence models used in the virtual shopping assistant.

The population considered in this study was centered around an open group through a call executed at the university participating in this study. Of the people who accepted the call were 57 administrative staff and 21 students. Of the 78 participants, 25 indicated vision problems; however, no serious problems were identified, such as acute vision loss. The detected problems can be classified as common vision problems where myopia, farsightedness, astigmatism, and presbyopia stand out. Therefore, for the assistant tests, two groups were generated; in the first, 53 people were considered, including administra-

tive staff and students. Since this group did not register a vision problem, it was decided to give them free navigation; they can use either the voice assistant or the chat to simulate a purchase process. It is worth mentioning that this system works directly with people and stores specific data such as identification, an account, and payment data. The use of the application and its data was verbally indicated to the entire population, and their verbal consent was requested to use data for purely academic purposes.

2.3.1. Features and Tools Used in the Design of the Voice Assistant

The designed assistant uses AI as its primary tool, which allows natural language processing (NPL) [32]. Through this, the voice assistant allows users to interact with a device using voice commands instead of touching a screen or typing text. Some of the expected features of the voice assistant in its operation are as follows:

- The assistant must respond to user requests such as purchase requests, login, account creation, and shopping cart.
- The assistant should fulfill the function of making the client feel comfortable using it.
- The voice assistant should help the user carry out the entire online shopping process using the internet channel.

The development of Zuri is carried out using the Django framework, which allows for the integration of all the programming in a friendly and easy way in a Python programming environment. In addition, the JavaScript programming environment is integrated to use the AI APIs so that the assistant recognizes the user's voice and returns the information or starts the requested process. For the design of the Zuri interface, the CSS programming language is used, where all the design is managed. Finally, for the functionality, usability, and accessibility tests, a web page is generated that simulates an eCommerce environment of a clothing company [33]. To develop this web page, HTML is used where the Chatbot and assistant interface are implemented and integrated. The general operating mechanics that Zuri must comply with are presented in Figure 2.

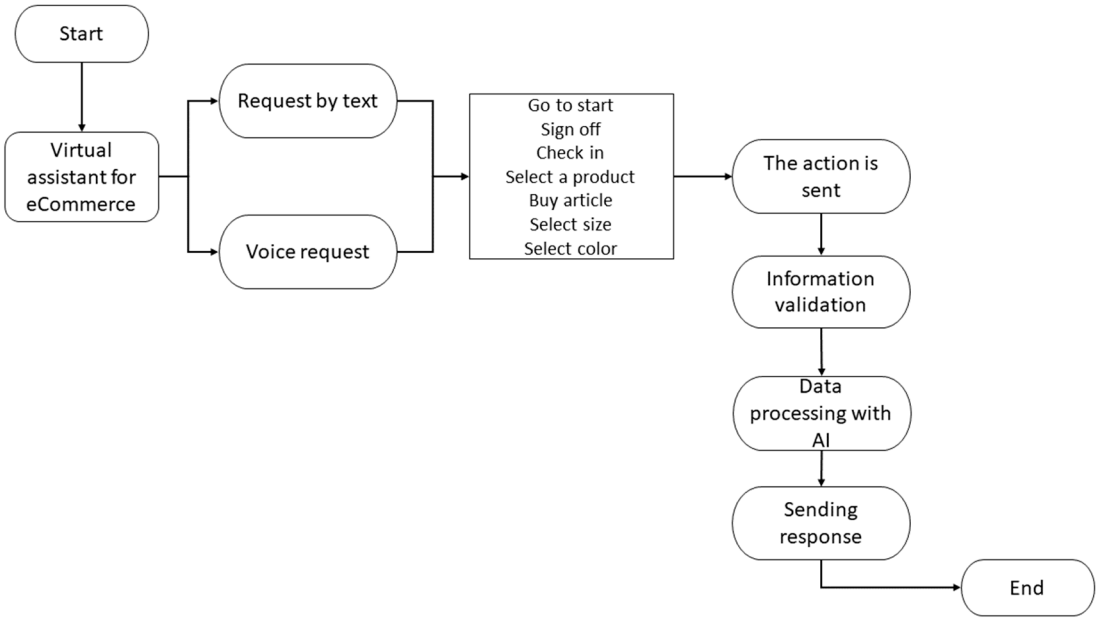

Figure 2. Flowchart of the expected operation of the "Zuri" voice assistant.

The figure shows several actions that Zuri must perform once the user accesses the web page where this has been implemented. In the first phase, Zuri makes its presentation to the user; in the second phase, there are two options; the user can request text or voice commands [29]. This option is implemented in Zuri to satisfy the needs of people with visual problems and the regular population who only wants to use the assistant to improve

the online shopping experience. Once the request has been registered, the wizard presents the user's options, for example, make a registration, go to the beginning, close the session, select a product, or select a size. These actions can be registered by the assistant using the selection using a click or by voice command; this depends on the previous phase. Subsequently, the action is sent, and the validation and processing by the AI begin, which initiates the interaction and accompaniment with the user until the entire purchase process is finished.

The way of interaction with Zuri has two methods: the user uses the manual option with the selection of the options and actions using a click, and the second option uses voice commands [34]. For the second method, a specific rule is established in which the user must comply so that the wizard recognizes the command and can perform the requested action. For example, to access the main menu options, the user must precede the assistant's name to the command. Actions include the following:

- Zuri goes to the start;
- Zuri signs out;
- Zuri interests me (the article);
- Zuri, I want to register, etc.

2.3.2. Diagram of Implementation of the Voice Assistant in a Web Environment

The implementation scheme focuses on defining the tools used and their functionality within the wizard. In the first instance, the development of the assistant responds to the framework where the application is developed, Django, which handles the Python programming language [35]. In the second instance of implementation, three different programming languages are established, starting with HTML, which is used to manage the eCommerce structure; CSS, which is used within the development to establish the icons of the assistant; and finally, JavaScript will oversee managing the AI. Figure 3 establishes the implementation scheme that guarantees the operation of Zuri.

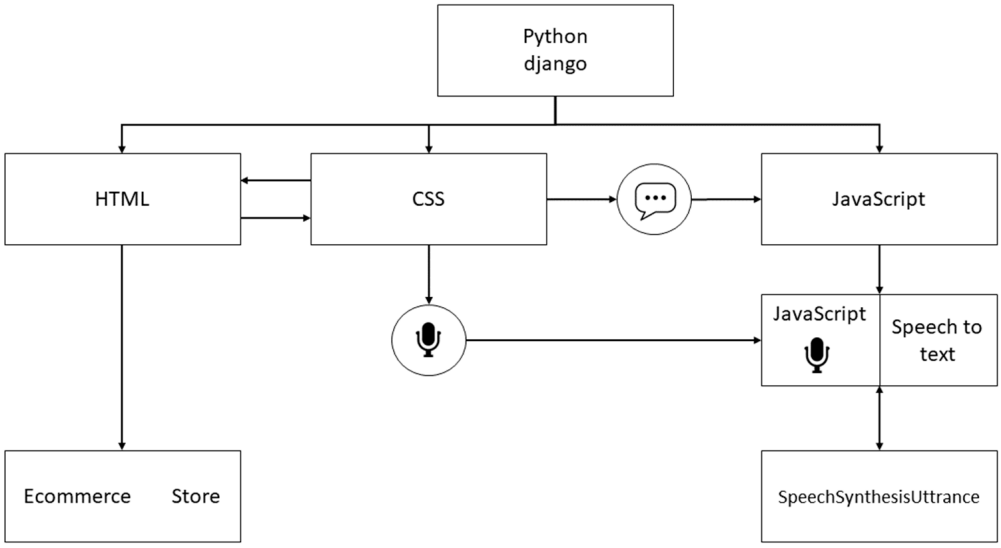

Figure 3. Zuri implementation scheme in a web environment.

The processing of the information that Zuri receives and how it interacts with the user is presented in Figure 4. The process begins with Zuri's presentation and offer of the service; for this, the system detects that a client enters the web page and sends a voice notification. In the notification, the user is asked if they want to use the wizard to generate the purchase. If the answer is negative, the wizard closes the cycle, and the user manually continues the purchase [36]. Once the question is mentioned by the user, "Zuri starts the

purchasing assistant", the system begins the processing that is detailed in the figure until the entire purchase process is finished or until the user requests to close the session.

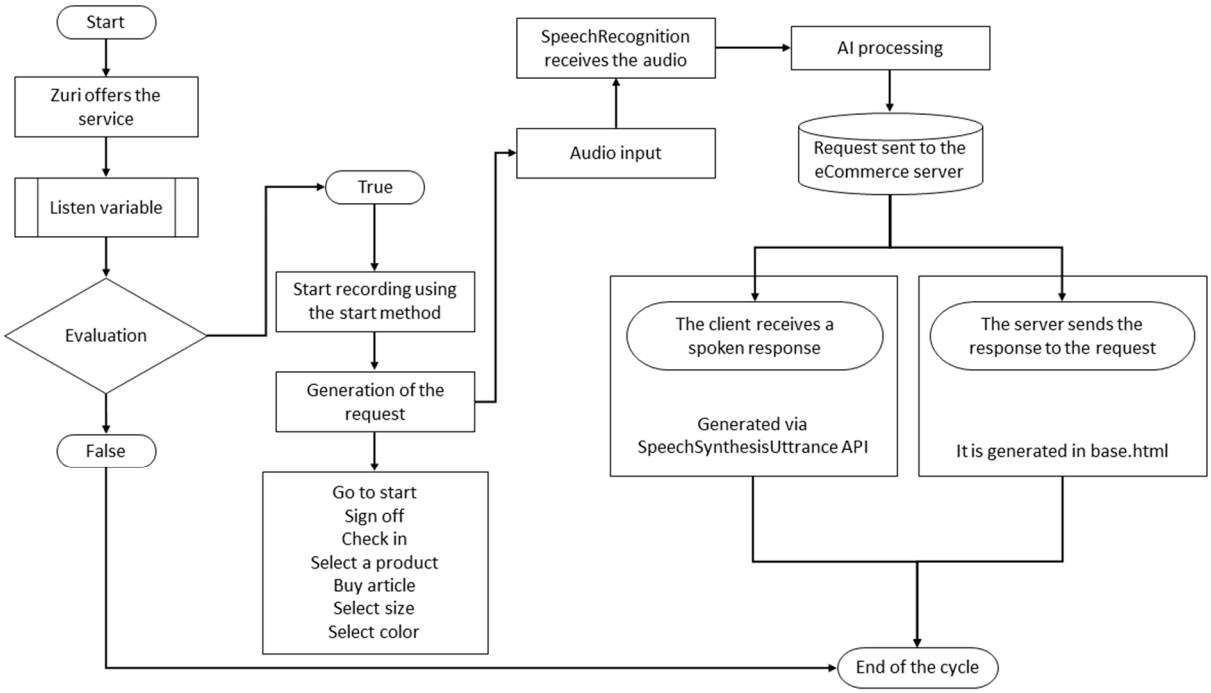

Figure 4. Diagram of voice assistant functionality in a complete cycle of interaction with the user.

2.3.3. Solution Development

The structure of the voice assistant applied to eCommerce focuses on using the Django framework; for this, a migration of the Python services is generated so that the services can later be converted into the different programming languages already established (CSS, JavaScript, HTML). By the identified actions that the client can carry out within the eCommerce, the control statements allow the different requests to be made that Zuri can respond to and generate an action to be executed [37]. At this stage, voice commands are implemented to comply with customer orders. In addition to the voice assistant, it was decided to include a chat as an alternative to written media so that the customer can choose which medium will be best suited to make the purchase or request without neglecting Zuri's main objective, which is to provide help to people with visual problems. Considering the requests that the base.html file be used, these include the SpeechRecognition and SpeechSynthe-sisUtterance APIs in the JavaScript language [38]:

- SpeechRecognition: This web API is responsible for generating speech recognition using artificial intelligence and machine learning techniques [39].
- SpeechSynthesisUtterance: This web API is responsible for returning the information in a voice environment.

The CSS and JavaScript programming languages were used to create the interface and the Chatbot, where colors, text, and positioning, among others, were defined. It was also defined that JavaScript receives the string, that is, it receives the string of characters that the client requests by voice (requests); however, the operations or models of Django are found in the Python programming language [40]. Therefore, the commands (get, post, delete, among others) are used so that Python can receive the request and process it within the Django framework that connects to the database, which implies that it can make the necessary changes [41]. In request handling, JavaScript receives the requests but cannot generate any local files, so this information is sent using HTTP to Python, which receives the string and saves it to a new file. All the information generated is sent through request methods to generate a complete interaction; among the methods used are the following:

- The get method is used to request information and asks for an informed response.
- The post method is used to send data to the server so that a file can be created, uploaded, or modified; this method is used by the JavaScript application.
- The delete method is responsible for deleting specific resources.

All the information generated from the interaction with the user is sent through the HTTP methods so that Python receives it and accesses the database, reviews the information of the products, and generates a response to the request. For processing requests, use is made of AI techniques, for which data collection is necessary, to gather relevant training data for the AI model, such as voice recordings, text transcripts, and other data relevant to the tasks that Zuri can answer. In the next stage, data pre-processing is performed, which consists of cleaning and preparing the data to be compatible with the AI model [42]. This can include denoising voice recordings and normalizing the data to have the same structure. For the design of the AI model, convolutional neural networks (CNN) and natural language models (NLP) are used [43]. The CNNs use a percentage of the data to train the selected AI model; the tools used are TensorFlow, PyTorch, or Keras [44]. These tools have been applied to select the best characteristics in this work.

Once the model has been developed and trained, it goes to an evaluation stage, in which its operation is established based on its precision and ability to perform specific tasks. Once the model has been trained and evaluated, it is integrated into the voice assistant application. Finally, a testing stage is generated, where the voice assistant is adjusted as necessary to improve its responsiveness and execution.

3. Results

For Zuri's evaluation, this was applied to a simulated eCommerce; that is, a web page was generated in which the assistant was implemented. The page simulates a shopping environment with clothing items and accessories. Within the page catalog, several products were entered, such as dresses, t-shirts, sweaters, slippers, and suitcases. Figure 5 shows the product interface of the designed eCommerce page, in which several photographs have been uploaded, and a value that is not necessarily related to the actual product cost has been placed as a reference.

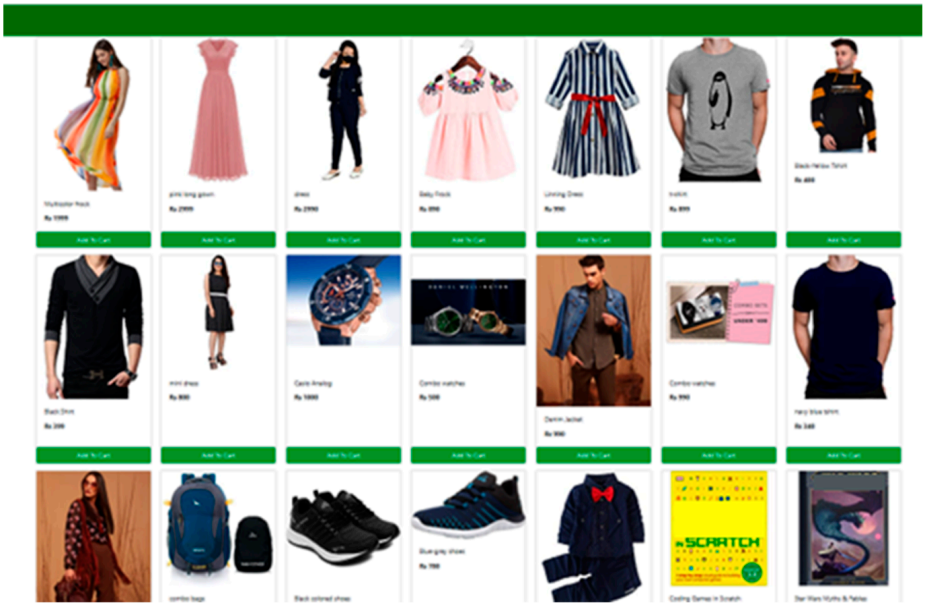

Figure 5. Product store of a simulated eCommerce page.

In the mechanism of use for the assistant, all phases were fulfilled; that is, all users registered when creating an account. This first phase is mandatory for all customers who want to purchase eCommerce. In the end, a survey on the use of Zuri was run to identify the

user's preferences and the parameters that need to be adjusted. From the results obtained from the first group, it shows that 48% of consumers prefer to use a voice assistant to make purchases online instead of carrying the process out manually. In addition, 35% of consumers who used Zuri to shop reported that their shopping experience had improved, allowing them to make purchases faster and easier. Another interesting result identified is that it was found that consumers who use voice assistants to make purchases spend 17% more on average than those who buy through traditional means. The survey carried out on the participants found that customers would expect retailers to implement voice assistants in their businesses. According to the responses obtained, this would increase conversion rates by 51% and increase the order value by 29%.

In group two, using Zuri was established as mandatory since this group represents potential customers with vision problems in a real environment. Therefore, from the beginning, the 25 users selected the Zuri option. From the results obtained, it can be mentioned that 50% of consumers who presented visual problems see an advantage in using Zuri to buy online, compared to 28% of consumers. Additionally, 55% of visually impaired consumers reported that their shopping experience was improved by using Zuri. Similarly, it was identified that the voice assistant helps people with visual problems navigate the website more easily and quickly since they can ask questions and give orders instead of reading and searching for information visually.

Table 2 shows the relationship between the parameters that influence the effectiveness of using voice assistants in electronic commerce, with the feeling generated by the user. However, it is important to note that these parameters can influence the effectiveness of voice assistants in different ways; they must be considered together to determine the overall impact of using Zuri in eCommerce.

Table 2. Evaluation of parameters in the use of a voice assistant in eCommerce, in relation to the feeling generated by users.

Parameters	Description	Feeling Generated
Interaction	Ease of use and the ability to understand and respond to user needs.	The ability to recognize speech, understand natural language, and the ability to respond quickly.
User experience	The satisfaction and convenience of the shopping experience.	The ability to customize, the ease of searching and browsing, and the speed of loading.
Business impact	The effect on sales, customer loyalty, and compliance with accessibility regulations.	Increased conversion rates, increased average order value, and compliance with web accessibility guidelines.
Technology	The technology's ability to integrate with other systems and scalability.	The ability to integrate with payment and inventory management systems, the ability to expand into new platforms and markets, the ability to handle high volumes of requests, and the ability to provide a consistent experience across devices and channels.
Security	Protection of customer information and compliance with privacy regulations.	The ability to protect customer data and payment information, comply with privacy and data protection regulations, and the ability to offer customer privacy and security options.

At the technological level, Zuri was evaluated in several criteria that were selected to evaluate the usability of the assistant in eCommerce, the results are presented in Table 3.

Table 3. Evaluation of the usability of the assistant in eCommerce, with the use of voice assistants.

Parameter	Description	Value
Error rate	Percentage of times the attendee provided an incorrect answer.	3%
Response time	The average time it takes for the wizard to respond to the user.	2.5 s
Task success rate	Percentage of times the assistant completed a task successfully.	85%
User satisfaction rate	Percentage of users who were satisfied with the wizard experience.	90%
Speech-to-text transcription accuracy	Percentage of accuracy in converting the user's voice to text.	95%
Learning capacity	Percentage improvement in assistant accuracy after a test interaction.	100%

It is important to consider that these values, in a production environment and with a larger population, will depend on the design and specific characteristics of the voice assistant and the users who interact with it. In addition, it is important to consider that these parameters may vary depending on the context of use and the specific characteristics of each project.

For the system adjustments, the acceptable limits of the quality metrics were identified; these vary according to the specific application. Quality metrics allow for assessment of the accuracy of models and predictions and are used to compare different models or to determine if a model is accurate enough for the desired application. Common quality metrics include root mean square error (RMSE), mean absolute error (MAE), coefficient of determination (R2), and mean absolute percentage error (MAPE). These metrics are presented in Table 4, with the values corresponding to system performance. By relating the results obtained from each algorithm and the EAR, it is possible to evaluate the system's overall performance. The table shows the system performance metrics.

Table 4. Values obtained from the system pressure versus the limits established in the tests.

Metric	RMSE	MAE	R2	MAPE
Value	11.351	10.924	0.803	15%
Boundaries	15.000	13.000	1 (100%)	20%

According to the results obtained, it has been identified that the system, when using the AI libraries, recognizes the voice requests of the students. To obtain a percentage of precision and effectiveness that guarantees the execution of voice commands, the system must process a large volume of data, for which a training data set and a test containing information about the voice commands are used. By working with a data set that allows the model to be adjusted and its performance to be evaluated, an adequate result is guaranteed to make requests in eCommerce. The results of the quality metrics obtained in the set of tests are presented below:

- RMSE: 10,561;
- MAE: 9154;
- R2: 0.85;
- ASM: 12%.

To determine the acceptable limits of these quality metrics, it is necessary to consider the problem's context and the model's accuracy expectations. In the tests, a scenario was proposed where the model has an acceptable precision if it can recognize a request by the user's voice, with an average error of +/−13,000. In this case, the RMSE value of 10.561 is less than the accuracy expectation, so the model could be considered acceptable in terms of accuracy. However, the MAE value of 9.154 indicates that the model has a systematic

bias in its predictions and that adjustments may be necessary to improve its accuracy. The R2 value of 0.85 indicates that the model explains 85% of the variability in the recognition levels of a user's voice command, which would be considered acceptable in many cases. On the other hand, the MAPE value of 15% indicates that the model has an average error rate of 12% in the predictions, which may or may not be acceptable, depending on the context and expectations of the problem.

4. Discussion

Technology has advanced enormously in recent years and has enabled the development of a wide range of devices and systems to assist visually impaired people in their daily lives. One of the most important developments has been the rise of voice assistants, which have become a useful tool to help visually impaired people with online purchases. In this context, designing a voice assistant for electronic commerce that adapts to the needs of people with vision problems is important and relevant. In Ecommerce, voice assistants are becoming increasingly popular because they allow users to make purchases online without using a screen or keyboard [45]. Voice assistants use the user's voice, which is converted to text and processed using speech recognition algorithms. The result is that the user can interact with the system more naturally and easily.

When designing a voice assistant for the visually impaired, it is important to consider several factors. First, it is important that the voice assistant is easy to use and allows the user to access all the necessary functions quickly and efficiently. This can be achieved by incorporating clear and simple voice commands and using an intuitive user interface. Another factor to consider is the accuracy of speech recognition [18,23]. Visually impaired users may have difficulty pronouncing certain words or phrases correctly, so the voice assistant must be able to recognize the user's voice even in noisy situations or when the pronunciation is not perfect. Therefore, the speech recognition system must be designed accurately and with various voice inputs to ensure the best user experience.

The design of a voice assistant for Ecommerce is an emerging technology that has gained great importance recently, especially for people with vision problems. Incorporating this technology has significantly improved the online shopping experience for these people. It has allowed them to make purchases more autonomously and without assistance [46]. This paper discusses the design of a voice assistant for Ecommerce and how it can be aligned with the needs of people with vision problems. The design of the assistant voice proposal for Ecommerce is a complex process involving various technologies to create a unique and effective shopping experience for users. Zuri's design must consider various factors, such as user interaction, speech recognition accuracy, natural language understanding, quick response, and accessibility.

For the visually impaired, Zuri's design focuses on providing a shopping experience that is accessible and easy to use. To achieve this, emphasis is placed on the voice assistant's ability to recognize and respond to user commands, as well as the clarity and precision of the responses [47,48]. The design should also consider the importance of simple and consistent navigation. For this, user interface design techniques allow users to navigate the application easily and intuitively and access the information they need quickly and clearly.

Zuri has various benefits for people with vision problems. First, it allows for greater independence in the online purchasing process, allowing them to make purchases without additional assistance. In addition, using Zuri allows for a greater browsing speed and selection of products, saving time and effort for people with vision problems. Currently, there are various jobs in the design of voice assistants for eCommerce, especially in accessibility [49]. One of the most relevant works is the Amazon Echo project, which uses Amazon's voice recognition technology to create a screen-free shopping experience. Another example of work on eCommerce voice assistant design is the Google Assistant project, which uses Google's artificial intelligence technology to create a voice assistant that can perform a wide variety of tasks, including online browsing and the purchase of products.

The results have identified certain factors that act as limitations when creating a voice assistant in an eCommerce environment for people with vision problems. Among these, the ones with the greatest incidence are that the availability and quality of artificial intelligence technology for voice and natural language processing may be limited and require a significant investment of resources to implement the proposal. Although the proposal seeks to improve accessibility for people with vision problems, there could be barriers to accessing the virtual shopping assistant, such as a lack of internet access or compatible devices. In addition, the virtual shopping assistant could have difficulties adapting to the individual needs of each user, which could limit its effectiveness. Another important aspect is privacy and security; because the proposal involves using artificial intelligence technology, there could be concerns regarding the privacy and security of users' data.

Although the proposal may be useful for people with vision problems, there could be resistance from some users to rely on a virtual shopping assistant instead of making purchases themselves. In the long term, if the proposal is implemented in different countries or regions with different languages and cultures, there could be limitations regarding the understanding and adoption of the virtual shopping assistant by users. The proposal could also have difficulties effectively personalizing the user's shopping experience, limiting its usefulness and effectiveness. In addition, the quality of the service offered by the virtual shopping assistant could be affected by external factors, such as the performance of internet service providers or the availability of the products requested by users. Finally, the virtual shopping assistant may have difficulty understanding and responding to complex user requests and questions, limiting its ability to provide a satisfactory service.

5. Conclusions

First, it is important to note that people with vision problems face many challenges when shopping online. eCommerce websites and applications are often designed with visual interfaces that can be difficult for people with visual disabilities to navigate. Even when assistive technologies such as screen readers are used, users may still have difficulty finding the information they need or performing specific tasks, such as adding a product to the cart or making a purchase.

This is where voice assistants can make a difference; visually impaired users can navigate and shop more autonomously without additional assistance by using voice to interact with an assistant. Additionally, speech recognition technology can be more accurate and faster than other input methods, such as a keyboard or mouse, making the checkout process more efficient and enjoyable for users.

The use of voice assistants in Ecommerce is an emerging technology that has significantly improved the online shopping experience for everyone, especially those with low vision. The eCommerce voice assistant design focuses on providing an accessible and user-friendly shopping experience with simple and consistent navigation, the ability to recognize and respond to user commands, and clear and precise responses. The benefits found in the results include greater independence and speed in the purchase process and the possibility of being used by people with physical disabilities that allows them to interact with a screen effectively.

Regarding the existing works, existing projects such as the Amazon Echo and the Google Assistant project are two relevant examples of works in designing voice assistants for eCommerce. However, their costs have been identified as one of the limitations that is reflected in the user. In general, using voice assistants in eCommerce for the visually impaired is a promising technology that can significantly improve accessibility and the online shopping experience for these people. It is important to continue researching and developing this technology to improve the quality of life for people with visual and other physical disabilities.

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Institutional Review Board Statement: This work does not require authorization for research in humans. This is contemplated in the Helsinki Declaration of the Medical Association, which establishes that "Medical research is subject to ethical standards that promote respect for all human beings and protect their health and individual rights. Nevertheless, some research populations are vulnerable and need special protection. The needs of economically and medically disadvantaged people must be recognized. Special attention should also be paid to those who cannot give or withhold consent on their own, those who may give consent under duress, those who will not personally benefit from the research, and those who have research combined with medical care."

According to the statement, this work is not medical research; on the contrary, what is evaluated is the efficiency and precision of software integrated into a Web page for the improvement of electronic commerce. Although a segment of the population is used for its evaluation, the information collected is clearly in the design and adjustment of software that does not use methods or devices that can be invasive for humans or animals.

In addition, by the "REGULATION OF THE ETHICS COMMITTEES FOR RESEARCH IN HUMAN BEINGS" of Ecuador:

- Ministerial Agreement 4889.
- Official Gazette Supplement 279 of 01-July-2014.
- Actual state

Establishes "ETHICS COMMITTEES FOR RESEARCH IN HUMAN BEINGS (CEISH)" in art. 4.'Definition.'Human Research Ethics Committees (CEISH) are bodies linked to a public or private institution in charge of conducting ethical evaluation, approving research involving human beings or biological samples, and ensuring the evaluation and monitoring of clinical studies during their development. Every clinical trial carried out in the country, before starting its execution, must be evaluated by a CEISH approved by the National Health Authority.

For this reason, based on the above, my institution establishes that it cannot issue any certificate for not being a medical research work, considering that the study's objective is software design as an aid for electronic commerce.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data is available in the authors' repositories; readers who want the sources should contact the corresponding author's email.

Conflicts of Interest: The authors declare no conflict of interest.

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