Step 1 - Accessibility Inspection with Teran Design Considerations Teran 2022

In the first stage of the inspection, the design considerations (Teran, 2022) were considered to operate the five banking applications with the most significant number of customers in the first quarter of 2023. The tests were performed in ascending order, organizing the design considerations (Teran, 2022) and observing the description and evidence. The report consists of observations regarding design considerations that were not met, partially met, or could not be evaluated.

Application A

Data Input

It has five considerations: two had a positive result, two had a negative, and one had a partial result. Considerations DC-2 and DC-4 did not have the results expected for the DC-2 test, which is related to the voice feature the application does not offer. The DC-4 design consideration is associated with the button functionality ”continue” on the keyboard to continue to the next task, which is not answered, as the button hides the on-screen keyboard. The partially met design consideration was the DC-3, which refers to the keyboard adaptations according to the data input, such that when entering the data, the keyboard is not changed.

Data Output

It has 11 considerations; nine had a negative result, one had a partial result, and one had a positive result. Consideration DC-6 had a partial result because the application icons do not appear on all screens. Among the considerations that had negative results, DC-7 has no similarity to the physical receipt; the DC-8 application does not provide a notification feature in settings, and the C9 application does not provide a feature to change font size. DC-10, DC-11, and DC-13 are related to the voice feature, and the application does not offer them. DC-12 does not have large icons and is not available for on-screen help through text or audio. The resources that DC-14 and DC-15 propose are not made possible in the application.

Navigation

It consists of six considerations, two of which are not met, three of which are met, and one of which is partially met. DC-17 is not met as the forms are arranged on the same screen, and DC-18 does not allow for changing the data entered after advancing the step of the task. DC-20 had a partial result, as the application has a visual event when touching the buttons but does not have a sound feature.

Data security and privacy

It has three considerations. Two were not attended to, and one was attended to partially. The application did not provide a voice feature for DC-23 and DC-24, and DC-25 had the result partially because the functionality of pasting the code in the field is available on the screen; however, it does not work.

Metalinguistic signs

It has four considerations, all of which had a negative result. DC-26 is related to the virtual assistant feature, which is not provided. DC-27 is associated with the sound feature that the application does not offer; DC-28 is related to the change in size from the font, which the

application does not provide, and DC-29 to the voice and visual feature, which the application is also not available.

Application B

Data Input
It comprises five considerations, three of which were met, one partially answered, and one not answered. Design consideration DC-5 needed to be met as it did not display a previously created Pix key or the option to receive via Pix after creating one key. Consideration DC-2 was partially met, as the application offers the ability to voice on the home screen, but the voice search did not work, only the audio search.

Data Output
Contains 11 design considerations. Among them, two were attended to, eight were not met, and one was partially met. DC-6 design consideration has been met partially, as not all icons are well represented. Among the considerations of design that still need to be met, DC-7 is related to the proof of transaction being similar to physical evidence, which does not occur. DC-8 is related to the possibility of customizing the notification sound, a feature the application does not provide. The DC-10, DC-11, and DC-13 are related to voice commands, which was not possible to test because the application provides the functionality. However, the audio search could have been more effective when carrying out tests than the text. DC-14 is related to activating and deactivating the voice at the start of the application and in the settings. Still, the application has no menu setting, and the search icon is activated when the button is pressed. A DC-15 is related to the Pix receipt or payment graph, a resource the application does not contain, and a DC-16 is related to the favorites listing on the Pix screen, which is unavailable.

Navigation
Contains six design considerations. Among them, three tested positive, and the other three negative results. DC-17 is related to the arrangement of forms on the screen to be divided, avoiding data-filling errors. However, all forms are grouped on the same screen. DC-18 is related to the possibility of changing data entered after changing screens. However, the application only allows you to change data on the same screen. DC-20 is related to visual effects and sound during screen changes, making it easier for the user to understand, but the application does not provide these resources.

Data security and privacy
It has three considerations, all of which had a negative result. DC-23 and DC-24 are related to reading data by voice, a feature the application does not provide. DC-25 is associated with the automatic reading of codes sent to the smartphone, but the application prompts the user to enter the code manually.

Metalinguistic signs
It corresponds to four design considerations, two of which were partially attended, and two had a negative result. DC-26 is related to the availability of the in-app virtual assistant and deactivating the voice feature after a period of inactivation, but a voice alert is not provided. DC-28 is related to the instructions in the application and has a few characters, large fonts,

and highlighted keywords, but the Keywords are not highlighted. Among the considerations with a negative result, DC-27 is related to the voice feature, which the application does not provide, and DC-29 is related to visual instructions, which is also not provided.

Application C

Data Input
It contains five design considerations, three of which had a positive outcome, one had a negative result, and one had a partial result. DC-2 is related to the voice search that the application provides. Still, it redirects to the menu according to the keywords spoken by the author without considering the entire search context. The DC-5 is related to the listing of Pix keys that had been previously created, a feature that the application does not provide.

Data Output
It contains 11 design considerations, among which four had partial results and another seven tested negative. Among the partial results, DC-6 is related to icon illustrations similar to the real world, but not all icons are understandable according to their function. DC-7 is related to the similarity of digital receipts with physical receipts, which is similar. DC-9 is associated with arranging texts with few characters and large fonts but does not occur on all screens. DC-12 is related to the size and understanding of the icons placed on the application, but the icons are not significant, and not all of them are easy to understand.

Navigation
It contains six design considerations, among which four had a negative outcome and two tested positive. Among the design considerations that had negative results, DC-17 is related to the arrangement of the forms grouped on the same screen. DC-18 is related to editing and changing the entered data after the screen change, a function that the application does not provide. DC-20 not to met because it does not have the click event on the buttons and events on the screen when it is changed. DC-21 was not met to be answered because the back button is displayed when completing a Pix transaction.

Data security and privacy
It contains three design considerations, all of which had a negative outcome. DC-23 and DC-24 relate to interpreting data informed by audio, a resource the application does not provide. DC-25 is related to automatic data insertion provided for the Smartphone, but you must enter it manually.

Metalinguistic signs
Contains four design considerations, two of which resulted in partial attended, and two had a negative result. DC-26 is related to the available virtual assistant and the button to turn off the voice feature after inactivation time, which is not granted. DC-28 is associated with arranging large fonts, a few characters, and highlighting keywords, but the application does not. DC-27 is related to the voice feature and instructions when the user is in doubt, which are not available, and DC-29 is related to audio and video instructions and on-screen interactions with the user, which are provided exclusively through event click on the buttons.

Application D

Data Input
It contains five design considerations, three of which had a positive result, one had a negative result, and one had a partial result. DC-2 is related to the search for audio on the home screen, a function that exists. The user is redirected to the menu that carries out the transaction; however, they need to be instructed on how to do so. And DC-4 is related to the obligations button on the keyboard, which is hidden after tapping this button.

Data Output
It contains 11 design considerations, two of which partially resulted in a met, two had a met result, and seven did not have a met result. The DC-6 is related to the arrangement of the icon illustrations, which only occurs on some screens, and the DC-12, which is associated with the layout of icon sizes and understanding of the same. However, audio or text instructions are only shown when the icons are understandable. Among the design considerations with a negative outcome, DC-8 is related to personalizing the receipt of notifications with the audio, but the application does not provide this function. DC-10, DC-11, and DC-13 are related to the voice feature the application does not offer. DC-14 is related to the activation and deactivation of the voice feature on the home screen. Still, this functionality is only activated if the button is pressed and the selection of the “I prefer to speak” option is activated. The DC-15 is related to the presentation of a graph with Pix sending and receiving values, which is not provided. DC-16 is related to viewing favorite users, but the application does not have this list.

Navigation
It contains six design considerations; among them, one was not met, three were met, one was partially met, and one was unable to be evaluated. The DC-17 still needs to be met, as it is related to the arrangement of forms to be shown on screens differently, and the application shows the entire form on just one screen. The DC-20, which was partially met, is related to visual and audio interaction so that the user can better visualize tasks, but the application does not contain an audio mechanism. DC-22 could not evaluate it because the application was already configured with the account user and did not allow testing with first access.

Data security and privacy
It has three design considerations: two still need to be met, and one was met. DC-23 and DC-24 relate to the voice feature the application does not provide.

Metalinguistic signs
It contains four design considerations. Three were partially met, and one was not answered. Among those partially met, DC-26 is related to the availability of the virtual assistant application, which contains predefined questions and answers and does not have an Audio feature deactivation button provided after inactivation time. DC-28 is related to the availability of instructions through texts with words highlighted keys, little text provided, and large fonts. However, only those Task titles are underlined. DC-29 is related to providing help through image and audio features, but the application does not offer these features. The DC-27, which still needs to be met, is related to the audio resource that is not available.

Application E

Data Input
It has five design considerations. Three were met, and two were not met. DC-2 is related to the voice feature that is not included in the application, and DC-4 is related to the button on the keyboard to continue, which is not available.

Data Output
It has five design considerations. Three were met, and two were not met. DC-2 is related to the voice feature that is not included in the application, and DC-4 is related to the button on the keyboard to continue, which is not available. It contains 11 design considerations, of which two were met, eight had a negative result, and one had a partially met result. The DC-7 had a negative result due to the receipt arrangement not being similar to the physical one. The DC-8 is related to customizing notifications with audio, but the application does not provide this feature. DC-10, DC-11, and DC-13 are related to the voice feature that the application is not available. DC-14 is associated with the activation and deactivation of the voice mechanism; however, the application does not offer it. DC-15 is related to the availability of a graph with balance parameters and debits from sent and received Pix, which is also not provided through the application. The DC-16 is related to the favorites list. However, the list displays the most frequently used users. DC-12 was partially met, as the available icons are significant but do not provide audio or text instructions from your meaning.

Navigation
Six design considerations; among them, four had positive results, one had the result partially met, and one could not be evaluated. DC-20 is related to the visual and sound effects that the application provides in user interaction when carrying out tasks, which was partially completed, and DC-22 was unable to evaluate as the application was already configured with the user account and did not allow first access tests.

Data security and privacy
It contains three design considerations. All of them had a negative result. Considerations DC-23 and DC-24 relate to the voice feature that the application does not make available, and DC-25 is related to the automatic completion of code sent to the smartphone, which is requested to be completed manually.

Metalinguistic signs
It contains four design considerations. One was attended to, and three were partially met. DC-27 is only served in the “Pix copy and paste” function, in which an icon indicates what type of information should be entered in the input field data. DC-28 is related to the instructions made available to users with small screens, and DC-29 is associated with providing instructions through illustrations and voice resources to facilitate user understanding. However, the application does not have a voice feature.

Step 1.1 - General inspection observations

When viewing the data contained in present the keyboard corresponding to the data entry Table Design Considerations [Teran 2022], some design considerations such as DC-1, DC-3, DC-8, DC-10, DC-11, DC-13, DC-14, DC-15, DC-18, DC-19, DC-20, DC-22, DC-26, DC-27, and DC-29 are difficult to interpret, with the need to re-read the description of the design consideration for better understanding as well as descriptions in the table of design considerations that are classified into different dimensions but with similar definitions, as in DC-9 and DC-28, DC-6 and DC-29, DC-11 and DC-13.

DC-2, in its description, contextualizes the use of the voice resource in tasks to be performed in the application. However, other considerations related to voice and audio resources are specifically addressed in the other dimensions of design considerations, which results in repeat tests, regardless of the dimension classification.

In DC-5, two different functionalities are described. The first corresponds to presenting the user with previously created Pix keys, and the second corresponds to presenting the option to receive via Pix after completing the creation of a new key. Although the evidence identifies the problem of the first functionality and suggests a solution for the second functionality, this implies difficulty in understanding and consequently groups design considerations.

DC-6 and DC-12 are also correlated, as they address the size arrangement and understanding of illustrations and icons on application screens. However, DC-12 suggests proposing help through audio or texts when the user does not understand the illustration or icon.

The description of the DC-10 is not clear, which results in difficulty in understanding and re-reading the description for better understanding. A suggestion to redefine the description would be to read the data entry fields on the keyboard, in real-time, through the audio feature, to validate the correct data entry by the user.

The descriptions of the design considerations DC-11 and DC-13 are correlated in that they address data validation through the voice feature. However, DC-11 suggests the possibility of reporting an error alert on the screen if invalid data is entered.

DC-26 description contains two different features. The first is related to the provision of a virtual agent to help with the tasks to be performed, and the second is related to the provision of voice alerts after user inactivation time or when using an invalid voice command.

DC-9 and DC-28 descriptions are similar. Although DC-28 describes the importance of font size and few characters in the instructions, DC-9 discusses the same idea but focuses on the application's functionality.

The DC-29 description condenses the importance of design considerations DC-6, DC-12, and DC-20. It also generates comprehension bias when comparing data consumption in videos, which makes the purpose of using or not using videos for help instructions confusing.

The other design considerations did not allow for more than one interpretation when reading the descriptions and evidence or carrying out tests on applications.

In all five categories there are considerations related to voice and text fields, reported in the design consideration description. However, there is no subcategory informing the direction of these tests, which implies repetitions in executions.

Design considerations DC-2, DC-8, DC-10, DC-11, DC-13, DC-14, DC-20, DC-23, DC-24, DC-29 are related to audio features through notifications, data input or output.

Design considerations DC-5, DC-6, DC-7, DC-12, DC-14, DC-15, DC-16, DC-17, DC-18, DC-19, DC-20, DC-21, DC-22, DC-25, DC-27, DC-28 are related to the application layout, through responses from user interactions.

Design considerations DC-1, DC-3, DC-4, DC-9, DC-25, DC-27, and DC-29 are related to the responsiveness of using entered or validated text fields.

Step 2 - General observations of accessibility inspection with design considerations and assessment of Melo 2023 and Teran 2022

The general observations on the second test sequence were summarized more due to the author's familiarity with the considerations and experience developing the first test sequence. Overall, the successful design considerations relating to audio and visual features that the apps need to provide did not persist into the second test sequence.

In Application A and B, the test that had a ``partial'' result was design and evaluation consideration IV-3, which deals with whether the confirmation button on the native keyboard of the smartphone can be used to proceed with the task. This functionality is not available on all screens of the mentioned mobile banking.

In Applications B, C, and D, the test with a ``partial'' result was the design and evaluation consideration OV-18, which dealt with providing titles and subtitles in large fonts, with few characters and highlighted keywords throughout the application. This design and evaluation consideration facilitates the possibility of the test having a ``partial'' result, as three different functionalities are described in its description despite being directly related.

Only Application C had a ``partial'' result for design and evaluation considerations IV-1 and OV-17, which deal with adapting the mask of a data field according to its input and the similarity of the receipt with the physical document, respectively. We observed that, in some data entry fields, a mask did not adapt to the type of data entered, and the receipts generated by the Only mobile banking concentrated part of the information genuinely generated by the physical receipt.

The design and evaluation consideration with a ``partial'' outcome evidenced in Application E was OV-22, which concerns providing the option to edit the data before completing the task when performing a Pix transfer before the task completion screen. However, a screen is displayed to confirm the data. However, an edit button is available only in the value field.

The tests with an ``unable to evaluate'' result were Applications D and E, both in design and evaluation consideration IV-6. To validate the tests of this consideration, the mobile banking were installed on smartphones other than those genuinely configured. However, due to security validation reasons, it was impossible to complete the account access settings to carry out the tests in the mobile banking mentioned.

Among the five mobile banking operated, at least one test from each category of design and evaluation considerations had a ``no'' result. Around 13 tests with a ``no'' result were unanimous across all mobile banking, including in the Data Entry and Visual category, IV-7. In the Data and Audio Input category, IA-10, IA-11 and IA-12. In the Data and Visual Output category, OV-14, OV-19 and OV-26. In the Data and Audio Output category, OA-27, OA-28, OA-29, OA-30 and OA-31. In the Data Input and Data Output, Visual and Audio category, IOVA-33.

Step 3 - General observations of comparison of the Brazilian Technical Standard and design considerations of Melo 2023 and Teran 2022

The design and evaluation consideration IV-6 is implicitly related to recommendation 5.1.1.26, as IV-6 indicates the provision of a button for creating a Pix key after the first access instructions, and the recommendation suggests that the application provides guidelines in the first access of the user.

IV-8 is indirectly related to requirements 5.1.1.6 and 5.1.1.7, which expose the importance of declaring accessible names at the code level to allow screen readers to identify elements. It is important to highlight that the development process for this requirement varies depending on the technology used to develop the interface.

The description of recommendation 5.1.1.2 informs that the reason for the forms to be divided into screens is related to the responsiveness of the task view when using screen enlargement (zoom) resources. In other words, based on this recommendation, attention is directed only to viewing the form and not to the cognitive effort involved in filling it out.

On the one hand, requirement 5.1.2.6 talks about extending the period of time to perform a task and does not mention alerting the user in case of inactivity, as suggested by design and evaluation consideration IA-12. On the other hand, it is not recommended to emit sound signals that could interfere with the execution of a task, in accordance with section 5.1.2.8.

We note that no design and evaluation considerations are related to the requirement or recommendation of NBR 17060:2022 in the Media category, which condenses pre-recorded audio resources, subtitles for videos, and alternative text. The design and evaluation considerations condense similar features into the OV-16 and IOVA-33, which present animated illustrations that are easy for the user to understand and use voice assistants and animations to assist users in their tasks, respectively.