

Human Computer Interaction CS449 – CS549 Group Assignment-6

User Based Usability Testing of a Gesture Based Interactive System

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We will test the Assignment-5 system's usability with actual users in this assignment. After using the application, the users will provide comments on their experiences. Its usability must be assessed, along with the elements that influence its use and the usability problems of this program in gesture-based interaction.

Methodology

First of all, the application was tested within our group in order to identify the possible errors and bugs that could interrupt the usability testing process. During the testing we found some problems with the gesture guide images. Initially, the list containing these images was shown to the user in half, so that the user could not see the guide images completely. To solve this problem, we displayed these images in a grid-like structure.

After testing and refining the software, we created a persona to collect demographic data about the users. Our persona includes first name, last name, age, gender, education level and technical skills, personality, goals and motivations. This information helps us to better understand our users and their expectations. As a result, we can improve the software and its user experience based on their information (Canziba, 2018, p. 2). Our persona is written as follows:

Persona-1: Ashi Yilmaz

Demographics:

- Age: 24
- Gender: Female
- Education: Engineering student

- Tech Proficiency: Highly skilled in using software, coding, and exploring new tools.

Personality:

- Analytical: Detail oriented and has problem solving skills.
- Ambitious: Good grades, professional experience and wants to create a solid portfolio.

Goals and Motivations:

- Values tools that save time and enhance productivity for personal and academic projects.

Frustrations:

- Prefers tools that are intuitive and easy to learn without heavy reliance on long documentation.

After creating the persona, we received our testers' demographic information, shown in Table 1. We found six candidates, three of whom are male and three of whom are female. According to Tullis and Albert (2013, p. 117), five participants are not enough to capture the usability issues of the system. On the other hand, the small number of screens and tasks in our test environment limits the scope of our design (Tullis & Albert, 2013, p. 119).

All candidates are students at Sabancı University and our tests are held on the university campus. The age range of our users is between 22 and 26. Four of the candidates have advanced computer skills, while two of them have intermediate computer skills. Two of the respondents are studying Computer Science, one of them a double major in Computer Science (CS) and Visual Arts and Computer Design (VACD). One of the participants is studying Industrial Engineering (IE) and the other is studying Mechatronics (ME). The last candidate is a student of Data Science (DS). Also, three of the candidates were Master's students and the rest were Bachelor's students. None of our users had any experience with gesture-based applications.

Table 1. Demographic information of our candidates.

User	Age	Gender	Education	Occupation	Computer Used In Tests	Computer Skills
Müge	23	F	Master	Student	Acer Laptop	Intermediate

Dedeoğlu			(IE - FENS)			
İdil Kale	24	F	Bachelor (VACD - FASS & CS - FENS)	Student	Acer Laptop	Advanced
İlke Kanił	22	F	Bachelor (CS - FENS)	Student	Acer Laptop	Advanced
Ömer Kuyucu	23	M	Bachelor (CS - FENS)	Student	Acer Laptop	Advanced
Mohammad Imanzadeh	25	M	Master (ME - FENS)	Student	Acer Laptop	Intermediate
Ashkan Hashemi	24	M	Master (ME - FENS)	Student	Acer Laptop	Advanced

All our tests were carried out on an Acer Nitro7 gaming laptop with the following specifications: Intel Core i7 10th generation CPU, Nvidia 1660ti Geforce GTX GPU and 24GB of RAM. The laptop's front-facing camera was also used to capture the users' frames and hand movements. Once we had collected the personas, we invited our candidates one by one to the HCI lab at FASS G020. This location was chosen because it was necessary to conduct the tests in a quiet and isolated place. Before starting the test, we prepared the environment consisting of a comfortable chair, a desk and a laptop running the software we had developed and ready for testing.

During the test, as mentioned earlier, we conducted it in a quiet place and all the users were alone during the test. First, we kindly asked them to think aloud while they were experimenting with our software by saying the following: "Please say out loud what you're thinking while using the app. For example, if you're not sure how to perform a gesture or find a feature, say so. Describe what you're doing, what you expect to happen, and how you feel about the interaction. Let us know if you cannot complete a task or are unsure how to proceed. You can stop whenever you want."

After reading the previous quote, we described the tasks that the user would have to perform while testing the software. We also recorded our participants' voices so that we could analyse them more accurately later. We also took pictures of each of the participants. All the pictures are shown in Figure 1 down below:



(a)



(b)



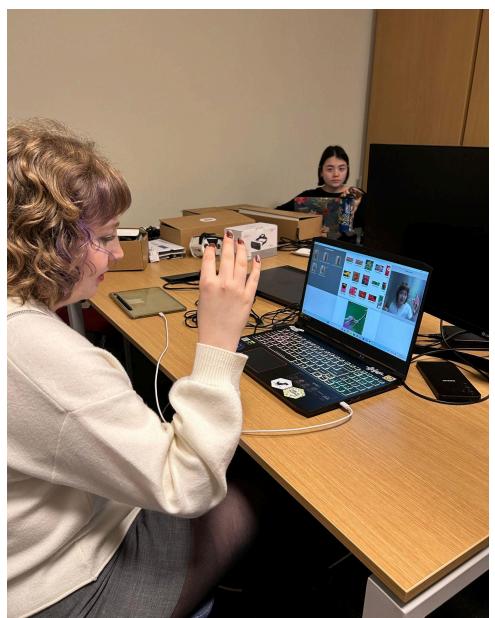
(c)



(d)



(e)



(f)

Figure 1. Images of our candidates during testing
(a) User İdil Kale during testing
(b) User Mohammad Imanzadeh during testing (c) User İlke Kanıl during testing
(d) User Ashkan Hashemi during testing (e) User Ömer Kuyucu during testing
(f) User Müge Dedeoğlu during testing

When tests were done, a questionnaire was given to each candidate that included the System Usability Scale (SUS) to assess the system's effectiveness, efficiency and satisfaction (Brooke, 1996). The SUS was prepared in a way that users are able to show their satisfaction rates through checking boxes that range from one to five, where one means "strongly disagree" and five means "strongly agree". We prepared the SUS based on the work of Brooke (1996).

Also the questionnaires were designed in a way that users can write their ideas about their overall impression, ease of learning, ease of use, efficiency, error handling, gesture functionality, navigation, aesthetic end design, challenges, improvements, satisfaction, and their final thoughts.

As mentioned earlier, we asked candidates to think aloud when interacting with the interface. After reading our think aloud statement, a series of predefined tasks were read to the users to inform them of the purpose of the software and to familiarise them with the system. These eight tasks included items such as exploring the interface, selecting the images using gestures, scrolling in four main directions (up, down, left, right) and zoom in/out tasks (See Appendix A). We also kindly asked the candidates to hover over the images and select another image to make them more familiar with the hovering functionality. We also show the user's image and the traces of their fingers in the camera frame because this feature was attractive to the development team and we thought it might be attractive to the users, as well. Therefore, in our last task we ask the participants to check the camera frame and discuss their feelings with us.

There are some reasons stating why we conducted usability testing. It is true that usability testing will help the development team to find areas that need improvement. However, usability testing will ultimately benefit the users themselves, as design decisions are made by gathering data from respondents' feedback that can be used to minimise or eliminate user frustration (Rubin & Chisnell, 2008, p. 21).

Furthermore, by conducting usability testing, the development team is able to create a historical record of usability benchmarks that can be used for future improvements and maintaining current usability standards. Getting feedback from users and developing the system accordingly will also lead to a reduction in the cost of services and support from the company. Last but not least, fixing bugs and making improvements based on users' ideas will make customers happy and can bring more new customers through their advertisements (Rubin & Chisnell, 2008, p. 22). Based on the above reasons, our development team decided to conduct a usability test on six candidates to find out which areas needed improvement.

Our aim was to find out how effective our system is and how much users tend to use the application in the future. We aimed to answer questions such as “How good or bad is our software?” or where we should focus our resources to eliminate our problems (Tullis & Albert, 2013, p. 119).

Results

In this section we report the quantitative and qualitative data collected from the users during the tests based on the recorded verbal feedback. We have reported quantitative data for each user in Table 2, consisting of task completion time, task success rate and task error rate. To collect this data, one of the team members recorded the data written in Table 2 and the other team members separately took pictures, recorded voices and made notes about the task completion rate.

Table 2. Quantitative data collected during the test for each user

User	Task Duration (mm:ss)	Task Success Rate (%)	Error Rate (%)
Müge Dedeoğlu	5:33	87.5	12.5
İdil Kale	8:20	87.5	12.5
İlke Kanlı	4:25	75	25
Ömer Kuyucu	5:11	75	25
Mohammad Imanzadeh	4:28	75	25
Ashkan Hashemi	8:13	62.5	37.5

In the following tables we will report their observations and our interpretation of the ideas and recommend the corresponding solution based on the voice recorded by the participants in the “think aloud” step, where the testers shared their ideas and emotions during the experiment, separately.

Table 3. Qualitative data collected during the test for user İlke Kanıl

Observation	Interpretation	Recommendation
She could not understand how to use the gestures	The guidance in the application is not clear	Write short description for each gesture
She had problem with scrolling in the main directions	The scroll gesture does not have flexibility	Change scroll gesture in a way that accepts more freedom in movements
She observed small delay on gesture event completion	Software is running on low number of threads	Use multithreading architecture

Table 4. Qualitative data collected during the test for user Ömer Kuyucu

Observation	Interpretation	Recommendation
He thought that zoom gesture is similar with the one on the phones	Zoom gesture is not familiar for the users	Make zoom gesture similar to the one on the phones
He mentioned that when he wants to zoom in repeatedly, zoom out happens	The delay between gestures is low	Add enough cooldown period between gestures
He had difficulty in understanding how to move the cursor	There is no guidance regarding moving the cursor	Add guidance image for cursor movement

Table 5. Qualitative data collected during the test for user Mohammad Imanzadeh

Observation	Interpretation	Recommendation
He had problem in identifying the zoom gesture	Zoom gesture guidance is not informative for the users	Create a more clear guidance for zoom gesture
He was moving his hand closely to camera, as a result the gesture detection feature was not working properly	There is no warning about how to position camera	Put a warning for camera position and improve gesture detection part

Table 6. Qualitative data collected during the test for user Müge Dedeoğlu

Observation	Interpretation	Recommendation
She didn't understand what to do at first	The guidance is not clear	Write short description on how to use the program
She performed the zoom gesture incorrectly	Zoom gesture guidance is not clear for the users	Create a more clear guidance for zoom gesture
She found the scroll up and down gestures difficult	The scroll gesture does not have flexibility	Improve scroll gesture so that there is more freedom in movements
She didn't understand how to move the cursor in the beginning	Moving the cursor is not intuitive	Add guidance on how to move the cursor

Table 7. Qualitative data collected during the test for user İdil Kale

Observation	Interpretation	Recommendation
She understood the rules easily; however, found them difficult to implement	The delay between the gestures is not sufficient, making the implementation difficult	The delay between the gestures can be increased
She had trouble scrolling down	She performed the motion quickly and it was not detected by the program	Improve scroll gesture so that there is more freedom in movements
She couldn't see the zoom gesture on the guide clearly at first	The placement of the fingers on zoom gestures is not visible enough	The images on the guide can be increased in size and a short explanation can be included

Table 8. Qualitative data collected during the test for user Ashkan Hashemi

Observation	Interpretation	Recommendation
He didn't pay attention to the gestures in the beginning	The gesture guide is not attention grabbing	The gesture image sizes can be incremented
He had trouble zooming in and out	It was difficult for him to focus on the image	Prevent clicking on other images while zooming

When he wanted to click an image, he clicked on the image under it	The cursor makes small movements making it difficult for the user to click	The cursor can be improved to be more stable
He had trouble scrolling up and down	The cooldown period between is not sufficient	Add enough cooldown period between gestures

In conclusion, the quantitative data we collected during the tests show that the performance of the participants varied in terms of task duration, success rate and error rate. The participants performed at different levels. The task durations ranged from 4:25 to 8:20, with Müge and İlke completing the tasks faster, while İdil and Ashkan took longer. However, İdil's success rate was one of the highest at 87.5%, including Müge with the same rate. On the other hand, Ashkan struggled with a lower rate of 62.5%. The other users (İlke, Mohammad and Ömer) completed the tasks with 75% accuracy in about 5 minutes. The most common problems experienced by the users during the qualitative tests are:

- Scrolling up and down is not flexible enough
- Unclear gesture guidance
- Zoom gesture including performance issues

The following paragraphs present the results of the interviews we conducted with the testers, based on the questionnaires designed to evaluate the users' experiences. The completed version of the questionnaire for each user can be found in Appendix C.

User İlke Kanıl

In the questionnaire, İlke Kanıl said that she found the app's graphical user interface (GUI) interesting and the overall experience exciting. They appreciated the idea behind the app and said that the mechanics worked well. İlke found it easy to learn the gestures and mentioned that she felt comfortable navigating through the app within a few seconds.

She described the gestures as very simple and intuitive, but the scrolling gestures, such as moving up and down and left and right, were a little difficult at first. Despite this, İlke found that the gestures helped her to complete tasks quickly and efficiently. She did not encounter any errors and found that the app did not slow down or complicate tasks.

For gesture functionality, İlke used clicking and scrolling (left to right) the most and found them effective. However, she encountered some difficulties with scrolling. She did not

mention any unnecessary gestures to remember. Navigation was smooth and she found it easy to move between images and sections, with the layout of the app supporting her workflow. In terms of design, İlke described the GUI as good, but suggested that the images could be larger to improve usability.

Challenges mainly revolved around scrolling, which İlke found hard at first and noted that it took a bit more time than expected. Therefore, she suggested improving scrolling functionality and enhancing the GUI further to provide a better user experience. Overall, İlke enjoyed using the app, stating that it made the process much easier and that they felt very satisfied while using it. She described the app as beneficial and would recommend it to others due to its strong concept and potential.

User Ömer Kuyucu

In the questionnaire, Ömer mentioned that it was a cool experience to use the software; however, at first it was difficult to use and he did not feel comfortable using the application. He mentioned that the guidance shown on the GUI was informative and it was easy to understand and learn the gestures in the application. Although Ömer found the gestures similar to those on the phone, he stated that it was a bit difficult to use all the gestures except clicking and moving the cursor. In terms of efficiency, he mentioned that the gestures did not help him as he felt that using a normal mouse was a better option. He also noticed that the application was slow at times, especially when scrolling and zooming.

He also reported some errors in the zoom and scroll gestures. For example, he noticed that when he tried to zoom in twice, he was unable to do so because the application detected that he was zooming out the second time. Furthermore, click and hover were the most used gestures for him, as he found them effective. He also found all the gestures easy to remember. Ömer wrote in the questionnaire that the GUI was so simple. He had some problems with zooming and scrolling. As a result, he told us that it would be better to improve the zoom and scroll functionality. Overall, he was satisfied with the application and mentioned that he liked the fact that he could control the GUI with his fingers and that he would recommend our application to others if the development team fixes the scrolling and zooming problem.

User Mohammad Imanzadeh

Mohammad was one of our testers who said that our application was wonderful. He mentioned that it was a new experience for him to work with gesture-based applications. He could easily learn the gestures and functionality after performing two or three of the gestures. Although clicking gestures was difficult for him, he mentioned that all the gestures were designed in an intuitive way. He mentioned that the application was efficient and he did not notice any lag or slow movements in the application. He had problems with the zooming part; however, the scrolling gestures worked for him as he mentioned that he used them more than other gestures. The interface of the application was useful to him as he stated that he could easily find everything he needed to work with the application. The only thing that Mohammad mentioned about the GUI was that it needed a bit of improvement. The only difficult gesture for him was clicking, and he told us that he would recommend our application to others.

User Ashkan Hashemi

Ashkan initially found the app somewhat confusing during the first five minutes of use. However, he quickly adapted to using gestures to complete the tasks. He noted significant difficulty with scrolling up and down, as his attempts to move in one direction occasionally triggered the opposite action, which he found frustrating. Additionally, he mentioned that the app did not provide feedback on his mistakes, leaving him unsure of how to correct them. Even though there were some challenges, Ashkan liked the interface design and particularly liked the click gesture, which he found effective and easy to use. He expressed overall enjoyment in using the app and felt satisfied upon completing the tasks.

User İdil Kale

İdil had a positive first impression of the app, finding the graphical user interface (GUI) useful and easy to understand, with a well-structured layout. She appreciated the gesture guide on the side of the screen, which made navigation more intuitive. İdil particularly enjoyed seeing her hand movements tracked in real time, which helped her to quickly grasp the functionality of the programme. She found the gestures intuitive, as they were similar to actions used in everyday life. However, she noted that they weren't as fast or efficient as using a mouse. While she appreciated the overall concept, İdil found scrolling and zooming challenging because these gestures didn't always work consistently. In particular, scrolling felt slow, which she found

frustrating. Despite these issues, she appreciated the resilience of the app, which allowed her to easily recover from mistakes without crashing or displaying errors. She also enjoyed the green trails created by her gestures, describing them as a fun and engaging feature.

User Müge Dedeoğlu

Müge felt unsure about how to use the app at first, but quickly got the hang of it, describing it as straightforward and easy to understand. Although she struggled with the gestures at first, she felt comfortable with them after a while. She mentioned that the app recognised her gestures well. However, Müge found scrolling up and down particularly challenging. She also found that the click and zoom gestures felt too similar, leading to unintended actions such as images changing when she did not mean to click. She also found that the cursor made small, jerky movements and the images changed too quickly, making tasks more difficult. She recommended reducing the sensitivity to improve this problem. Müge appreciated that mistakes could be easily corrected by returning to the previous photo. She described the app as promising and suggested that the layout could be further improved. She also recommended adding new features, such as combining images, to improve functionality. Overall, she found the experience exciting and said it was impressive to be able to complete tasks without physically touching the screen.

To summarise the users:

- Users enjoyed the gesture-based interaction and found the concept innovative and engaging,
- Scrolling up and down was found to be difficult as gestures were sometimes unresponsive,
- Zooming in and out was a challenge for some users, especially due to sensitivity issues or misinterpretation of gestures.

To evaluate the usability of our application, we prepared a questionnaire (see Appendix B) and gave it to the participants. Each participant gave a score between 0 and 40, with lower scores indicating poor usability and higher scores indicating better usability. The individual scores are as follows:

- İlke: 27
- Ömer: 24

- Mohammad: 35
- İdil: 32
- Müge: 37
- Ashkan: 25

The average score of the participants is 30 out of 40. The standard deviation is 4.97, indicating a reasonable level of variation in participants' experiences. Although most of the scores are relatively close to the average, there are clear differences, with the lowest score being 24 and the highest being 37. This means that the application is usable at a reasonable level, but there is room for improvement. While participants enjoyed some aspects of the application, such as its ease of use, likeability and learnability, issues such as gesture accuracy and guidance negatively impacted their experience and contributed to the lower scores.

Discussion and Conclusion

- **What Data Tells Us About the Application:**

The quantitative and qualitative data collected highlighted a number of usability issues with the application. Participants experienced delays and challenges in completing activities, according to quantitative data such as task time, success rate and error rate. Error rates ranged from 12.5% to 37.5%, and success rates ranged from 62.5% to 87.5%, indicating that users had problems with certain interactions. In particular, users experienced problems with certain motions such as scrolling and zooming, as well as delays in gesture recognition.

The qualitative data also reveal certain usability problems, such as difficulties in interpreting and executing gestures, poor instructions for camera positioning, and irregular gesture recognition due to insufficient cooldown times or limited gesture flexibility. These findings suggest that more responsive gesture recognition and more explicit instructions could improve the interface design and usability of the application.

- **Usability Issues and Reasons:**

The data raises a number of usability concerns, particularly around guidance, gesture interactions and system responsiveness.

Confusing Gesture Instructions: Users found it difficult to understand and use gestures, particularly for scrolling and zooming. Consistent with research on gesture-based interaction, many users found the gesture instructions to be either confusing or lacking. Users can become

dissatisfied when instructions are not clear or comprehensive enough, and confusing instructions can impact work performance (Tullis and Albert, 2013).

Flexibility and Gesture Recognition: Many users had problems with gesture recognition, especially when they moved their hands too quickly or positioned them incorrectly. This is a common problem in gesture-based systems, and indicates flaws in the application's gesture recognition implementation (Rubin & Chisnell, 2008). According to Tullis and Albert (2013), interaction systems should be able to recognise user input flexibly to accommodate different user behaviours and interaction speeds.

System Delays and Feedback: Another significant issue was the slight delay in gesture recognition, especially during scrolling and zooming. User experience research highlights the importance of low delays and prompt feedback in interactive systems (Canziba, 2018). According to user feedback, delays cause annoyance and interrupt the user's flow.

Inadequate Feedback and Help: A number of users reported being unable to move the cursor or perform certain operations, highlighting the lack of adequate textual or visual help. To avoid confusion and improve task performance, Tullis and Albert (2013) emphasise that user interfaces should provide immediate feedback to users.

- **Improvements Proposed on the Basis of User Feedback:**

Improved Gesture Control: Users behaviour implied that they had difficulty understanding the gestures, especially when scrolling and zooming. Providing more precise instructions, including short explanations for each gesture and larger images with accompanying text, is one way to address this. This improvement is consistent with research in HCI showing that task success rates increase and confusion decreases when instructions are explicit (Rubin & Chisnell, 2008).

Improved Gesture Recognition and Flexibility: To address users' concerns about gesture recognition, the gesture recognition system should be modified to allow for greater flexibility in hand movements and improved recognition at different speeds. In addition, as recommended by users, adding a cool-down interval between gestures will reduce errors caused by rapid gesture execution (Canziba, 2018).

Camera Positioning Alerts: Gesture recognition was affected by some users' hand placements. A camera position alert or guide could improve the quality of the interaction and assist users in making the correct movements. This enhancement is related to studies that emphasise the importance of context awareness in interaction design (Rubin & Chisnell, 2008).

Improved System Responsiveness: By increasing processing power, using multi-threading, and refining gesture recognition software, lag problems could be solved and the user experience improved. Responsiveness is essential to maintain user engagement and avoid annoyance, according to Tullis and Albert (2013).

User-centred Design Improvements: The application could benefit from adding more user-centred design elements, such as customisable gestures and adaptable input methods, to accommodate a wider range of users and allow them to tailor the program to their needs (Canziba, 2018). Some users also complained that it was difficult to see the images as they were sandwiched between the left and right panels. There is room for improvement in the GUI.

- **Limitations of the Study:**

Small Sample Size: The number of participants is an important drawback. With only six candidates, the sample size is tiny, which limits the applicability of the results. Five participants are often considered insufficient to identify all possible usability issues (Tullis and Albert, 2013). The findings of the study would be improved and a more comprehensive collection of feedback would be obtained from a larger sample (Tullis & Albert, 2013, p. 117).

Contextual and Demographic Homogeneity: There can be a demographic bias because all participants are students at Sabancı University. Larger user groups may not experience the same outcomes, especially those who are not in an academic environment or who have varying educational backgrounds and degrees of technological competence. The fact that the study was conducted in a single location (the university campus) and may not fully reflect how the program might be used in different contexts leads to this limitation.

Limited Task Scope: Because there are only a few screens and tasks included in the testing, the usability testing's scope is limited. According to Tullis and Albert (2013, p. 119), the design's narrow focus might not accurately reflect the system's full potential, which could lead to usability problems with untested software features being unnoticed.

References

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Appendix A - Usability Testing Tasks

- Request that users test the software as though they are by themselves.
- Take the test in a peaceful and silent setting.
- Use the same device for each person during the test.
- Keep track of users' responses while they think aloud during the test.

“Please say out loud what you're thinking as you use the app. For example, if you're not sure how to perform a gesture or find a feature, say so. Describe what you're doing, what you expect to happen, and how you feel about the interaction. Let us know if you cannot complete a task or are unsure how to proceed. You can stop whenever you want.”

Familiarize Yourself With the Application

Task 1 - Try to understand the interface and explore it.

Pick a Specific Image

Task 2 - Use gestures to scroll up-down.

Task 3 - Use gestures to scroll left-right.

Task 4 - Find an image and click to display and view it.

Zoom In and Out of an Image

Task 5 - While viewing the image, zoom in on the central part of the image.

Task 6 - While viewing the image, zoom out to return to the original size.

Scroll Through the Gallery

Task 7 - Hover over other images and select another by clicking to display it below.

Check the Camera

Task 8 - Now look at the camera. Describe your feelings.

Appendix B - Used Tools for Data Collection

Interview Questions to Assess User Experience and Usability Issues:

"Thank you for taking part in this usability test. We would like to ask you a few questions about your experience using the app. Please give us your honest opinion."

1. Overall Impression:

- What were your first impressions of the app?
- How would you describe your overall experience with the app? How did you feel?

2. Ease of Learning:

- Did you find it easy to learn how to use the gestures in the app?
- How long did it take you to feel comfortable navigating through the app?

3. Ease of Use:

- Did you find the gestures intuitive? Why or why not?
- Were there any gestures that you found difficult or confusing to perform?

4. Efficiency:

- Did you feel that the gestures helped you perform tasks quickly and efficiently?
- Were there moments where you felt the app slowed you down or made tasks more complicated?

5. Error Handling:

- Did you encounter any errors while using the app? If so, what happened?
- How did the app respond to any mistakes you made? Did it help you recover easily?

6. Gesture Functionality:

- Which gestures did you use the most, and how effective were they?
- Were there any gestures that felt unnecessary or difficult to remember?

7. Navigation:

- Was it easy to move between different images and sections of the app?
- Did the app's layout make it easy to find what you were looking for?

8. Aesthetics and Design:

- How did you feel about the app's visual design and interface?
- Did the design support or hinder your ability to complete tasks?

9. Challenges:

- What challenges or frustrations did you face while using the app?
- Were there any features or functions that didn't work as you expected?

10. Improvements:

- If you could change one thing about the app, what would it be? Why?
- Are there any additional features or improvements you think would enhance the experience?

11. Satisfaction:

- Did you enjoy using the app? Why or why not?
- What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

13. Final Thoughts:

- Is there anything else you'd like to share about your experience with the app?
- Would you recommend this app to others? Why or why not?

● SUS (System Usability Scale):

	Strongly disagree				Strongly agree
	1	2	3	4	5
1. I think that I would like to use this system frequently					
2. I found the system unnecessarily complex					

3. I thought the system was easy to use					
4. I think that I would need the support of a technical person to be able to use this system					
5. I found the various functions in this system were well integrated					
6. I thought there was too much inconsistency in this system					
7. I would imagine that most people would learn to use this system very quickly					
8. I found the system very cumbersome to use					
9. I felt very confident using the system					
10. I needed to learn a lot of things before I could get going with this system					

Appendix C - Filled Interview and Questionnaire

Usability test for İlke Kamil:

1. Overall Impression:

- What were your first impressions of the app?

I like the GUI and found it very interesting.

- How would you describe your overall experience with the app? How did you feel?

I felt excited. The idea is really good - Also the mechanism was also good.

2. Ease of Learning:

- Did you find it easy to learn how to use the gestures in the app?

Yes, it was easy.

- How long did it take you to feel comfortable navigating through the app?

A few seconds

3. Ease of Use:

- Did you find the gestures intuitive? Why or why not?

Yes, they are ~~greatly~~ ~~the~~ very simple.

- Were there any gestures that you found difficult or confusing to perform?

Scrolling ~~up~~ up-down and right-left
~~were~~ were a little bit hard -

4. Efficiency:

- Did you feel that the gestures helped you perform tasks quickly and efficiently?

Yes, very much.

- Were there moments where you felt the app slowed you down or made tasks more complicated?

No.

5. Error Handling:

- Did you encounter any errors while using the app? If so, what happened?

No

- How did the app respond to any mistakes you made? Did it help you recover easily?

There was no mistake I faced.

6. Gesture Functionality:

- Which gestures did you use the most, and how effective were they?

Clicking and scrolling from left to right

- Were there any gestures that felt unnecessary or difficult to remember?

No.

7. Navigation:

- Was it easy to move between different images and sections of the app?

Yes, it was ~~easy~~ easy

- Did the app's layout make it easy to find what you were looking for?

Yes

8. Aesthetics and Design:

- How did you feel about the app's visual design and interface?

Generally, it is good. Maybe the ~~images~~ images

could be bigger -

- Did the design support or hinder your ability to complete tasks?

Yes, the design supported to complete tasks

9. Challenges:

- o What challenges or frustrations did you face while using the app?

Scrolling was hard for me. at first.

- o Were there any features or functions that didn't work as you expected?

Scrolling took a little bit time.

10. Improvements:

- o If you could change one thing about the app, what would it be? Why?

Scrolling could be easier. And the GUI can be enhanced.

- o Are there any additional features or improvements you think would enhance the experience?

Improvement of scrolling would give a better experience

11. Satisfaction:

- o Did you enjoy using the app? Why or why not?

Yes, it makes the process much easier.

- o What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

I enjoyed very much.

13. Final Thoughts:

- o Is there anything else you'd like to share about your experience with the app?

No. It was a good experience

- o Would you recommend this app to others? Why or why not?

I would. The idea is really good and app would be beneficial really much.

- Ask subjects to complete SUS (System Usability Scale) below.

System Usability Scale

Strongly
disagree

Strongly
agree

$1, 3, 5, 7, 9 \rightarrow$ scale - 1
pos

$2, 4, 6, 8, 10 \rightarrow$ 5-scale
pos

	1	2	3	4	5	
1. I think that I would like to use this system frequently					X	$5-1 = 4$ ✓
2. I found the system unnecessarily complex	X					$5-1 = 4$ ✓
3. I thought the system was easy to use				X		$4-1 = 3$ ✓
4. I think that I would need the support of a technical person to be able to use this system		X				$5-2 = 3$ ✓
5. I found the various functions in this system were well integrated					X	$5-1 = 4$ ✓
6. I thought there was too much inconsistency in this system	X					$5-1 = 4$ ✓
7. I would imagine that most people would learn to use this system very quickly				X		$4-1 = 3$ ✓
8. I found the system very cumbersome to use	X					$5-1 = 4$ ✓
9. I felt very confident using the system					X	$5-1 = 4$ ✓
10. I needed to learn a lot of things before I could get going with this system	X					$5-1 = 4$ ✓

Usability test for Ömer Kuyucu:

S. 425

Ömer Kuyucu

1. Overall Impression:

- o What were your first impressions of the app?

I was cool.

- o How would you describe your overall experience with the app? How did you feel?

I was cool but hard to use

2. Ease of Learning:

- o Did you find it easy to learn how to use the gestures in the app?

I was easy to learn, hard to use.

- o How long did it take you to feel comfortable navigating through the app?

I never felt truly comfortable but it was ok throughout the end.

3. Ease of Use:

- o Did you find the gestures intuitive? Why or why not?

Yes, similar to phones etc.

- o Were there any gestures that you found difficult or confusing to perform?

All of them except click and move cursor.

4. Efficiency:

- o Did you feel that the gestures helped you perform tasks quickly and efficiently?

No, I could've done it faster using regular mouse.

- Were there moments where you felt the app slowed you down or made tasks more complicated?

When I'm zooming and scrolling yes.

5. Error Handling:

- Did you encounter any errors while using the app? If so, what happened?

Errors with zoom in/out, scroll left/right/up/down.

- When I'm trying to zoom in twice, I can't because it zooms out
when I'm trying zoom in again
- How did the app respond to any mistakes you made? Did it help you recover easily?

No.

6. Gesture Functionality:

- Which gestures did you use the most, and how effective were they?

Moving my cursor and clicks. Very effective.

- Were there any gestures that felt unnecessary or difficult to remember?

No

7. Navigation:

- Was it easy to move between different images and sections of the app?

Yes

- Did the app's layout make it easy to find what you were looking for?

~~No~~ & I think better idea would be to point my cursor to the top right when I'm trying to scroll right.

8. Aesthetics and Design:

- How did you feel about the app's visual design and interface?

It was very basic.

- Did the design support or hinder your ability to complete tasks?

9. Challenges:

- o What challenges or frustrations did you face while using the app?

zooming / scrolling

- o Were there any features or functions that didn't work as you expected?

zooming / scrolling

10. Improvements:

- o If you could change one thing about the app, what would it be? Why?

zooming and scrolling gestures.

- o Are there any additional features or improvements you think would enhance the experience?

I started in 7b.

11. Satisfaction:

- o Did you enjoy using the app? Why or why not?

Yes, it's cool to see my fingers

- o What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

↓
lost impression

↓
when clicking

↓
when zooming /
scrolling

13. Final Thoughts:

- o Is there anything else you'd like to share about your experience with the app?

No

- o Would you recommend this app to others? Why or why not?

Yes, if zoom issue is fixed.

- Ask subjects to complete SUS (System Usability Scale) below.

System Usability Scale Strongly
 disagree

Strongly
agree

1, 3, 5, 7, 9 → scale - 1
pos

2, 4, 6, 8, 10 → 5- scale
pos

	1	2	3	4	5	
1. I think that I would like to use this system frequently		X				5-2 = 3 ✓
2. I found the system unnecessarily complex	X					5-1 = 4 ✓
3. I thought the system was easy to use				X		5-4 = 1 ✓
4. I think that I would need the support of a technical person to be able to use this system	X					5-1 = 4 ✓
5. I found the various functions in this system were well integrated		X				5-2 = 3 ✓
6. I thought there was too much inconsistency in this system					X	5-5 = 0
7. I would imagine that most people would learn to use this system very quickly			X			5-3 = 2 ✓
8. I found the system very cumbersome to use					X	5-5 = 0
9. I felt very confident using the system		X				5-2 = 3 ✓
10. I needed to learn a lot of things before I could get going with this system	X					5-1 = 4 ✓

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Usability test for Mohammad Imazadeh:

Mohammad Imazadeh

1. Overall Impression:

- o What were your first impressions of the app?

It seems wonderful and smart!

- o How would you describe your overall experience with the app? How did you feel?

It was new experience for me
to use app like this.

2. Ease of Learning:

- o Did you find it easy to learn how to use the gestures in the app?

Yes, After 2-3 try I could do
it in the best way

- o How long did it take you to feel comfortable navigating through the app?

At least 5 min

3. Ease of Use:

- o Did you find the gestures intuitive? Why or why not?

Definitely yes

- o Were there any gestures that you found difficult or confusing to perform?

Maybe the click is a little difficult
for me.

4. Efficiency:

- o Did you feel that the gestures helped you perform tasks quickly and efficiently?

exactly

- Were there moments where you felt the app slowed you down or made tasks more complicated?

actually not.

5. Error Handling:

- Did you encounter any errors while using the app? If so, what happened?

maybe for zooming in and out.

- How did the app respond to any mistakes you made? Did it help you recover easily?

Maybe it is slow in this case

6. Gesture Functionality:

- Which gestures did you use the most, and how effective were they?

scrolling right and left

- Were there any gestures that felt unnecessary or difficult to remember?

clicking was a little difficult for me.

7. Navigation:

- Was it easy to move between different images and sections of the app?

Yes, exactly

- Did the app's layout make it easy to find what you were looking for?

Yes, it did.

8. Aesthetics and Design:

- How did you feel about the app's visual design and interface?

It's nice but maybe it can be better :)

- Did the design support or hinder your ability to complete tasks?

Yes, it did

9. Challenges:

- o What challenges or frustrations did you face while using the app?

Nothing else

- o Were there any features or functions that didn't work as you expected?

No,

10. Improvements:

- o If you could change one thing about the app, what would it be? Why?

clicking gesture is difficult and by its application it can be easier.

- o Are there any additional features or improvements you think would enhance the experience?

-

11. Satisfaction:

- o Did you enjoy using the app? Why or why not?

Yes, that is so interesting for me.

- o What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

excitement

13. Final Thoughts:

- o Is there anything else you'd like to share about your experience with the app?

No, there isn't

- o Would you recommend this app to others? Why or why not?

Yes why not.

- Ask subjects to complete SUS (System Usability Scale) below.

System Usability Scale

Strongly
disagree

Strongly
agree

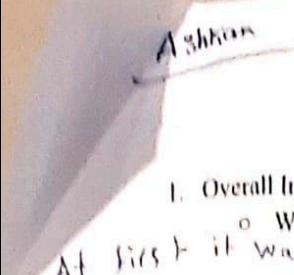
1, 3, 5, 7, 9 → Scale - 1
pos

2, 4, 6, 8, 10 → 5 - scale
pos

	1	2	3	4	5	
1. I think that I would like to use this system frequently					✓	5-1 = 4
2. I found the system unnecessarily complex		✓				5-2 = 3
3. I thought the system was easy to use				✓		4-1 = 3
4. I think that I would need the support of a technical person to be able to use this system		✓				5-2 = 3
5. I found the various functions in this system were well integrated					✓	5-1 = 4
6. I thought there was too much inconsistency in this system		✓				5-2 = 3
7. I would imagine that most people would learn to use this system very quickly				✓		4-1 = 3
8. I found the system very cumbersome to use	✓					5-1 = 4
9. I felt very confident using the system					✓	5-1 = 4
10. I needed to learn a lot of things before I could get going with this system	✓					5-1 = 4

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Usability test for Ashkan Hashemi:

 Ashkan

1. Overall Impression:

- o What were your first impressions of the app?
At first it was a little bit confusing to work with it but after some minutes it ~~was~~ was great.

o How would you describe your overall experience with the app? How did you feel?
It was really fresh and new so it was a very nice experience.

2. Ease of Learning:

- o Did you find it easy to learn how to use the gestures in the app?
Yes because after 5 minutes it was understandable to use the gestures.
- o How long did it take you to feel comfortable navigating through the app?
5 minutes.

3. Ease of Use:

- o Did you find the gestures intuitive? Why or why not?
I think scrolling up and down is
Yes; Because it was described below the gestures on how to use them in order to get what we want.
- o Were there any gestures that you found difficult or confusing to perform?
I think scrolling up and down is difficult because sometime the direction might be the opposite of what we wanted.

4. Efficiency:

- o Did you feel that the gestures helped you perform tasks quickly and efficiently?
Absolutely, it was very sufficient to use.

- o Were there moments where you felt the app slowed you down or made tasks more complicated?

Yes; when I wanted to scroll up and down it was a little bit slow for me.

5. Error Handling:

- o Did you encounter any errors while using the app? If so, what happened?

No.

- o How did the app respond to any mistakes you made? Did it help you recover easily?

Actually there was not any response from the app about my mistakes.

6. Gesture Functionality:

- o Which gestures did you use the most, and how effective were they?

clicking and it was the most sufficient and effective.

- o Were there any gestures that felt unnecessary or difficult to remember?

scrolling up and down was very difficult.

7. Navigation:

- o Was it easy to move between different images and sections of the app?

As I have mentioned before, only scrolling up and down was difficult.

- o Did the app's layout make it easy to find what you were looking for?

Not really.

8. Aesthetics and Design:

- o How did you feel about the app's visual design and interface?

It was perfectly designed and the interface was pretty good as well.

- o Did the design support or hinder your ability to complete tasks?

there was no response from it.

9. Challenges:

- o What challenges or frustrations did you face while using the app?

Scrolling up and down was frustrating.

- o Were there any features or functions that didn't work as you expected?

Scanning up and down.

10. Improvements:

- o If you could change one thing about the app, what would it be? Why?

Identifying on Scrolling up and down and hovering from images.

- o Are there any additional features or improvements you think would enhance the experience?

Nothing that I could add to improve.

11. Satisfaction:

- o Did you enjoy using the app? Why or why not?

Yes; I actually used something similar to this app myself, so it was enjoyable doing it again.

- o What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

Satisfaction and frustration.

13. Final Thoughts:

- o Is there anything else you'd like to share about your experience with the app?

The app was at its finest.

- o Would you recommend this app to others? Why or why not?

Yes; because it was a really new idea to use gesture in order to get to an image you want to check.

- Ask subjects to complete SUS (System Usability Scale) below.

System Usability Scale

Strongly
disagree

Strongly
agree 

	1	2	3	4	5	
-	1. I think that I would like to use this system frequently		✓			$3-1=2$ ✓
-	2. I found the system unnecessarily complex	✓				$5-2=3$ ✓
+	3. I thought the system was easy to use			✓		$4-1=3$ ✓
-	4. I think that I would need the support of a technical person to be able to use this system	✓				$5-4=1$ ✓
+	5. I found the various functions in this system were well integrated		✓			$3-1=2$ ✓
-	6. I thought there was too much inconsistency in this system	✓				$5-1=4$ ✓
+	7. I would imagine that most people would learn to use this system very quickly				✓	$5-1=4$ ✓
-	8. I found the system very cumbersome to use			✓		$4-1=3$ ✓
+	9. I felt very confident using the system	✓	.			$1-1=0$
-	10. I needed to learn a lot of things before I could get going with this system				✓	$5-5=0$

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Usability test for Müge Dededoğlu:

1. Overall Impression:	7/10
o What were your first impressions of the app?	
I didn't understand what was going on first, but I figured out fast, it is understandable.	
o How would you describe your overall experience with the app? How did you feel?	
It is good and it understands my gestures very well too. I felt like this can be something we will use in future.	
2. Ease of Learning:	
o Did you find it easy to learn how to use the gestures in the app?	
Yes, only in the scroll up and down part, it was hard.	
o How long did it take you to feel comfortable navigating through the app?	
When I understood the gestures. I felt comfortable just quickly.	
3. Ease of Use:	
o Did you find the gestures intuitive? Why or why not?	
I understand intuitively.	
o Were there any gestures that you found difficult or confusing to perform?	
Scroll up and down. Click and zoom are similar.	
4. Efficiency:	
o Did you feel that the gestures helped you perform tasks quickly and efficiently?	
Yes, it was easier.	

- o Were there moments where you felt the app slowed you down or made tasks more complicated?

No I think sometimes the mouse moves a lot and Pictures change fast.

5. Error Handling:

- o Did you encounter any errors while using the app? If so, what happened?

Pictures changed even though I didn't click.

- o How did the app respond to any mistakes you made? Did it help you recover easily?

Yes, I can go back to old picture.

6. Gesture Functionality:

- o Which gestures did you use the most, and how effective were they?

I used zoom out and in, if is effective but it say zooming out and zooming in

- o Were there any gestures that felt unnecessary or difficult to remember?

No.

7. Navigation:

- o Was it easy to move between different images and sections of the app?

Yes.

- o Did the app's layout make it easy to find what you were looking for?

Yes, but it can be improved

8. Aesthetics and Design:

- o How did you feel about the app's visual design and interface?

It looks promising.

- o Did the design support or hinder your ability to complete tasks?

No.

9. Challenges:

- o What challenges or frustrations did you face while using the app?

There weren't challenges or frustrations.

- o Were there any features or functions that didn't work as you expected?

No.

10. Improvements:

- o If you could change one thing about the app, what would it be? Why?

I think sensitivity should be reduced.

- o Are there any additional features or improvements you think would enhance the experience?

Maybe, new features like combining photos

11. Satisfaction:

- o Did you enjoy using the app? Why or why not?

Yes, it is not something I tried before.

- o What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

Excitement.

13. Final Thoughts:

- o Is there anything else you'd like to share about your experience with the app?

No.

- o Would you recommend this app to others? Why or why not?

Yes, because without touching the screen you can do a lot of things

- Ask subjects to complete SUS (System Usability Scale) below.

System Usability Scale Strongly
 disagree

Strongly
agree

	1	2	3	4	5	
1. I think that I would like to use this system frequently				X		6-1=3✓
2. I found the system unnecessarily complex	X					5-1=1✓
3. I thought the system was easy to use				X		5-1=0✓
4. I think that I would need the support of a technical person to be able to use this system	X					5-1=0✓
5. I found the various functions in this system were well integrated				X	X	5-1=0✓
6. I thought there was too much inconsistency in this system	X					5-2=3✓
7. I would imagine that most people would learn to use this system very quickly					X	5-1=0✓
8. I found the system very cumbersome to use	X					5-1=0✓
9. I felt very confident using the system				X		6-1=3✓
10. I needed to learn a lot of things before I could get going with this system	X					5-1=0✓

Usability test for İdil Kale:

1. Overall Impression:

- o What were your first impressions of the app?
CRM was very useful and understandable. I liked seeing how my hand was traced. The rules were easy to understand and I liked that the rules were always on the screen.
- o How would you describe your overall experience with the app? How did you feel?
The rules were easy to understand, but sometimes difficult to apply. Seeing how my hand was traced and tracked made using the program a lot faster.

2. Ease of Learning:

- o Did you find it easy to learn how to use the gestures in the app?
Yes, they were easy to understand. Having them always on screen made my job easier.
- o How long did it take you to feel comfortable navigating through the app?
It took me a short time to understand, but it took me a little longer to do it well.

3. Ease of Use:

- o Did you find the gestures intuitive? Why or why not?
Yes, because the gestures we use in our daily lives.
- o Were there any gestures that you found difficult or confusing to perform?
Up and down as well as zoom in and zoom out.

4. Efficiency:

- o Did you feel that the gestures helped you perform tasks quickly and efficiently?
It probably wasn't as fast or efficient as using a mouse.

- o Were there moments where you felt the app slowed you down or made tasks more complicated?

I felt it slows down when I was trying to get the page down and when I was trying to get it up.

5. Error Handling:

- o Did you encounter any errors while using the app? If so, what happened?

I did not encounter any errors.

- o How did the app respond to any mistakes you made? Did it help you recover easily?

It was easy to recover as it did not stop work or give any errors.

6. Gesture Functionality:

- o Which gestures did you use the most, and how effective were they?

Since I couldn't do the long press and dragging part completely, I spent most of my time on it. I guess it wasn't very effective.

- o Were there any gestures that felt unnecessary or difficult to remember?

No, there weren't any.

7. Navigation:

- o Was it easy to move between different images and sections of the app?

It wasn't so easy.

- o Did the app's layout make it easy to find what you were looking for?

Yes, it was very structured and easy to find.

8. Aesthetics and Design:

- o How did you feel about the app's visual design and interface?

It was ~~was~~ very structured and ~~was~~ well planned.

- o Did the design support or hinder your ability to complete tasks?

It supported.

9. Challenges:

- o What challenges or frustrations did you face while using the app?
The parts of going up and down were difficult also zoom in and out.
- o Were there any features or functions that didn't work as you expected?
Up and down part.

10. Improvements:

- o If you could change one thing about the app, what would it be? Why?

Up and down scrolling because it was hard to manage.

- o Are there any additional features or improvements you think would enhance the experience?

Maybe changing some features would make better since the movements are opposite to each other when the previous movement is repeated to perform another. Since the movement, the system does not give the reaction.

11. Satisfaction:

- o Did you enjoy using the app? Why or why not? I expected.

Yes I really enjoy. Because it wasn't something that I tried before.

- o What emotions did you feel while using the app (e.g., satisfaction, frustration, excitement)?

First, excitement and then a little bit frustration but at the end I was proud with myself.

13. Final Thoughts:

- o Is there anything else you'd like to share about your experience with the app?

I also remembered this. I made a mistake because zooming in and out with three fingers is a little different from what we use in daily life.

- o Would you recommend this app to others? Why or why not?

Yes. Because it is an unusual and new app.

- Ask subjects to complete SUS (System Usability Scale) below.

System Usability Scale	Strongly disagree	Strongly agree
------------------------	----------------------	-------------------

	1	2	3	4	5	pos
1. I think that I would like to use this system frequently			X			3-1-2✓
2. I found the system unnecessarily complex	X					5-1-1✓
3. I thought the system was easy to use				X		4-1-3✓
4. I think that I would need the support of a technical person to be able to use this system	X					5-1-4✓
5. I found the various functions in this system were well integrated			X			3-1-2✓
6. I thought there was too much inconsistency in this system	X					5-1-6✓
7. I would imagine that most people would learn to use this system very quickly			X			3-1-2✓
8. I found the system very cumbersome to use	X					5-1-4✓
9. I felt very confident using the system				X		4-1-3✓
10. I needed to learn a lot of things before I could get going with this system	X					5-1-4✓