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# U S A B I L I T Y   R E P O R T

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**DATE:** April 24, 2021  
**TO:** Dr. Hundhausen, CptS 443/543 Instructor  
**FROM:** Jingyuan Huang, Chaowen Ran, Minjian Li, Bowen Wan, Xi Jiang, Zhifu Yang, HCI Consultants  
**RE:** International Center Platform Usability Test  
**HIGHLIGHTS VIDEO URL:** <https://youtu.be/a3yryVPPCKI>

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## SUMMARY

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### *Purpose and Scope*

On April 21st through 22nd, we conducted a usability study of the International Center Platform, which enables one to enrich the experience of different cultures by joining in various activities, matching and chatting with recommendation friends, creating individual events, and finishing surveys that help the center provide better activities. In the study, participants used a smartphone to walk through several tasks on a high-fidelity prototype in order to experience the core functionality of the software. Background questionnaires and exit questionnaires were employed in the study to extract data that reveal issues and uncover opportunities to help us exploit a platform with better user experience.

### *Methods*

We recruited three participants for this preliminary usability study. All participants are WSU students, where two of them are bilingual. Each of them is recruited as a representative of master, bachelor, and PhD students, respectively.

We ran the study in three participants' apartments, where there is a computer, a video camera, and a smartphone. The computer is to display questionnaires and task requirement of the study; the camera is to record all details during the usability study, and the smartphone is used for the performance of our platform. All video records are captured manually because of the lack of a tripod. Only one participant, one observer, and one camera operator are allowed in each test run. The observer and the camera operator stand behind participants to avoid putting pressure on them.

We allotted 30 minutes for each study session. At the beginning of the test, participants filled out an on-line background questionnaire. See Appendix A for a copy of the questions and their responses. Next, they asked to think aloud while they explored the International Center Platform interface.

After the on-line background questionnaire, participants were asked to use International Center Platform to complete a series of five tasks. See Appendix B for a copy of the original task sheet that participants received for the test. As they worked through these tasks, participants were instructed to think aloud by verbalizing their thoughts and actions. If they became silent, or if it was unclear what they were up to, they were prompted to explain what they were doing.

Upon completion of the tasks, participants filled out an exit questionnaire that solicited their impressions of International Center Platform Software. Appendix C includes the exit questionnaire and participants' responses.

## FINDINGS

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### Overview

The design of the International Center Platform received eight or a higher score on ease of use, learnability, and usefulness, which fulfills the expectation on our user experience goals (See table 1 from tuple 1 to tuple 3). In particular, all participants gave a full score for usefulness. On the contrary, the design satisfies a completion rate of 60% of the usability goals, where the usability goals can be found on table 1 from tuple 4 to tuple 8. The completion rate, written as  $CR$ , is calculated by formula (1), where  $n$  is the number of tasks,  $T_i$  denotes the  $i$ -th task, and  $P(T_i)$  is the percentage of participants who completed task  $T_i$  on time.

$$CR = \sum_{i=1}^n \frac{1}{n} \cdot P(T_i) \quad (1)$$

Overall, the design of the International Center Platform can be considered a success on user experience goals, while the design needs improvement on usability goals, especially on task 3.

*Table 1. Summary of key results vis-à-vis the usability and user experience goals we established for our software.*

Usability or U.E. Goal	Relevant Empirical Result	Commentary
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The average rated score of ease of use must be 8 out of 10 or higher.	Participant 1 (score): 10.00 Participant 2 (score): 10.00 Participant 3 (score): 8.00 Average: 9.33	Satisfied.
The average rated score of learnability must be 8 out of 10 or higher.	Participant 1 (score): 10.00 Participant 2 (score): 10.00 Participant 3 (score): 9.00 Average: 9.67	Satisfied.
The average rated score of usefulness must be 8 out of 10 or higher.	Participant 1 (score): 10.00 Participant 2 (score): 10.00 Participant 3 (score): 10.00 Average: 10.00	Satisfied. Participants commented that they will use the software again.
Users must be able to set personal information within two minutes (Task 1).	Participant 1 : 38 sec Participant 2 : 66 sec Participant 3 : 105 sec Average: ≈70 sec	Satisfied.
Users must be able to sign up for an event in 60 seconds (Task 2).	Participant 1 : 11 sec Participant 2 : 34 sec Participant 3 : 133 sec Average: ≈59 sec	Consider to be unsatisfied. Participant 3 spent more than two minutes on task execution.
Users must be able to find a matched person and then sent a chat request to that person in 60 seconds (Task 3).	Participant 1 : N/A sec Participant 2 : 54 sec Participant 3 : 58 sec Average: N/A sec	Consider to be unsatisfied. Participant 1 gave up after a few tries because of the technical issue of the platform. As a result, task was ceased and the execution time of participant 1 is not available.
Users must be able to apply for a new activity within two minutes (Task 4).	Participant 1 : 40 sec Participant 2 : 145 sec Participant 3 : 153 sec Average: ≈113 sec	Unsatisfied. Participant 2 and C were not able to finish the task on time.

Users must be able to find a specific questionnaire and then submit the result of that questionnaire in 45 second (Task 5). (The questionnaire is pre-designed so that users take fixed time to answer all questions.)	Participant 1 : 38 sec Participant 2 : 51 sec Participant 3 : 60 sec Average: ≈50 sec	Unsatisfied.  Participant 1 is the only one who finished the task on time.
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*Remarks: The time spent on reading task requirement is not included in the result.*

We begin each subsection below with a brief description of the user subtask to which the problems listed in the subsection pertain. Next, in order of decreasing severity, we describe the associated usability problems, and provide “Severity” and “Scope” ratings<sup>1</sup> based on the empirical evidence. Following the problems, we cite evidence of each problem based on our analysis of the usability study. Each subsection concludes with specific design recommendations that we believe will remedy the problems.

## 1. Profile Set Up

In this task, the participant is assigned to set up the personal information and profile picture for the first-time login. At the beginning of the task, a test account with a password is given to the participants in order to log in to the platform. After login, participants will type in the personal information and choose a profile picture on system page 1 and system page 2, respectively. The title of page 1 and 2 are simply called “Setting”. While in system page 2, participants have to tap the “Finished” button to complete this task.

### *Problems:*

1. Assigned with setting up personal information and profile picture in two different pages, users may be confused by the page title. They may shortly think about what actions should be performed at the current system page (Severity = 3, Scope = 3).
2. On system page 2, the page of profile settings, users may tap “Nickname”, which is not a button. (Severity = improvement, Scope = 3).

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<sup>1</sup> Severity indicates the level of difficulty that the problem caused users (1 = most severe). Scope indicates the range of users that the problem is likely to impact (1 = broadest). See Appendix E for precise definitions of these terms.

### *Evidence:*

One of three participants (P1<sup>2</sup>) has experienced problem one. P1 expressed hesitation using term “Uh” before he decided to start from typing in his nickname. Besides, one of three participants (P3) has experienced problem two. Despite the fact that “Nickname” under the profile picture is designed to be a plain text reminding users what they have typed in as their nickname, P3 treated it as a button.

### *Diagnosis:*

1. It is possible that the interface is suffering from human perception bias (Johnson, chapter 1). Participants consider the page title “Setting” as options of system setting rather than personal information setting until they read the first personal information setting options. The situation may cause a short period of hesitation before the action performance, as participants are forced to shift the concept from one to another.
2. According to the related concept of cognitive walkthrough (Norman, 1989), design purposes are obvious to designers but may be hidden from the users’ perspective. From the designers’ point of view, the purpose of placing the nickname under the picture is to remind users what they have typed in as a nickname, which will not hinder users from performing the task. However, from the users’ point of view, they may identify the nickname as a button, a system functionality allowing users to change the nickname.

### *Recommendations:*

1. To avoid ambiguity, the page title is changed from “Setting” to “Personal Information Setting” in order to describe the current page better. Figure 1.1 is presenting the adjustment.

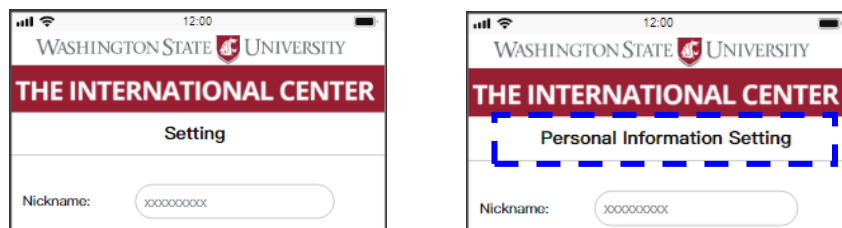


Figure 1.1 the page is changed to avoid ambiguity. Original interface (left). Modified interface (right)

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<sup>2</sup> When we cite evidence, we indicate the numbers of the actual participants who experienced the problem. If you are interested in further exploring the nature of each problem, you are invited to check the Critical Incidents Log (Appendix D) and to look at the videotapes. The Critical Incident Log contains a separate sheet for each participant. Each entry indicates the approximate time (from the start of the videotape) of the corresponding critical incident. You can use this number to index the videotape.

2. The interface is modified by removing the “Nickname” from the page. Nickname is irrelevant to the theme of a profile picture setting page. The elimination of the element helps users focus on current stage of the task. If users need to modify the nickname, they can press the “Back” button to return to the previous page. The adjustment is shown in figure 1.2.

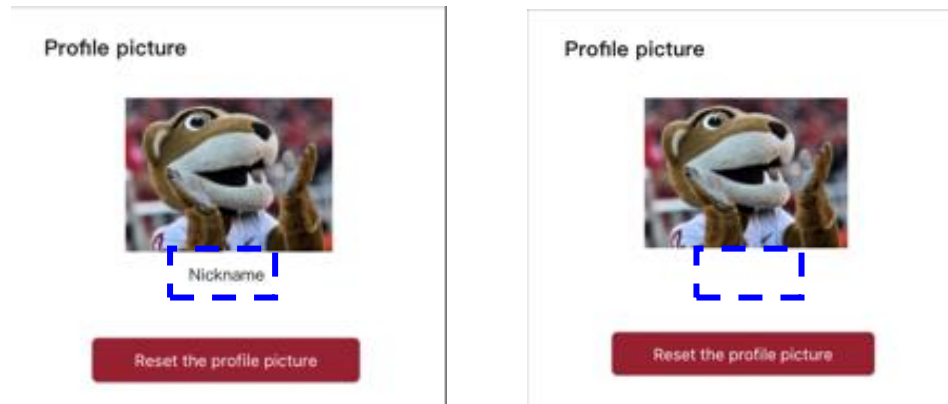


Figure 1.2 remove “Nickname” from the interface. Original interface (left). Modified interface (right)

## 2. Event Hunting and Joining

In this task, participants are assigned to hunt and sign up for the event that they are interested in. The participant needs to tap the button “Click for More Information” along with the posted event to start the sign-up process. Participants also need to select payment type and pay for the application fee during the sign-up process. The best strategy to complete the task is to search events from the recommendation list on the homepage, while the standard one is to start from the “Events” page. Note that in this task, the platform does not charge any fee from the participant in reality, and we do not ask the participant to enter any private information on the payment page; it is simply an interface simulation process.

### *Problems:*

1. Assigned with event hunting as the beginning of the task, participants may fail to locate the event exhibition block. They may guess an incorrect page as the start point of the task. (Severity = 2, Scope = 2).
2. Since there are two strategies to finish the task, participants can basically accomplish this task via activities listed on the recommendation section. Based on the observation, participants may not notice that there is a recommendation section on homepage. (Severity = 2, Scope = 2)
3. After the payment, the participant may not sure whether the event has been successfully signed up or not. (Severity = 2, Scope = 1)

### *Evidence:*

Two of three participants (P2, P3) have experienced problem one. Term “So” and “Guess” was presented by P2 expressing lost. P3 was dragging the page up and down, looking for the start point of the task. A few seconds later, P3 was searching items on homepage and then tapped into an incorrect page. Besides, two of three participants (P2, P3) have experienced problem two. P1 is the only one that directly signed up for the event via recommendation section on homepage. Three of three participants (P1, P2, and P3) have experienced problem three. A period of silence shows after P1 and P3 finished the payment, since they are checking the task requirement to confirm the completion of the task. P2 asks the observer that if the event has already been signed up.

### *Diagnosis:*

1. Participants are struggling to figure out the start point of the task, or even getting into an unexpected page. In fact, activities are listed on the homepage. With the purpose of attracting attention from users, the area displaying the events occupies almost 50% of the interface. However, participants mainly focus on their goal (Johnson, chapter 8), and therefore, they are probably not able to see the listed events.
2. The situation is that participants may complete the task in an inefficient method. This issue shares the same factor with problem one, that is, users are not able to detect objects but task goals. Also, it is possible that the section title “Recommended Event’s” is suffering from the problem of discriminability of colors (Johnson, chapter 4). Participants are not able to detect the section title because the color of it is crimson, same as the theme color of the interface.
3. It is possible that the platform is suffering from the lack of system feedback. According to the fundamental principles of interaction (Norman, 1989), the lack of system feedback increases the risk of the Gulf of Evaluation. As the result of the lack of system feedback, the Gulf of Evaluation happened, and participants confuse whether their actions lead to their goal.

### *Recommendations:*

1. Add “More Events” button on the opposite side of “Recommended Events” reducing the time on discovering the events section on the homepage. See figure 2.1.

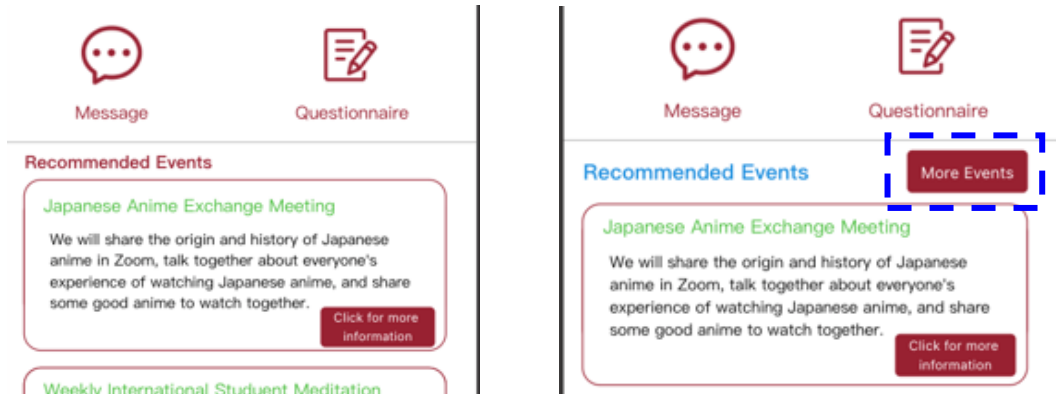


Figure 2.1 “More Events” button is added to the interface. Original interface (left). Modified interface (right)

2. Highlight the section title “Recommended Events” with another color to make it more detectable. The color of the title is changed from crimson to azure. See changes in figure 2.2.

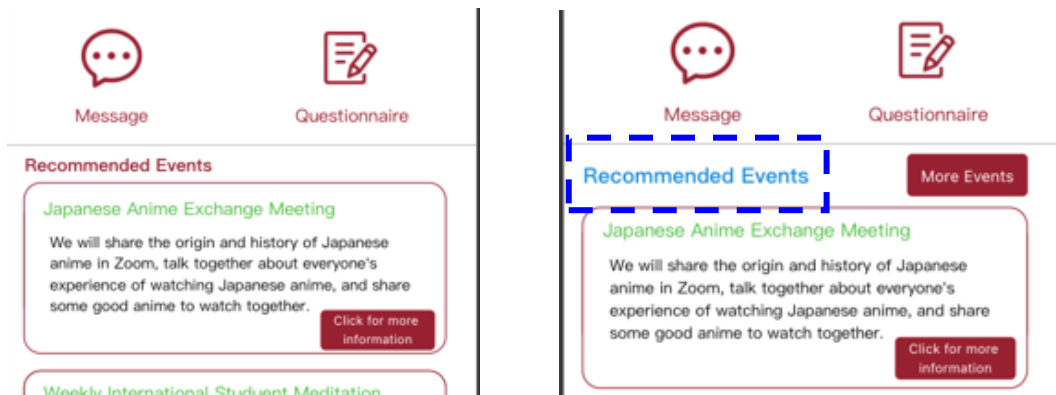


Figure 2.2 the color of the section title is changed from crimson to azure. Original interface (left). Modified interface (right)

3. Add a system feedback page to notify users that they have successfully signed up for the event. The added page will show system message at the center and an “OK” button under the message. See figure 2.3.1 and figure 2.3.2 below.



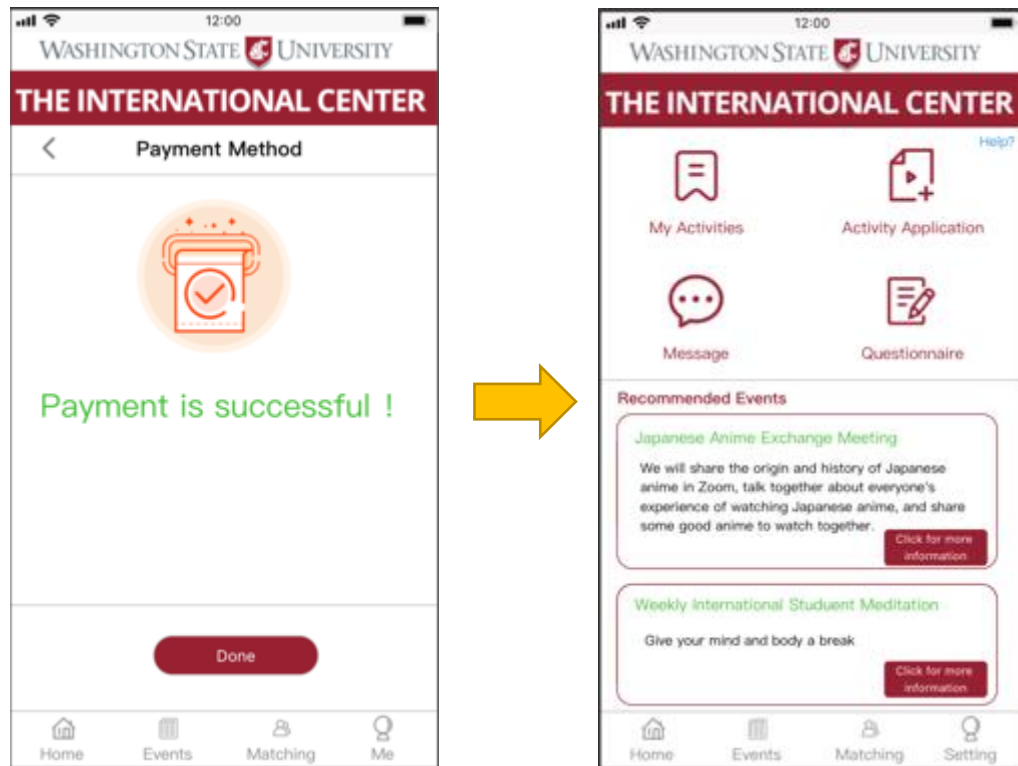


Figure 2.3.1 system progress before adding the system feedback

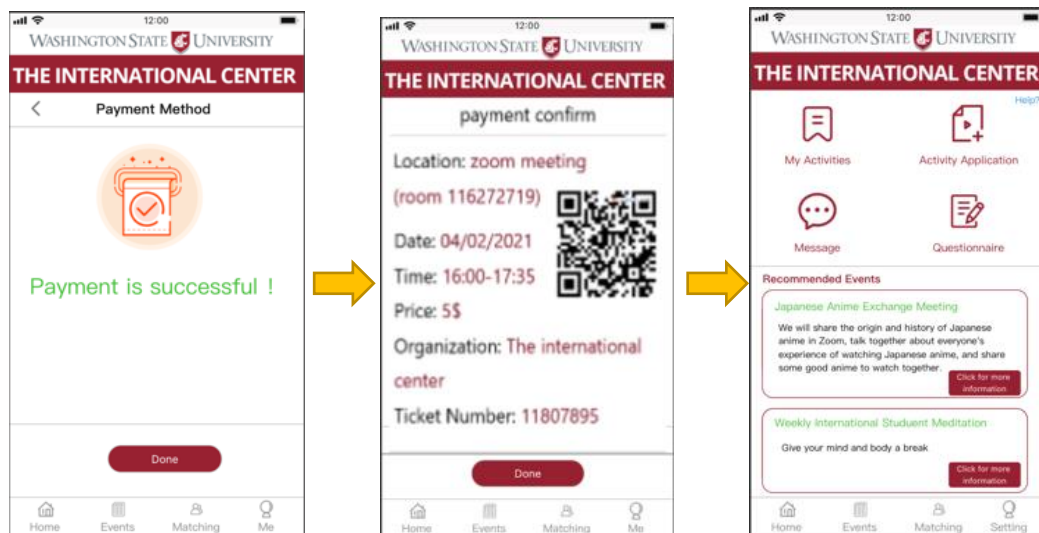


Figure 2.3.2 system progress after adding the system feedback

### 3. Friend Matching

In this task, participants are assigned to send a chat request to a recommended friend. With this task, participants are required to open up the “Matching” page found at the bottom of the page. Inside “Matching”, participants should tap the person they are interested in sending out a chat request. After tapping a person, a confirmation window pops up asking if the user really want to send out the request. If needed, the participant can press the refresh button on the right-hand-side corner of the page to have a new list of recommendation friends. The bias of the matching system is based on the profile setting of the participant. The algorithm matches users with someone who shares the language background with them.

#### *Problems:*

1. The design concept for sending out chat request is to tap the person on the recommendation list instead of tapping a button. By observation, participants may have trouble when they are trying to send out a chat request. Participants may give up after a few tries. (Severity = 1, Scope = 2)
2. The task is finished once the chat request is sent out. Participants may do the task over to send a message to others. (Severity = 2, Scope = 3)

#### *Evidence:*








Two of three participants (P1, P2) have experienced problem one. P1 was frequently and repeatedly tapping the screen without a specific target, but the system do not process. Then P1 give up and continue to the next task. The system does not progress until P2 tapped on the “OK” button on the confirmation window for the third time. Besides, two of three participants (P2, P3) have experienced problem two. P2 puts effort to figure out task 3 completed. P3 keeps sending out messages to a person, and does not realize the completion of the task until a hint is sent out by the observer.

#### *Diagnosis:*

1. According to the evidence, one of the participants taps the screen several times without targeting a specific place, while another participant multiply taps the button on the confirmation window to progress. It is possible that participants are suffering from the Gulf of evaluation. According to Norman text, system feedback should be immediate. The delay of system feedback leads to the Gulf of evaluation.
2. It is possible that the platform is suffering from the lack of system feedback. According to the fundamental principles of interaction (Norman, 1989), the lack of system feedback increases the risk of the Gulf of Evaluation. As the result of the lack of system feedback, the Gulf of Evaluation happened, and participants do not realize that they have finished the task and do the task over. The factor causing this problem is similar to problem 3 in task 1.

*Recommendations:*

1. The problem can be solved by improving the response time of the system. Meanwhile, a button with signifier “+” is added along with each person to smooth the execution of the task. See figure 3.1 for more details.

Some friends recommend to you 			
Name	Good language	Interesting language	State
Sam 	Chinese	English	
Jim 	English	Chinese	
Rose 	English	Japanese	








Some friends recommend to you 			
Name	Good language	Interesting language	Chat Request
Sam 	Chinese	English	
Jim 	English	Chinese	
Rose 	English	Japanese	

Figure 3.1 change the last attribute of the last column, where “+” is a button. Original interface (left). Modified interface (right)

2. Add a pop-up window to notify users that they have successfully sent out a chat request. The new window pops up after clicking the “Ok” button on the previous pop-up window. See figure 3.2.1 and figure 3.2.2 below.

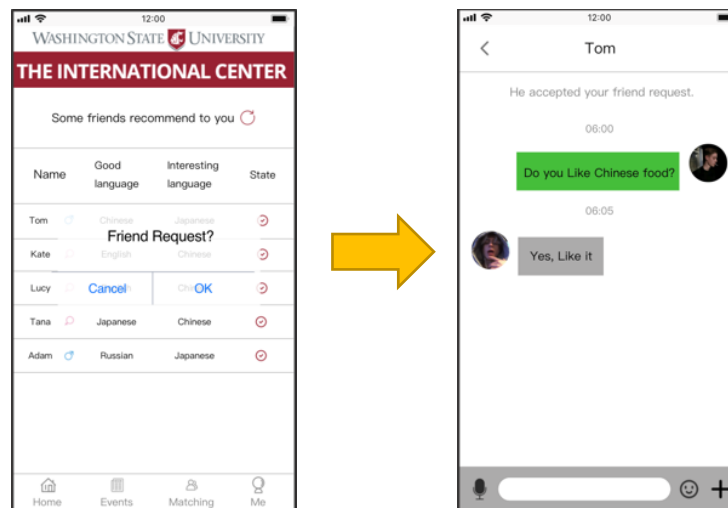


Figure 3.2.1 system progress before adding the system feedback

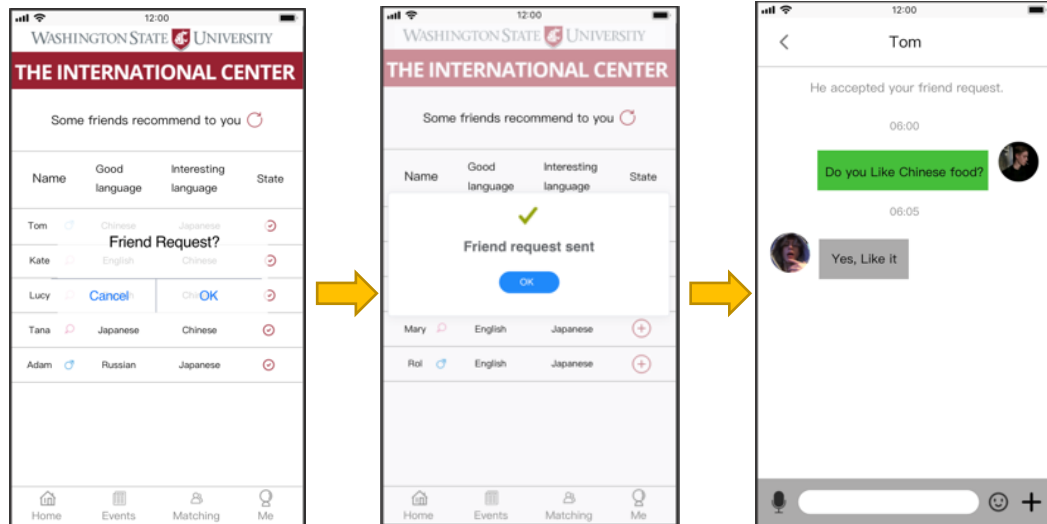


Figure 3.2.2 system progress after adding the system feedback

#### 4. Activity Application

In this task, the participant is assigned to create a new activity. With this task, the participant needs to fill out an application form and submit this form to the system. The participant is not required to post the new activity. The portal to the application form can be found on the right-hand-side corner of the homepage, named “Activity Application”.

##### *Problems:*

1. The portal button to the application form only shows on the homepage. Participants may get lost at the beginning of the task, as the current page should be the one that they finished the previous task. (Severity = 2, Scope = 3).
2. After submit the application form, the page turns to “activity records” page. Participants may not be sure if the activity is created. (Severity = 3, Scope = 2)

##### *Evidence:*

One of three participants (P2) has experienced problem one. P2 try to find the application form inside the “Events” and “My Activities” page at the very beginning. Unfortunately, the form is not in neither of the two pages. With a hint from the observer, problem solved, and P2 said “Oh ok, I saw it”. The term “Oh” is presented by P2 to express surprise. Besides, two of three participants (P2, P3) have experienced problem two. P2 ask “I have already created a new event, right?” after submitting the application form. P3 expresses nothing but silence after submitting the application form.

### Diagnosis:

1. For the first-time failure, P2 starts the task from the page that is the end of the last task. In this case, P2 needs to recall memory to remind her that the “Activity Application” button is on the homepage. However, recall is hard (Johnson Text, chapter 9). Whenever P2 realizes that she is on the wrong page, she returns to the homepage. At this time, unfortunately, she chooses the wrong page again. Different from the first-time failure, the second-time failure is possibly because she focuses too much on task execution so that she is not able to detect the “Activity Application” button, although she is on the homepage. This phenomenon can be explained by Johnson Text, chapter 8.
2. Similar to task 2 problem 3, the platform is probably suffering from the lack of system feedback again in task 3. According to the fundamental principles of interaction (Norman, 1989), the lack of system feedback increases the risk of the Gulf of Evaluation. As the result of the lack of system feedback, the Gulf of Evaluation happened, and participants confuse whether they have already signed up for the event.

### Recommendations:

1. Redesign the platform so that buttons with signifiers are added into page “Events” and page “My Activities”, where such buttons are a portal to the activity application form (see figure 4.1.1 and figure 4.1.2). While performing tasks on the redesigned platform, users are able to access to the application form in one of the three pages (“Events”, “My Activities”, and homepage) based on personal habit rather than recalling memory.

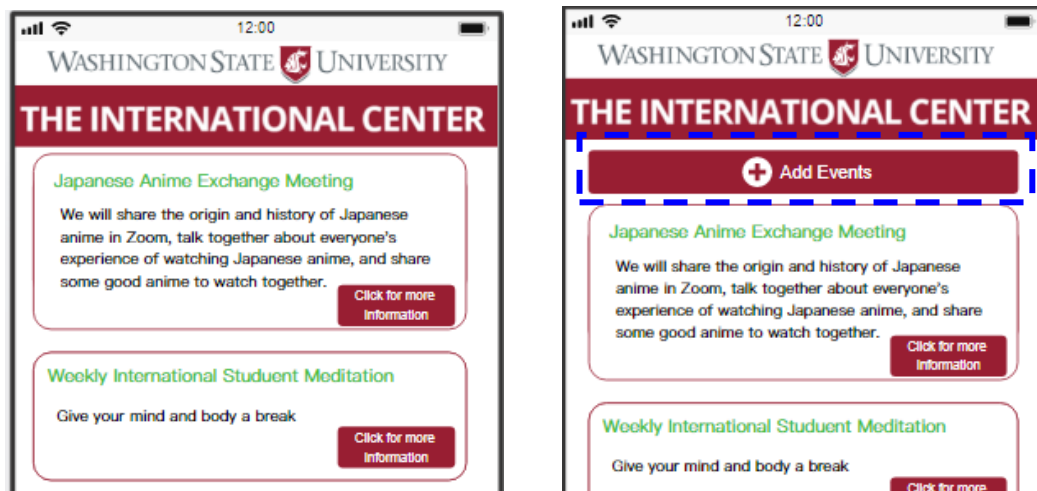


Figure 4.1.1 a portal button with signifier is added into “Events” page. Original interface (left). Modified interface (right)

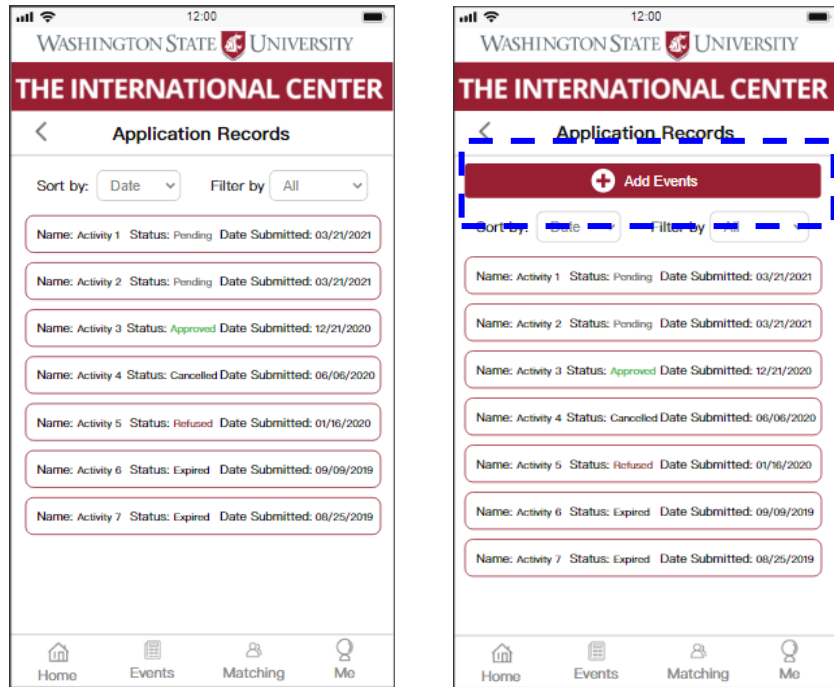


Figure 4.1.2 a portal button with signifier is added into “My Activities” page. Original interface (left). Modified interface (right)

2. Add a system feedback page to notify users that the event has been successfully created. The added page will show system message at the center and an “OK” button under the message. See figure 4.2.1 and figure 4.2.2 below.

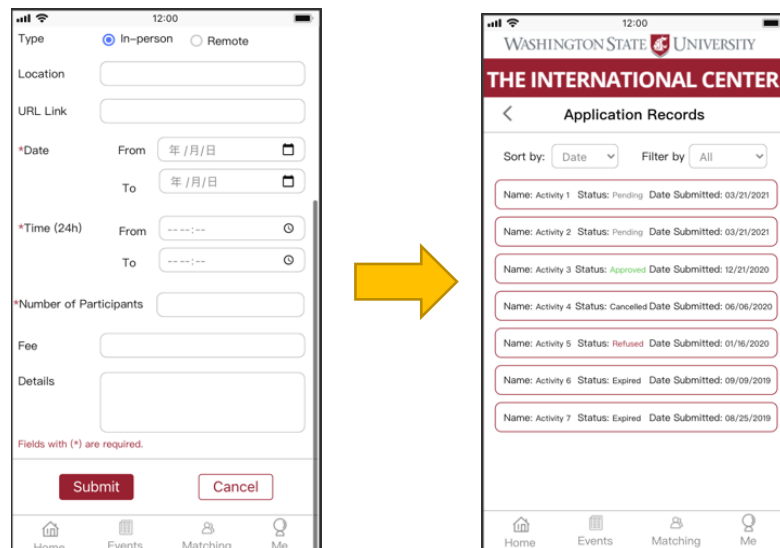


Figure 4.2.1 system progress before adding the system feedback

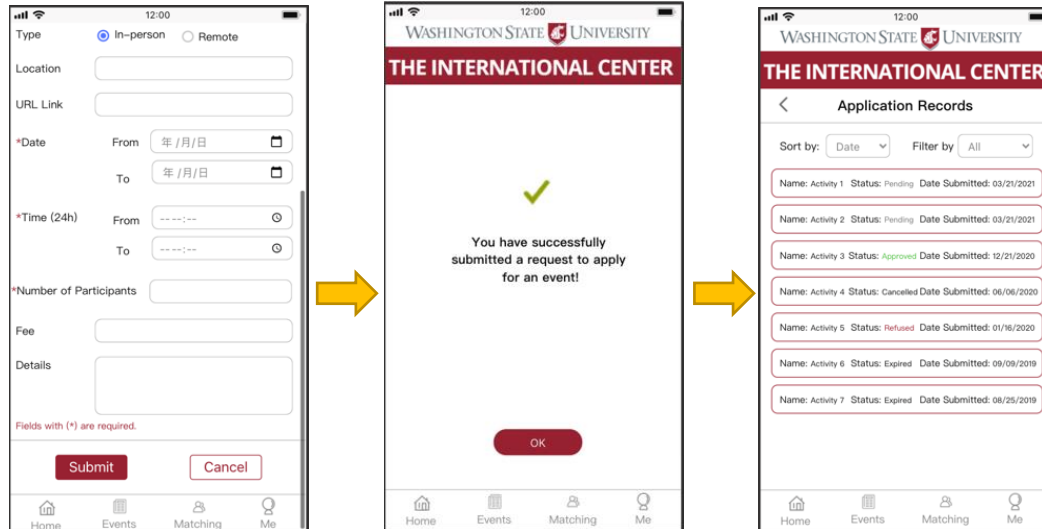


Figure 4.2.2 system progress after adding the system feedback

## 5. Questionnaire

In this task, the participant is assigned to randomly finish a questionnaire and submit the answer of it. With this task, the participant needs to figure out the start point of the task. All questionnaires are listed inside the “Questionnaire” button which can be found under the “Activity Application” button.

### *Problems:*

1. Similar to problem one in task 4, participants may fail to locate the “Questionnaire” button, and they may think the questionnaire should be attached to the introduction of the event. (Severity = 2, Scope = 3).
2. Inside the “Questionnaire” page, there are two labels “Completed Activities” and “Upcoming Activities”. The signifier of two labels may be ambiguous to participants. (Severity = 3, Scope = 3)
3. After submitting the questionnaire, the system will turn to a page with a “continue” button. The participant may be misled by the button and thought the questionnaire has not finished yet. (Severity = 2, Scope = 2)

### *Evidence:*

One of three participants (P1) has experienced problem one. P1, first, taps the “Click for more information” button along with an event. After a few seconds, he returns to the homepage. Besides, one of three participants (P2) has experienced problem two. After submitting the questionnaire, P2 slows down and thinks a little. Two of three participants (P2, P3) have experienced problem three. P2 said, “Oh, I guess I gotta click on continue (button),” which implies that

she suspects that the questionnaire has not finished yet. After P3 saw the “continue” button after submitting the questionnaire answers, a period of silence appears.

#### *Diagnosis:*

1. It is possible that the platform is suffering from the inexplicit information and functionality needed at several steps of interaction. Also, similar to problem one in task 4, participants need to recall memory to remind themselves that the “Questionnaire” button is on the homepage. However, recall is hard (Johnson Text, chapter 9). Moreover, since the questionnaire is related to activities, participants may, therefore, consider the entrance of the questionnaire is placed on the activity introduction.
2. Similar to task 1 problem 1. The problem is probably caused by the ambiguity of the button label on the questionnaire page (Johnson, chapter 1). Participants may mislead to understand that the current page is an activity page, yet, the current page is a questionnaire page.
3. The ambiguity issues mentioned by Johnson text happened again. It is possible that participants think the questionnaire is not finished yet, because of the “continue” button.

#### *Recommendations:*

1. Add a button on the activity introduction page, where the button is a portal to the questionnaire page. Users can enter the questionnaire page either on activity introduction page or homepage. See figure 5.1.

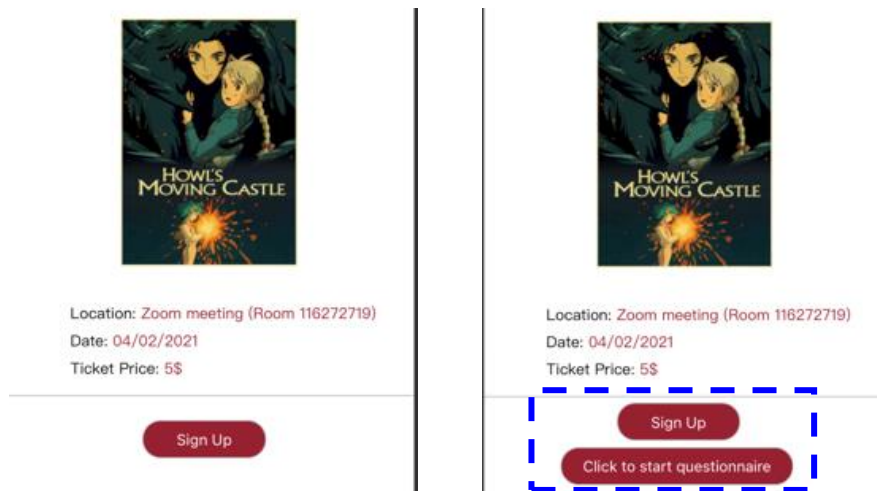


Figure 5.1 a button with signifier is added into the event introduction page. Original interface (left).  
Modified interface (right)



2. Change the button label “Completed Activities” to “Questionnaire for Participated Activities.”; Change the button label “Upcoming Activities” to “Upcoming Questionnaires”. See figure 5.2.



Figure 5.2 the label of the button is changed. Original interface (left). Modified interface (right)

3. Change the button label “Continue” to “Finish and Back” after submitting the questionnaire answers. See figure 5.3.

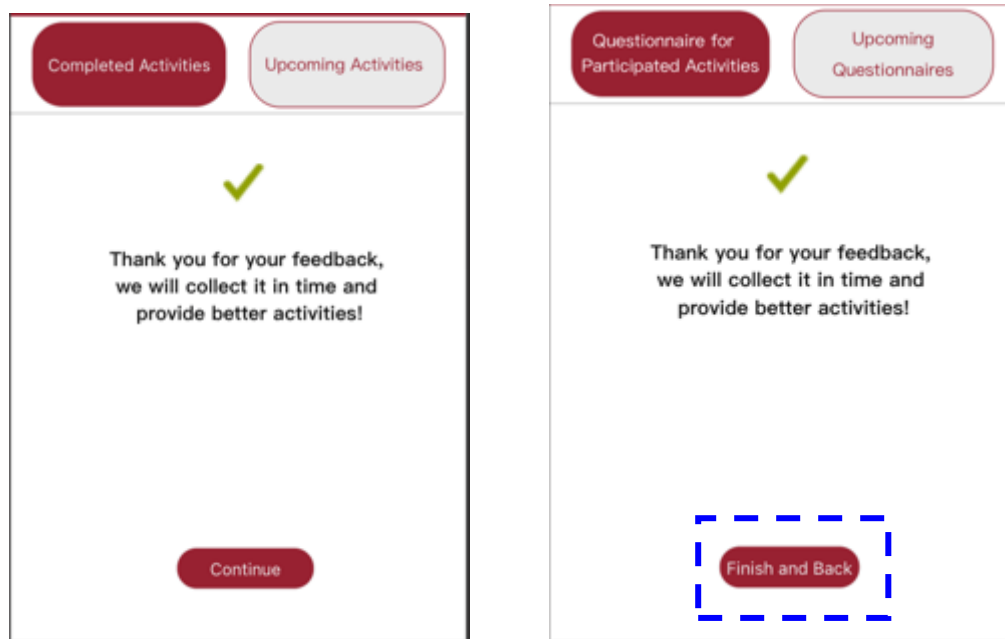


Figure 5.3 the label of the button is changed. Original interface (left). Modified interface (right)

## 6. General Problems

In observing the usability study and listening to participants' suggestions, we identified several general problems with the interface. These problems, which span multiple user tasks, are collected in this subsection. Note that, unlike the previous subsections, this subsection does not always cite evidence. In most cases, it draws on established usability guidelines, and on the suggestions of participants in the study.

*Problems:*

1. Problem 1 (Severity = Improvements, Scope = 3). In task 3, the recommendation list may include added friends.
2. Problem 2 (Severity = 2, Scope = 1). This problem shows when participants did the task over. Participants might be having trouble when they were trying to send out a message to others.
3. Problem 3 (Severity = Improvements, Scope = 3). The style of the pop up window was not consistent.

*Recommendations:*

1. *Summary of recommendation 1*, adjust the matching algorithm so that people that have been added as friends will never be the output of the algorithm.
2. *Summary of recommendation 2*, change the label of the button on chat from "+" to "Send".
3. *Summary of recommendation 3*, to standardize the style of each pop up window.

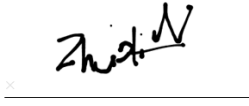


## APPENDIX A: BACKGROUND QUESTIONNAIRE RESPONSES

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Table 2 is listing the result of the background questionnaire for each participant recruited in the study. The result is export from Qualtric XM as a Microsoft Excel file. In order to appropriately exhibit the spreadsheet in this document, the original table has been reshaped; certain private information, such as IP address, has been removed, but the content related to the background questionnaire remains unchanged. In order to clearly describe the questionnaire result of each participant, we encode all participants, and add column called "Participant ID" to the table.

*Table 2. Results of Background Questionnaire.*

StartDate	EndDate	Finished	Q1	Q2
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Start Date	End Date	Finished	I consent to this usability study.	Please type your printed name.
4/21/2021 19:15	4/21/2021 19:28	True	Yes	Zhuoli Wang
4/22/2021 12:22	4/22/2021 12:37	True	Yes	Xinchen Zu
4/22/2021 16:14	4/22/2021 17:04	True	Yes	Xiaofan Ruan
Q3	Q4	Q5	Q6	Q7
Signature: - Name	Date:	Are you a student in WSU?	What is your degree?	What is your major?
	4/21/2021	Yes	master	education
	04/22/2021	Yes	bachelor	communication
	4-22-2021	Yes	PHD	Mechanical Engineering
Q8	Q9	Q10	Q11	Q12
What is your nationality?	What kind of languages are you familiar with?	What kind of languages do you want to learn (except English)?	Have you participated in an event organized by International Center?	If you have participated in an event organized by International Center, please describe its topic and details (if no, just answer No).
Chinese	English and Chinese	Japanese	No	

Chinese	Chinese	Japanese	No	No
Chinese	Chinese & English	Japanese	Yes	Orientation / Welcome new students event.
Q13	Q14			
Where did WSU students learn about the events posted by the international center?	How do you make foreign friends now?	Participant ID		
E-mail	Facebook and Instagram	1		
E-mail	online platform	2		
E-mail	From projects	3		

The result of background questionnaire in table 2 implies that two of our participant has experienced at least two different cultures because of their mastery of two languages. All participants are interested in the same language, and only one of them has participated in activities organized by the International Center. The result also indicates that email is the only online tool that can learn about events posed by the International Center, and participants make foreign friends via other approaches instead of the center.

The rest of the appendix A is the commitment signed by participants before the usability study.

**Informed Consent Agreement to Participate In Usability Study of  
International Center Platform**

Jingyuan Huang, Chaowen Ran, Minjian Li, Bowen Wan, Xi  
Jiang, Zhifu Yang School of Electrical Engineering and  
Computer Science Washington State University

**Description of Study:** You have been asked to participate in a usability test of new software created as part of the above persons' (henceforth, "the researchers") course project for CptS 443/543 at Washington State University. Your participation in this usability test will help the researchers to better understand the software's strengths and weaknesses. You have been asked to spend about 20 minutes participating in this test. This will involve you doing some or all of the following things:

- Reading aloud and studying brief task descriptions;
- Interacting with a computer;
- Interacting with the researchers and/or other students;
- Thinking aloud (explaining what you're doing and thinking), and
- Filling out questionnaires.

The researchers will record the session on videotape. Although your voice, and possibly your face, will appear on the recording, your name will not be on the recording. The recordings will be viewed only by the instructor and students affiliated with CptS 443/543 at Washington State University in order to fulfill a course requirement. When the researchers describe their work to the class, they will not use your name.

**Risks and Benefits Expected:** The study will not incur any risks beyond the minimal risks associated with interacting with a computer. The study is not expected to help you directly. The results may help the researchers to improve the design of their software.

**Confidentiality:** Any information about you that is obtained from this study, including what you say, will be confidential. Your real name will be kept in a locked file and only the researchers will have access to it. Only your code name will be on the video recording and in reports of the study.

**Right to Refuse or End Participation:** You may refuse to participate in this study or stop participating at any time.

**Certification:** By signing below, you certify that you have read and that you understand the foregoing, that you have been given satisfactory answers to your inquiries concerning projects procedures and other matters, and that you have been advised that you are free to withdraw your consent and to discontinue participation in the usability test at any time.

You herewith give your consent to participate in this test with the understanding that such consent does not waive any of your legal rights,

nor does it release the researchers or any agent thereof from liability for negligence. You understand that you shall remain anonymous in all written and verbal reports of this test. You may make a copy of this form to keep.

## APPENDIX B: USABILITY TEST TASKS

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### General Instructions

Thank you for agreeing to help us with this usability test. We sincerely appreciate your time and effort!

International Center Platform is a mobile-based app that enables you to easily access information about events posted by International Center, participate in events, design your own events, and interact with people from different cultures.

In today's test, you will use International Center Platform to sign up an event. We expect that you will need somewhere around 5 minutes to work through the tasks.

As you participate in today's test, please keep the following points in mind: We are testing the app, and not you! Your interaction with our app will help us to better understand our software's strengths and weaknesses, so that we can ultimately improve the app's design. You are free to take a break at any time. Before beginning each task, please read all written instructions aloud. When you are finished with a page of instructions, please do not advance to the next page until you are instructed to do so. **If you are working alone:** Please read each task aloud before you begin. As you work through each exercise, please "**think aloud.**" Let me know what you are up to by verbalizing your thoughts and actions. In addition, please share any opinions, questions, or concerns that come to mind. If, at any point, you become silent, I will remind you to continue thinking aloud. **If you are working with a partner:** Please read each task aloud before you begin. As you work through the task, you and your partner should work together as a team. Actively engage in a conversation with your partner. Inform each other of what you're up to. As you work, I may ask you questions about why you have done something or how you feel about some part of the system. This will help me to better understand what you are doing. Have fun!

**Please await further instruction before going on to the next screen.**

### Background Scenario

Chris is an international student from Vietnam who grew up watching anime, so he is very interested in Japanese culture. He is now a freshman in education at WSU and usually has much free time. He learned from his classmates that WSU has a department called the International Center that organizes activities for

international students, and he wanted to get involved. He use Google to search the International Center and found an event about Japanese culture posted by the International Center, but he didn't know where to sign up. When he thought he had to go to the International Center office to fill out a form to sign up, his classmate told him about an app called International Center Platform, which allows him to register online.

Launch International Center Platform. Please use International Center Platform to complete the following study tasks.

**Please await further instruction before going on to next screen.**

### **Task 1**

In International Center Platform, all functions are based on the settings of your profile.

In this task, you need to use your WSU network ID to log in this platform and then set up the profile:

**Please await further instruction before going on to the next screen.**

### **Task 2**

After logging into the app, suppose you are interested in Japanese culture and you want to participate in an event about Japanese culture.

In this task, you need to find and sign up for an event that you are interested in:

**Please await further instruction before going on to the next screen.**

### **Task 3**

In this platform, users are able to communicate with the person that has the same language interest, which is a good way to encourage cultural exchange.

In this task, you need to look at the intelligent matching and find a person who you are interested in, and then sent a chat request to that person:

**Please await further instruction before going on to the next screen.**

### **Task 4**

Suppose you are not satisfied with the existing event and you want to design a new one by yourself.

In this task, you need to create a new event and apply it:

**Please await further instruction before going on to the next screen.**

## Task 5

Suppose you have received a questionnaire about the Japanese culture you have participated in. On the one hand, through this questionnaire office can understand the satisfaction level of the participants and at the same time office can combine the results of the questionnaire to design activities that attract more people to participate.

The task requires you to successfully submit a questionnaire about the Japanese event:

**Please await further instruction before going on to the next screen.**

Congratulations!! You have completed all tasks in this usability test. Before you go, we'd like you to complete an exit questionnaire that elicits your opinions on the software you just used. Click on the next button to start the exit questionnaire.

## APPENDIX C: EXIT QUESTIONNAIRE RESPONSES

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Table 3 is listing the result of the background questionnaire for each participant recruited in the study. The result is export from Qualtric XM as a Microsoft Excel file. In order to appropriately exhibit the spreadsheet in this document, the original table has been reshaped; certain private information, such as IP address, has been removed, but the content related to the exit questionnaire remains unchanged. In order to clearly describe the questionnaire result of each participant, we encode all participants, and add column called "Participant ID" to the table.

*Table 3. Results of Exit Questionnaire.*

	Q15	Q16
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Participant ID	On a scale of 1 to 10, with 1 being "very difficult" and 10 being "very easy," how would you rate the ease of use of International Center Platform?	On a scale of 1 to 10, with 1 being "very difficult to learn" and 10 being "very easy to learn," how would you rate the learnability of International Center Platform?
1	10	10
2	10	10
3	8	9
Q17	Q18	Q19
On a scale of 1 to 10, with 1 being "not useful at all" and 10 being "very useful," how would you rate the usefulness of International Center Platform as a tool for participating in a culture event?	Did you find any of the tasks to be confusing? Which ones? How would you change the tasks to make them easier to understand?	What did you like about the app you used? Were there any features that you found particularly useful? Why?
10	I didn't find any tasks being confusing.	I think this app is every easy to use, and students don't need to receive the email to check the activites from International Center.
10	Create an own activity and post an activity was a little confusing. Combine two steps into one.	matching with people.
10	NA	Chatting and matching is interesting. Provide a way to create public/individual events :D
Q20	Q21	Q22

What did you not like about the software you used? Were there any features that gave you particular grief? Why?	If you were designing this app, how would you change it so that it worked better for you?	Is the software you used something that you could see yourself using again? Why or why not?
No	I will fix the touch button. Also, I hope to add the photo of the person in the Friend page.	I will use it again. Because as a famous university, it should provide the most convenient way for students to check what is interesting and urgent in campus. Also, an App of an university can show the tech power of an university.
None.	putting down the event host's contact information.	yes, it is easier to just sign up for an event on my phone.
Freeze sometimes. Didn't provide receipt after payment. Didn't send a confirmation after your enrolled in an event.	Colorful. Adding some funny figures.	Yes. There is not many events available. No competition apps.

According to table 3, the average rated score of ease of use, learnability, and usefulness of the platform is 9.33, 9.67, and 10, respectively. We apply such three dimensions to evaluate the satisfaction level of our design, each of which fulfills the expectation that the average rated score of each dimension should be eight or higher. From questions 18 to 22, generally, participant 1 provides very positive feedback to our platform, while participant 2 provides mostly positive one and participant 3 provides mixed one. Question 19, in particular, two of three participants state that the matching functionality is outstanding. Additionally, in question 22, all participants express that they would like to use our platform again. In contrast, one of three participants thought that the activity application section and the system feedback could have further improvement.

## APPENDIX D: CRITICAL INDICIDENTS LOG

### Participant 1

Time	Task	Description of Incident
02:58	Task 1 Start	
02:58		Selected the username textbox and typed in username.
03:02		Selected the password textbox and typed in password.
03:07		Tapped "sign in" button and the page turned to profile setting.
03:08		Using term "Uh" to express hesitation.

<b>03:10</b>	Started to fill out personal information.
<b>03:20</b>	Personal information setting end and tapped the “Next” button.
<b>03:22</b>	Checking the task requirement.
<b>03:24</b>	Tapped the “Finished” button and task 1 competed.
<b>03:44</b>	Task 2 Start
<b>03:44</b>	Immediately select an activity and get into the information page
<b>03:45</b>	Did not read the activity information and tapped “sign up”
<b>03:48</b>	Used default payment method, so participant tapped the “Confirm Pay” without hesitation.
<b>03:50</b>	Tapped “Done” button without any hesitation.
<b>03:51</b>	Check the task requirement.
<b>04:00</b>	Confirmed that task 2 end.
<b>04:21</b>	Task 3 Start
<b>04:21</b>	Immediately located the “Matching” tab and tapped it.
<b>04:25</b>	Frequently and repeatedly tapped the screen, but the system does not give any feedback.
<b>04:28</b>	Told the observer that he got some trouble.
<b>04:30</b>	Tried several times.
<b>04:42</b>	Participant gave up, task 3 was ceased.
<b>04:53</b>	Task 4 Start
<b>04:53</b>	Participant immediately located the “Events/Activities Application” button when going back to the “Home” page.
<b>04:56</b>	Filling the application form.
<b>05:21</b>	The application form completed.
<b>05:22</b>	Participants submitted the application form.
<b>05:23</b>	Stayed at the “My Events” page.
<b>05:25</b>	Check the task requirement.
<b>05:30</b>	Confirmed that task 4 end.
<b>06:04</b>	Task 5 Start
<b>06:05</b>	Participant tapped the “Click for more information” button
<b>06:10</b>	Participant realized that his at the wrong page.
<b>06:11</b>	Back to the home page.
<b>06:11</b>	Immediately found the “Questionnaire” button
<b>06:12</b>	Participant stated that he could not find the questionnaire that he needed
<b>06:18</b>	Observer explained that only the pre-designed questionnaires are available during the usability test.
<b>06:24</b>	Participant chose a questionnaire and started to answer the questions.
<b>06:33</b>	Questionnaire finished.
<b>06:35</b>	Check the task requirement.
<b>06:39</b>	Confirmed that task 5 end.

## Participant 2

Time	Task	Description of Incident
08:09	Task 1 Start	
08:09		Logging in with username and password.
08:35		Successfully logged into the platform.
08:36		Started filling personal information.
09:02		Finished filling personal information.
09:03		Started setting profile picture.
09:06		Using term “Uh” to express she was thinking about the appropriate profile picture.
09:11		Decided to use the default picture as her profile picture.
09:12		Tapped the “Finished” button.
09:18		Asking the observer to move to task 2.
09:21		Observer confirmed task 1 is finished.
09:37	Task 2 Start	
09:38		Term “So” shows that participant was thinking where to start the task.
09:44		Participant correctly guessed that tab “Events” should be the place to start the task, but that is not the most efficient way to finish the task.
09:45		Hunting for interesting event.
09:51		Decided to pick the first event.
09:52		Quickly pressed the “Sign up” button
09:58		Confirm payment method.
10:01		Successfully signed up the event.
10:03		Asked the observer whether she had signed up for the event or not.
10:05		The observer answered the question asked by the participant.
10:33	Task 3 Start	
10:33		Participant correctly guessed the task should be finished inside “Matching” page.
10:43		Finding the person that the participant is interested in.
11:05		Sent a chat request to a person.
11:05		A confirmation window popped up.
11:06		Participant tapped the “OK” button, but the system did not respond.
11:08		Participant tapped the “OK” button again.
11:09		The third time that participant tapped on the “OK” button, but this time, the system responded.
11:10		Task 3 finished but the participant did not realize.
11:16		Participant realized that task 3 was completed.
11:42	Task 4 Start	
11:51		Participant thought the activity application button was inside the “Events” page

<b>11:58</b>	Participant realized she was not on the right track so she went to page "My activities"
<b>12:06</b>	Participant got lost.
<b>12:15</b>	Reviewed the quest request.
<b>12:18</b>	Participant realized that she was on the wrong page.
<b>12:24</b>	The participant asked the observer for help.
<b>12:35</b>	The participant eventually figured out where to apply for an activity, saying "Oh ok, I saw it."
<b>12:40</b>	The participant was on the right track again.
<b>12:41</b>	Filling the application form.
<b>13:56</b>	Finished filling and submitted the application form
<b>13:58</b>	The participant asked whether she had already created a new event or not.
<b>14:07</b>	The observer confirmed that task 5 was finished.
<b>14:39</b>	Task 5 Start
<b>14:46</b>	Participant went back to the home page, and immediately located the "questionnaire" button.
<b>14:47</b>	Participant slowed down and thought a little bit.
<b>14:55</b>	Participant decided to try to finish the first questionnaire.
<b>15:00</b>	Answering the questionnaire.
<b>15:14</b>	Questionnaire was finished and submitted.
<b>15:26</b>	Participant thought that the questionnaire was not finished yet as she saw the continue button on the page.
<b>15:28</b>	Participant clicked on continue and task 5 end.

### Participant 3

<b>Time</b>	<b>Task</b>	<b>Description of Incident</b>
<b>10:46</b>	Task 1 Start	
<b>10:46</b>		Browsing the interface.
<b>10:51</b>		Typed in username.
<b>11:04</b>		Selected the password textbox.
<b>11:07</b>		Moving the cellphone out of the screen when typing in password.
<b>11:13</b>		Finished typing in password
<b>11:15</b>		Password incorrect
<b>11:17</b>		Re-entered password.
<b>11:31</b>		Successfully logged in and about to fill in the personal information
<b>12:02</b>		Started to set up profile picture.
<b>12:05</b>		Tapped "Nickname", which is not a button.
<b>12:06</b>		Browsing the current interface.
<b>12:11</b>		Decided to use the default picture as his profile picture.
<b>12:12</b>		Clicked the finish button, and task 1 finished.

<b>12:53</b>	<b>Task 2 Start</b>
<b>12:54</b>	Participant was dragging the page up and down
<b>13:11</b>	Scanning through the menu on Home page
<b>13:17</b>	Tapped into activity application form, which is an incorrect page.
<b>13:26</b>	Back to the home page.
<b>13:28</b>	Figured out where to start task 2, but that is not the most efficient way.
<b>13:31</b>	Accidentally tapped the button that does not belong to the platform and therefore the platform closed.
<b>13:37</b>	Re-opened the platform
<b>13:40</b>	Browsing and reading events
<b>14:07</b>	Chose an events and open it
<b>14:15</b>	Giving comments on events.
<b>14:34</b>	Tapped "Sign up" button
<b>14:40</b>	Choosing payment method
<b>14:48</b>	Finished payment and task 2 complete
<b>14:54</b>	A period of silence
<b>15:06</b>	Moving to the next task
<b>15:30</b>	<b>Task 3 Start</b>
<b>15:41</b>	In matching page
<b>15:42</b>	The participant pressed the "Refresh" button
<b>15:50</b>	Sent out a chat request. (Task 3 end)
<b>15:56</b>	Participant did not realize the task had finished
<b>15:58</b>	Participant was surprised
<b>16:01</b>	Participant did the task over, he was trying to send message to someone.
<b>16:15</b>	Participant still did not realize the task had finished
<b>16:17</b>	Participant continued to do the task over.
<b>16:24</b>	The observer gave a hint to participant.
<b>16:51</b>	<b>Task 4 Start</b>
<b>16:52</b>	The participant immediately figured out where the application form is.
<b>16:55</b>	Filling the application form.
<b>19:05</b>	Submitted the application form. (Task end)
<b>19:09</b>	A period of silence
<b>19:12</b>	The observer gave hint to the participant that the task was completed.
<b>20:01</b>	<b>Task 5 Start</b>
<b>20:04</b>	Back to the home page
<b>20:09</b>	Located the questionnaire button
<b>20:09</b>	Inside the questionnaire page.
<b>20:28</b>	Opened a questionnaire
<b>20:29</b>	Answering the questionnaire questions
<b>21:11</b>	Questionnaire was finished.
<b>21:12</b>	A period of silence shows when the participant saw the "continue" button after submitting the questionnaire answers.

## APPENDIX E: SUMMARY OF USABILITY PROBLEMS

Problem Description	Evidence*	Severity	Scope	Diagnosis	Design Recommendation
Shortly think about what to do next	P1 03:08	3	3	Ambiguity	Change "Setting" to "Personal Information Setting"
"Nickname" is think of as a button	P3 12:05	Improvement	3	Cognitive Walkthrough	Remove "Nickname"
Having difficulty of starting the task, or getting lost	P2 09:38; P3 12:54; P3 13:17	2	2	Focus too much on goal, and memory recall is hard	Add extra portal
Use inefficient strategy to finish the task	P2 09:44; P3 13:28	2	2	Focus too much on goal, or discriminability of colors	Highlight the section title "Recommended Events"
Not sure whether the event is successfully signed up or not	P1 03:51; P2 10:03; P3 14:54	2	1	Gulf of Evaluation	Provide system feedback
Having trouble to send out a chat request	P1 04:25; P2 11:06	1	2	Delay of system feedback	Improve the response time of the system and change column "State" to "Chat request" with "+" buttons to smooth the task process
Participants do the task over	P2 11:10; P3 16:01	2	2	Gulf of Evaluation	Provide system feedback
Get lost at the beginning of the task	P2 11:58	2	3	Focus too much on goal, and memory recall is hard	Add extra portal
Not sure if the event is created	P2 13:58	3	2	Gulf of Evaluation	Provide system feedback
Fail to locate the "questionnaire button"	P1 06:15	2	3	Focus too much on goal, and memory recall is hard	Add extra portal
The meaning of "Completed Activities" and "Upcoming Activities" in the questionnaire page are confusing	P2 14:47	3	3	Ambiguity	Change "Completed Activities" label to "Questionnaire for Participated Activities"; Change "Upcoming Activities" label to "Upcoming Questionnaires"

<b>“Continue” button shown on the page after submitting the questionnaire answer is confusing</b>	P2 15:26; P3 21:12	2	2	Ambiguity	Change the button label “Continue” to “Finish and Back”
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\*Provide participant number and time of all relevant incidents documented in critical incidents log, e.g., “P1 2:32; P3 4:39”



## APPENDIX E: SEVERITY AND SCOPE RATINGS

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Severity and scope ratings are included to communicate which problems are most important.

### Severity

Severity is an assessment of a problem's impact on user performance. The following scale is derived from Dumas and Redish (1993):

- **Severity 1** problems prevent users from completing a task. Participants give up after a few tries or they need a hint to continue. For example, users consistently select an incorrect dialog option and do not know what else to do.
- **Severity 2** problems create significant delay and frustration. Participants continue to get lost or to use inefficient methods to accomplish a goal. For example, the lack of feedback to users confirming what they have just done causes them to do the task over to make sure they did it correctly.
- **Severity 3** problems have a minor effect on usability. For example, an unusual term in a dialog causes users to hesitate for a moment before making the correct choice.
- **Improvements.** While not problems *per se*, improvements will make the task even easier to perform or learn. The interface doesn't hamper users but there is something that could make it even better.

### Scope

Scope is an assessment of how frequently users will encounter a problem. The more users that a problem affects, wider its scope.

- **Scope 1** problems will affect almost all users.
- **Scope 2** problems will affect many users.
- **Scope 3** problems will affect few users.