

### User Experience Study of Testing and Risk History Calendar (TRHC) for HIV Patients in South Africa: A Tablet-based Android Application

**Technical Report** May 9, 2022

### Leadership

Dr. Rose Marra Dr. Joi Moore

### **Study Team**

Kanupriya Singh Shangman Li Yuanyuan Gu

<u>Citation</u>: Singh, K., Li, S., Gu, Y., Marra, R., & Moore, J. (2022). User Experience Study of Testing and Risk History Calendar (TRHC) for HIV Patients in South Africa: A Tablet-based Android Application. University of Missouri-Columbia, MO: IE Lab



### **Table of Contents**

1. About the IE Lab	3
2. Executive Management Summary	4
Goals and Methods	6
2.1 Design Review (with Usability Heuristics)	6
3. Results	7
4.1 Visibility of System Status	7
4.2 Match Between System and the Real World	8
4.3 User Control and Freedom	10
4.4 Consistency and Standards	11
4.5 Error Prevention	12
4.6 Recognition Rather Than Recall	13
4.7 Flexibility and Efficiency of Use	14
4.8 Aesthetic and Minimalist Design	15
4.9 Help Users Recognize, Diagnose, and Recover from Errors	17
4.10 Help and Documentation	17
4. Design Recommendations	18
5. Conclusion	20
Acknowledgements	20
References	21



### 1. About the IE Lab

Founded in 2003, the mission of the Information Experience Lab, in short IE Lab, is to improve digital information and communication systems through research methodologies that blend traditional usability evaluation with user experience data, human information behavior research and socio-technical integration design. The IE Lab is operated by the School of Information Science & Learning Technologies (SISLT) in the College of Education and Human Development at the University of Missouri-Columbia. The IE Lab has provided service to a range of clients across Missouri, including MU researchers, corporate, non-profit and other academic partners.

Working closely with clients, the IE Lab director and a doctoral project leader guide the study that is conducted by a team of SISLT doctoral students who are trained as usability and UX researchers. The IE Lab website is <u>http://ielab.missouri.edu</u>

School of Information Science & Learning Technologies University of Missouri

# Information Experience Laboratory

### 2. Executive Management Summary

Working in collaboration with Dr. Enid Schatz from the School of Health Professions and Dr. Abu Mosa from the School of Medicine at the University of Missouri-Columbia, the IE Lab proposes to conduct a heuristics review of a tablet-based Android application, called the Testing and Risk History Calendar (TRHC) designed to collect retrospective social, sexual and health data regarding HIV testing and risk of older adults in South Africa.

#### Background

The TRHC application is based on a Life History Calendar (LHC) designed to collect empirical data about the HIV testing and social, sexual, and health risk histories of older urban South Africana adults (over 60 years). The main purpose of conducting the TRHC study is to identify the reason behind older South Africans performing or not performing an HIV test (Parvin et al., 2021).

TRHC is a tablet-based application built for the Android platform and contains three customizable modules: surveys, respondents' consent, and active tasks. It contains a calendar format as well as questions asked through several surveys related to the TRHC study. These surveys include questions related to socio-demographics, relationships, and health about a particular respondent (Parvin et al., 2021).

The goal of this heuristics review is to evaluate the overall quality of the usability of the TRHC application and provide design recommendations to improve the usability of the application.

To study the usability quality, 10 usability heuristics by Jakob Nielsen (Nielsen, 1994) have been applied with usability experts from the IE lab. The evaluators were able to gain an understanding of the usability quality, and where the application needs to improve the user experience. The team assigned a satisfaction score from 0, 1 - 4 (with 0 being not available, 1 being the worst and 4 being the best) on how the application adheres to each of the usability heuristics, with a severity level 1 - 3 (with 1 being low severity and 3 being high severity) and a rationale of why the evaluators assigned the given score. Design recommendations have been provided on how the application could improve on that aspect of usability.

Overall, the TRHC application has useful functionalities that can enable a researcher to collect information on a patient's health history. It includes project description, consent, and useful tabs to collect relevant patient information. However, the application needs to improve its usability for a good user experience, user engagement, and user trust in the application.

**Recommendations** on how the TRHC application can improve the design of the application, include:

- Provide feedback to users through clear instructions, guidelines, and prompts. For example,
  - Add instructions and space for adding the *Date* of data collection
  - Provide feedback to users to inform them the status of their action is, i.e., what happens when they click Next button? Does it submit the Form they are currently working on, or does it take them to the next page?
  - Tabs on the Calendar page need more guided instructions on their usage as read-only, readwrite, etc.
  - When a user clicks 'Save' after entering information in the Calendar, provide a systemgenerated prompt to notify the user that the entered information is saved.
- Use familiar names, terminologies, concepts, and phrases. For example,
  - o It is recommended to include a format for entering name, e.g., First Name, Last Name



University of Missouri

## Information Experience Laboratory

- Use intuitive terminology that helps users understand that they will use the 'Calendar' tab to collect data on a patient's life history. For example, Life History Calendar. Or HIV Risk & Life History Data Calendar Enter patient's life history data in calendar format.
- Ask gender information respectfully on the Respondent's demographics page. e.g., include male, female, non-binary, transgender, intersex, and prefer not to say.
- Include design elements that facilitate user control, freedom, and flexibility in use. For example,
  - Provide a clearly labeled and marked exit button or 'Go back to the Main Menu' or 'Home' button on each page
  - The application should have a clear way to exit current interaction and go back to the main menu.
  - Provide instructions and guidelines for using Project Description and Consent page for both novice and expert users, i.e., how to enter/edit the description, how to retrieve previously entered project description
- Ensure consistency in the design concepts used in the application. For example,
  - Provide a 'Agree to continue' or 'Disagree and exit' button on the Consent page in continuity to the consent description
  - Users should be able to read the consent on a single page by scrolling up and down and sign their name at the end of the same page
  - Check accessibility-compliant color combinations
  - Adjust font size. Use at least an 8-pt font.
  - Consider accordions, i.e., expandable sections to reduce clutter by showing details only when users are interested
  - Change colors of tabs which serve different purpose, e.g., References (supportive information)
- Enable users to prevent, diagnose, and recover from errors. For example,
  - Include the error notification when users enter incorrect data, e.g., for date of birth, name format, Respondent ID. System should prompt the user to check the value entered in the field if the user mistakenly enters numerals instead of alphabets, or vice-versa.
  - Replace the error notification message to a prominent place
  - Include error prevention for each page, i.e., notify users if they would like to proceed to the next page, or if they would like to save the data before moving to the next page
- Provide help and documentation. For example,
  - Provide something like an FAQ, which will have the most common questions a user might have
  - Provide a short phrase describing the goal and required action for each tab on the menu
  - Provide a glossary of terms used on the site that offer a brief explanation to better help the user understand the content

A detailed list of recommendations is available in the Results and Design Recommendations sections. Next steps include revising the design of the application based on the above design recommendations, and then testing the usability, i.e., effectiveness, efficiency, and user-satisfaction of the application with end-users using usability testing methods.

5



### **Goals and Methods**

The goal of this study was to understand the usability quality of TRHC application. In this report, as part of the first iteration, the IE lab presents a heuristic evaluation of the first prototype of the TRHC application.

#### 2.1 Design Review (with Usability Heuristics)

In the first iteration, the IE Lab has conducted a heuristic review based on standard usability heuristic guidelines to find major usability problems in the design of the TRHC application and provide recommendations to improve the design. The heuristic evaluation is a method used to diagnose the design and functionality of a system by applying ten different usability heuristics. Each of the ten heuristics is a guide on how a system should use its aesthetics, feedback, and functionality in assisting the user with task completion and comprehension.

Heuristic evaluation of the first prototype of the TRHC application is conducted by three IE Lab research members using Nielsen's 10 usability heuristics (1994) for user interface design. Potential problems in the application design are analyzed for their severity and scored using the following parameters:

- System satisfaction score (0-4, with 4 meaning the highest satisfaction score) •
- The problem severity (1-3, with 3 meaning the highest severity), and •
- The rationale of the evaluation, e.g., giving evidence with screenshots. •

Satisfaction score

0 = Not available at all

- 1 = Poor
- 2 = Fair
- 3 = Good
- 4 = Very good

Problem severity

1= Low severity

2= Medium severity

3= High severity



### 3. Results

We here present the results of the website's usability quality along Nielsen's ten heuristics (Nielsen, 1994).

#### 4.1 Visibility of System Status

The first heuristic is called "visibility of the system status," which states that a system should keep users informed of what is going on using reasonably timed feedback (Nielsen, 1994). The significance of this heuristic is that it allows users to feel in control of the system, take appropriate actions to complete their tasks and accomplish their goals, and be able to trust the application (Harley, 2018).

Satisfaction Score: 1 – Poor; Severity Score: 3 - High

Problem	Recommendation
Typically, a user/researcher enters the date of reading and signing the consent. At no point, the application collects the date of data collection. Date of data collection will act as feedback for users to trace the time of their action and give them a sense of control.	<ul> <li>Add instructions and space for adding the <i>Date</i> of data collection.</li> <li>If this function will be automated later, user may need the freedom to edit the <i>Date</i> of data collection</li> </ul>
It is not clear when each Step ends on a page. On clicking the Next button, the system brings the user back to the main menu. For example, in <b>Figure 1.,</b> it appears that clicking Next will take the user to the next page of Step 1 of 1. Instead, clicking Next bring the user back to main menu.	<ul> <li>Clearly indicate the end of the Form on the page</li> <li>Provide feedback to users to inform them the status of their action, i.e., what happens when they click the Next button? Does it submit the form, or does it take them to the next task?</li> </ul>
While Overview tab is Read-Only, the other tabs are Read-Write ( <b>Figure 2</b> ). However, the type of functionality provided by each tab is unclear. It can be confusing for new users to figure out which tab will enable them to enter or edit information and which tab will only allow them to read the entered information.	<ul> <li>Use an intuitive name to describe the 'Project Description' tab, e.g., New Project</li> <li>A short description of the goal and required action for each tab on the Calendar page is recommended</li> <li>Calendar page tabs need more guided instruction on their usage, read-only, read-write, etc.</li> </ul>
On entering new information in the Socio- Demographic and Health page, the application automatically takes the user back to the main menu. It does not allow the user to stay on the page to enter additional information.	<ul> <li>When a user clicks 'Save' after entering information in the Calendar, provide a system-generated prompt to notify the user that the entered information is saved.</li> <li>At the same time, before automatically taking the user to the main menu, the system must ask the user if he/she wants to continue entering data or wants to go back to the main menu</li> </ul>

School of Information Science & Learning Technologies

# Information Experience Laboratory

University of Missouri

2.51 🖬 🕼 📾	
← Step 1 of 1	
Demographics Page	
Respondent's Details	
Full Name	
Answer	
Respondent ID	
Enter a number	
Date of Birth	
Enter a date	
Gender	
O Male	
Female	
O Other	
	NEXT

#### Figure 1. Demographic form

3:06 🖾 🕞 💼										♥⊿∎
AT A	HC									
	OVER	/IEW	SOCIO-DEM	OGRAPHIC CAL	EN 1	HEALTH CALEN	DAR	PARTM	IERS	
Year (Age)	2013 (-9)	2014 (-8)	2015 (-7)	2016 (-6)	2017 (-5)	2018 (-4)	2019 (-3)	2020 (-2)	2021 (-1)	2022 (0)
References	Snowden	Crimean Peninsula	NASA on Pluto	Trump Elected	Tri-Hurricanes	California Wildfire	Hong Kong Protest	s Covid-19	Tokyo 2020	NFTs
Condition/Duration					Enter Tim	eline Entry				
Partner Initials		Enter Timeline Entry								
Location		Enter Timeline Entry								
Urban/Rural		Enter Timeline Entry								
Housing Type					Enter Tim	eline Entry				
Marital Status	Enter Timeline Entry									
Economic Activity		Enter Timeline Entry								
Pension/Grants					Enter Tim	eline Entry				

Figure 2. TRHC Calendar tab including all tabs to enter data and provide an overview via the Overview tab

#### 4.2 Match Between System and the Real World

The heuristic 'match between system and the real world' means that a system should speak the users' language. Using concepts, words, phrases, and terminologies familiar to the user. The information should be presented in a natural and logical way.

Satisfaction Score: 2 – Fair; Severity Score: 2 - Medium

8



School of Information Science & Learning Technologies University of Missouri

# **Information Experience** Laboratory

Problem		Recommendation
Step 2 of 2 in the Consent form asks for 'Please enter your full name' (see <b>Figure 3</b> ). It is not clear whose full name is required here – researcher or the respondent. This section needs more specific instructions/guidelines for the user on how to enter information on consent and later, add their full name.	• A us Fo re sto	dd instructions on the consent page for required ser (researcher/respondent) and for their actions. or example, Researcher reads the consent to the spondent in step 1 and sign his/her full name in ep 2.
In both Step 2 of the Consent page and the Demographic Page, it is unclear in which format the Full Name needs to be entered, e.g., does Full Name require the first name first, followed by last name or vice-versa? It is also unclear if the user has an option to enter the middle name. See <b>Figure 4</b> .	• It er • A	is recommended to include a format for ntering name, e.g., First Name, Last Name dd instructions/space for middle name
While the goal of the 'Calendar' tab is to enable researchers to input data, the ultimate output would be a life history calendar. The name for the 'Calendar' tab does not resonate with the purpose of collecting Tests and Risk History of patients (see <b>Figure 5</b> ).	• U ur cc ex Li hi	se intuitive terminology that helps users inderstand that they will use the 'Calendar' tab to ollect data on a patient's life history. For sample, <i>Life History Calendar</i> .' Or <i>HIV Risk &amp;</i> <i>ife History Data Calendar - Enter patient's life</i> <i>istory data in calendar format.</i>
Gender options on the Respondent Page need to follow a universally acceptable format to respectfully include all respondent groups (e.g., Prefer not to answer). See <b>Figure 1</b> .	• A R m ar	sk gender information respectfully on the espondent's demographics page. e.g., include ale, female, non-binary, transgender, intersex, ad prefer not to say.

2:43		<b>►</b> ∡
<	← Step 2 of 2	
	Please enter your full name	
	Pull Mana	
	Pul Name	





University of Missouri

2:51 l	
÷	Step 1 of 1
I	Demographics Page
F	Respondent's Details
ł	ull Name
	Answer

Figure 4. Demographics Page asking Respondent's Full Name

232 🛛 🛈 🖬			•⊿
TRHC - Interview Activity			
	Name ID: Gerde	f Birth:	
	Project Description Press to read Project Description	Consent Sign for Consent	
	Respondent's Details	Calendars	
	Add your Details	Go to History Calendars	
	Upload Dat	a to REDCap	

Figure 5. Main menu displaying all the tabs

### 4.3 User Control and Freedom

The heuristic "user control and freedom" emphasizes that users experience a sense of freedom and confidence when it's easy for them to back out of a process or undo an action. Exits allow users to remain in control of the system and avoid getting stuck and feeling frustrated.

Satisfaction Score: 1 – Poor; Severity Score: 3 - High

Problem	Recommendation
The whole application is missing an exit button to go back to the main menu.	• Provide a clearly labeled and marked exit button or 'Go back to the Main Menu' or 'Home' button
The process of interaction on a page does not have a 'cancel' or 'exit' link to allow the user to quit a task or multi-step process.	<ul><li>on each page</li><li>The application should have a clear way to exit current interaction and go back to the main menu.</li></ul>

10



#### 4.4 Consistency and Standards

Users should not determine if different words or actions mean the same thing and the platform follows consistent conventions. When a system works the way, a user thinks it will work, there is a much higher rate of task completion than when the system does not (Nielsen, 1999).

Satisfaction Score: 2 – Fair; Severity Score: 2 - Medium

Problem	Recommendation
Consent form asks full name as Step 2 on a different page. In an ideal situation, users should be able to sign on the same page after reading the consent to experience task continuity.	<ul> <li>Provide a 'Agree to continue' or 'Disagree and exit' button on the Consent page in continuity to the consent description</li> <li>Users should be able to read the consent on a single page by scrolling up and down and sign their name at the end of the same page</li> </ul>
The 'Respondent's Details' tab is confusing as one opens the tab. On opening the tab, the title of the page is 'Demographic Page.' 'Respondent details' appears as a subtitle. See <b>Figure 6 (a)</b> <b>and (b).</b>	• The term 'Respondent's Details' is recommended to be used as main title on the Demographics page to maintain consistency with the Main Menu



Figure 6. Respondent's Details Tab (a) and (b)



#### **4.5 Error Prevention**

The design of the system should prevent errors from happening in the first place. Error-prone conditions should be eliminated or checked before the action is committed. One of the best ways to prevent user error in a system is to impose limits on the user interactions (Laubheimer, 2015).

Satisfaction Score: 1 – Fair; Severity Score: 3 - Low

Problem	Recommendation
The application does not prompt an error when users enter a future or current date for Date of Birth on the Respondent Page. See <b>Figure 7</b> .	• Include the error notification for incorrect data, e.g., date of birth, name, respondent ID. System should prompt the user to check the value entered in the field if the user mistakenly enters numerals instead of alphabets, or vice-versa.
When user does not fill in the required information, the system will indicate 'Invalid answer, try again!' However, the notification shows up at the bottom of the screen, which is not noticeable. See <b>Figure 8</b> .	• Replace the error notification message to a prominent place.
The feedback received from the system is minimal to zero as the user is navigating through the different tabs on the Calendar page while entering respondent's data.	<ul> <li>Error prevention should be implemented for each page (e.g., notify users if they would like to proceed to the next page, or if they would like to save the data before moving to the next page).</li> <li>End of each Page needs to be clearer and more intuitive.</li> </ul>

т	кнс									
	OVERV	/IEW	SOCIO-DEM	OGRAPHIC CAL	EN	HEALTH CALEN	DAR	PARTI	NERS	
Year (Age)	2013 (-9)	2014 (-8)	2015 (-7)	2016 (-6)	2017 (-5)	2018 (-4)	2019 (-3)	2020 (-2)	2021 (-1)	2022 (0)
References	Snowden	Crimean Peninsula	NASA on Pluto	Trump Elected	Tri-Hurricanes	California Wildfire	Hong Kong Protes	ts Covid-19	Tokyo 2020	NFTs
Condition/Duration	Enter Timeline Entry									
Partner Initials	Enter Timeline Entry									
Location		Enter Timeline Entry								

Figure 7. Calendar page displaying the Year (Age) to enter respondent's history

M	School of Information Science
U	& Learning Technologies

University of Missouri

3:59 🗚 🕦 💼	
← Step 2 of 2	
Please enter your full name	
Full Name	
	Invalid answer, try again! NEXT

Figure 8. Error display at the bottom of the page

### 4.6 Recognition Rather Than Recall

The user's memory load should be minimized with objects, actions, and options that can be seen. Information should not be remembered by the user from one area of the system to another. Offering contextual prompts can help users recognize certain functions (Budiu, 2014).

Satisfaction Score: 1 – Fair; Severity Score: 2 - Medium

Problem	Recommendation
It is unclear what Respondent ID means, or what is the acceptable data entry format, is it retrievable/searchable, if yes, how? See <b>Figure</b> <b>9</b> .	• Provide instructions/guidelines for users to enter Respondent ID. If users can use the ID to search information from a database, then additional guidelines need to be provided for information search using Respondent's ID.
The 'References' for recording life history by years may not be effectively utilized by all users as it requires memorizing and recalling historical events. This may cause confusion and possible errors in data recording. See <b>Figure 10</b> .	• Utilize prompts with the historical references, e.g., pop-ups with information on the event, or range of period in brackets with the event (COVID-19: 2020-2021).

School of Information Science & Learning Technologies

# Information Experience Laboratory

University of Missouri

Full Name		
Answer		
Respondent ID		
Enter a number		
Date of Birth		
Enter a date		

Figure 9. Respondents Details on Demographics page

3.00 0 0										~ ~
т 🦳	RHC									
	-									
	OVERV	/IEW	SOCIO-DEM	OGRAPHIC CAL	EN	HEALTH CALEN	DAR	PARTN	ERS	
Year (Age)	2013 (-9)	2014 (-8)	2015 (-7)	2016 (-6)	2017 (-5)	2018 (-4)	2019 (-3)	2020 (-2)	2021 (-1)	2022 (0)
References	Snowden	Crimean Peninsula	NASA on Pluto	Trump Elected	Tri-Hurricanes	California Wildfire	Hong Kong Protests	Covid-19	Tokyo 2020	NFTs
Condition/Duration	tion Enter Timeline Entry									
Partner Initials	Enter Timeline Entry									

Figure 10. References for years in the history calendar

### 4.7 Flexibility and Efficiency of Use

To speed up the interaction between the user and the system, accelerators should be used to enable advanced users to customize frequent actions. Offering accelerators on the homepage helps speed up task completion, because users can start completing tasks immediately, rather than must navigate through the site to start their tasks (Nielsen, 1994). The purpose of an accelerator is to offer a tool to experienced users so that they can complete tasks quicker without harming the user experience of a novice user (Nielsen, 1994).

Satisfaction Score: 1 - Poor; Severity Score: 2 - Medium

Problem	Recommendation
The Continue tab is not functional now (see <b>Figure 11</b> ). The information entered for a respondent is not retrievable from the main menu.	• Provide a database or list of interviews completed (or in progress) by a user in his/her private account.
The tab for 'Project Description' appears read- only and is not editable now (see <b>Figure 12</b> ). It is not clear how the existing information is entered or edited.	• Provide instructions and guidelines for using Project Description for both novice and expert users.



The tab 'Consent' appears read-only and is not editable now (see **Figure 13**). It is not clear how information can be entered or edited. • Provide instructions and guidelines for using Consent page for both novice and expert users.



Figure 11. Continue tab on the menu page.

2:33		₹4
÷	Step 1 of 1	
	Project Description	
	This is a place holder for some description of the project. Seems we can also add images to these descriptions Lets add those on the next page This will be the second page of the descript Some more explanations will be added here, along with a helpful diagram.	ons.

Figure 12. Project Description page

:42	2 D (y) mi	
4	← Step 1 of 2	
	Consent	
	This study will gather location and some data from your tablet with your permission. You can choose not to do this and still participate in this survey Your participation in this event will average minutes	je 30

Figure 13. Consent page

### 4.8 Aesthetic and Minimalist Design

The 8th heuristic states that everything in a system should serve a function to the user, and that the elements which don't serve a purpose are not needed (Nielsen, 1994). Every part of the system should be relevant to the system. Extra units of irrelevant information compete with the relevant units. However, minimalism becomes an issue when designers compromise the **color contrast** to make the page appear minimal (Sherwin, 2015). Low-contrast text severely degrades accessibility for user with low-vision or cognitive



University of Missouri

impairments and increases cognitive strain (Sherwin, 2015). More detailed color principles can refer to the following link: https://www.interaction-design.org/literature/topics/color-theory

Satisfaction Score: 1 - Poor; Severity Score: 3 - High

Problem	Recommendation
The low-contrast color theme of the application is very difficult to read and understand (see <b>Figure 14</b> ). Low-contrast text severely degrades accessibility for users with low-vision or cognitive impairments and increases cognitive strain. Users may find the text less trusting when it is hard to read.	<ul> <li>Check accessibility-compliant color combinations.</li> <li>Reposition less important elements on screen if high-contrast text is distracting for users.</li> <li>Provide color-theme options for users, if possible.</li> </ul>
The font size of the text is too small to read (see <b>Figure 14</b> ). When users scan text, larger texts are read first. Easier to read text keeps users more engaged with the application.	• Adjust font size. Use at least an 8-pt font.
Information density is high on the Calendar page for data collection (see <b>Figure 14</b> ).	<ul> <li>Consider accordions, i.e., expandable sections to reduce clutter by showing details only when users are interested.</li> <li>Change colors of tabs which serve different purpose, e.g., References (supportive information).</li> </ul>

3:06 🛛 🕞 🗐										₹⊿
at in	RHC									
	OVER	/IEW	SOCIO-DEM	OGRAPHIC CAL	EN	HEALTH CALEN	DAR	PARTI	NERS	
Year (Age)	2013 (-9)	2014 (-8)	2015 (-7)	2016 (-6)	2017 (-5)	2018 (-4)	2019 (-3)	2020 (-2)	2021 (-1)	2022 (0)
References	Snowden	Crimean Peninsula	NASA on Pluto	Trump Elected	Tri-Hurricanes	California Wildfire	Hong Kong Protes	ts Covid-19	Tokyo 2020	NFTs
Condition/Duration					Enter Tim	eline Entry				
Partner Initials					Enter Tim	eline Entry				
Location		Enter Timeline Entry								
Urban/Rural		Enter Timeline Entry								
Housing Type		Enter Timeline Entry								
Marital Status		Enter Timeline Entry								
Economic Activity		Enter Timeline Entry								
Pension/Grants					Enter Tim	eline Entry				

Figure 14. Calendar page for collecting Respondent's data



#### 4.9 Help Users Recognize, Diagnose, and Recover from Errors

The system uses plain language to indicate problems and suggest solutions. Error messages can be an opportunity to teach the user more about the system (Neilson, 2001). They can offer users suggestions on how to correct any slips or errors they've made, and gain insight on how the system works. An effective error message will be precise, polite, and offer a user a suggestion on how to fix the problem (Nielsen, 2001).

Satisfaction Score: 3 - Good; Severity Score: 1 - Low

Problem	Recommendation
The Continue tab is not working now to enable users to retrieve previously entered data (see <b>Figure 15</b> ).	• Error recovery can be made more intuitive for users by flashing/highlighting the next steps or actions.



**Figure 15.** Error prompt at the bottom of the screen on clicking 'Continue' - 'There is not interview to Continue. Please Start New Interview.'

#### 4.10 Help and Documentation

A system should be able to be used without documentation, however sometimes it is necessary. The information should be able to be searched and include concrete steps towards completion. Although a system may be perceived as being "simple" or "straightforward", there is always a chance that a user may not understand how to operate the system. Having a resource to help educate these users is vital in providing them a positive user experience (Nielson, 1991). Users who grow frustrated in being unable to either understand or complete a task, may cease using the system.

Satisfaction Score: 0 – Not available at all; Severity Score: 3 - High



School of Information Science & Learning Technologies

University of Missouri

# Information Experience Laboratory

Problem	Recommendation
No help guidelines or video tutorial or glossary available for users. If users have a question on how to navigate the application or the terminology used, there is no guide for them.	<ul> <li>Provide Help documentation and ensure it is easily searchable.</li> <li>Provide something like an FAQ, which will have the most common questions a user might have.</li> </ul>
Function and purpose of the terminologies used in Menu tabs (e.g., Server, Calendar) and Menu ribbon (e.g., Socio-demographic calendar, health calendar) may not be intuitive for all. The context of a terminology in the menu should be present the moment the user requires it	<ul> <li>Provide a short phrase describing the goal and required action for each tab on the menu.</li> <li>Provide a glossary of terms used on the site that offer a brief explanation to better help the user understand the content.</li> </ul>

### 4. Design Recommendations

The first prototype of the TRHC application needs improvement on several aspects of usability to improve the design and make the application user-friendly. The overall aesthetic of the application needs improvement in use of color-contrast and font-size to be able to convey information and functions clearly and efficiently. The feedback between user and the application needs to be consistent throughout the application. The application can improve user-experience by providing help document or FAQs to better assist new users in understanding the application and navigation.

Specifically, the design recommendations can be summarized as follows:

### Provide feedback to users through clear instructions, guidelines, and prompts

- Add instructions and space for adding the *Date* of data collection.
- Clearly indicate the end of the Form on a page.
- Provide feedback to users to inform them the status of their action is, i.e., what happens when they click Next button? Does it submit the Form they are currently working on, or does it take them to the next page?
- Use a more intuitive name to describe the 'Project Description' tab, e.g., New Project.
- A short description of the goal and required action for each tab in the Menu is recommended.
- Tabs on the Calendar page need more guided instructions on their usage as read-only, read-write, etc.
- When a user clicks 'Save' after entering information in the Calendar, provide a system-generated prompt to notify the user that the entered information is saved.
- At the same time, before automatically taking the user to the main menu, the system must ask the user if he/she wants to continue entering data or wants to go back to the main menu.
- Provide instructions/guidelines for users to enter Respondent ID. If users can use the ID to search information from a database, then additional guidelines need to be provided for information search using Respondent's ID.

School of Information Science & Learning Technologies University of Missouri

# **Information Experience** Laboratory

Utilize prompts with the historical references, e.g., pop-ups with information on the event, or range of period in brackets with the event (COVID-19: 2020-2021).

#### Use familiar names, terminologies, concepts, and phrases

- Add instructions on the Consent page for required user (researcher/respondent) and for their • actions. For example, Researcher reads the consent to the respondent in step 1 and sign his/her full name in step 2.
- It is recommended to include a format for entering name, e.g., First Name, Last Name.
- Add instructions/space for middle name to accommodate all user groups.
- Use intuitive terminology that helps users understand that they will use the 'Calendar' tab to collect data on a patient's life history. For example, Life History Calendar. Or HIV Risk & Life History Data Calendar - Enter patient's life history data in calendar format.
- Ask gender information respectfully on the Respondent's demographics page. e.g., include male, female, non-binary, transgender, intersex, and prefer not to say.

#### Include design elements that facilitate user control, freedom, and flexibility in use

- Provide a clearly labeled and marked exit button or 'Go back to the Main Menu' or 'Home' button on each page
- The application should have a clear way to exit current interaction and go back to the main menu.
- Provide a database or list of interviews completed (or in progress) by a user in his/her private account.
- Provide instructions and guidelines for using Project Description for both novice and expert users, i.e., how to enter/edit the description, how to retrieve previously entered project description.
- Provide instructions and guidelines for using Consent page for both novice and expert users, i.e., how to enter/edit the description.

#### Ensure consistency in the design concepts used in the application

- Provide a 'Agree to continue' or 'Disagree and exit' button on the Consent page in continuity to the • consent description.
- Users should be able to read the consent on a single page by scrolling up and down and sign their name at the end of the same page.
- The term 'Respondent's Details' is recommended to be used as main title on the Demographics page to • maintain consistency with the Main Menu.
- Check accessibility-compliant color combinations. •
- Reposition less important elements on screen if high-contrast text is distracting for users. •
- Provide color-theme options for users, if possible.
- Adjust font size. Use at least an 8-pt font.
- Consider accordions, i.e., expandable sections to reduce clutter by showing details only when users are • interested.
- Change colors of tabs which serve different purpose, e.g., References (supportive information).

School of Information Science & Learning Technologies

University of Missouri

## Information Experience Laboratory

#### Enable users to prevent, diagnose, and recover from errors

- Include the error notification when users enter incorrect data, e.g., for date of birth, name format, Respondent ID. System should prompt the user to check the value entered in the field if the user mistakenly enters numerals instead of alphabets, or vice-versa.
- Replace the error notification message to a prominent place.
- Include error prevention for each page, i.e., notify users if they would like to proceed to the next page, or if they would like to save the data before moving to the next page.
- Error recovery can be made more intuitive for users by flashing/highlighting the next steps or actions.

#### Provide help and documentation

- Provide Help documentation and ensure it is easily searchable.
- Provide something like an FAQ, which will have the most common questions a user might have.
- Provide a short phrase describing the goal and required action for each tab on the menu.
- Provide a glossary of terms used on the site that offer a brief explanation to better help the user understand the content.

### 5. Conclusion

Overall, the TRHC application has useful functionalities that can enable a researcher to collect information on a patient's health history. It includes project description, consent, and useful tabs to collect relevant patient information. However, the application needs to improve its usability for a good user experience, user engagement, and user trust in the application.

In this report, we have reviewed the design of the application using Nielsen's (1994) 10 usability heuristics and provided design recommendations for all major and minor problems identified in the application's design.

Next steps include revising the design of the application based on the above design recommendations, and then testing the usability, i.e., effectiveness, efficiency, and user-satisfaction of the application with end-users using usability testing methods.

### Acknowledgements

We are grateful to all faculty members and students who supported this study.



University of Missouri

### References

- Harley, A. (2018, June 3). *Visibility of system status (Usability Heuristic #1)*. Nielsen Norman Group. <u>https://www.nngroup.com/articles/visibility-system-status/</u>
- Laubheimer, P. (2015, August 23). *Preventing user errors: Avoiding unconscious slips*. Nielsen Norman Group: <u>https://www.nngroup.com/articles/slips/</u>
- Nielsen, J. (1994, April 24). Usability heuristics for user interface design. Nielsen Norman Group. https://www.nngroup.com/articles/ten-usability-heuristics/
- Nielsen, J. (1999, August 21). *Do interface standards stifle design creativity?* Nielsen Norman Group: <u>https://www.nngroup.com/articles/do-interface-standards-stifle-design-creativity/</u>
- Nielsen, J. (2001, June 23). *Error message guidelines*. Nielsen Norman Group: <u>https://www.nngroup.com/articles/error-message-guidelines/</u>
- Parvin, D., Mosa, A. S. M., Knight, L., & Schatz, E. J. Development of a tablet computer application for HIV testing and risk history calendar for use with older Africans. *Frontiers in Reproductive Health*, 3(671747), 1-16.
- Sherwin, K. (2015). Low-contrast text is not the answer. Nielsen Norman Group. nngroup.com/articles/lowcontrast/