Usability Evaluation of Mobile Weather Alert applications

The UNIVERSITY of OKLAHOMA
Gallogly College of Engineering
School of Industrial and Systems Engineering

Abdulrahman Khamaj & Ziho Kang

ABSTRACT

Today, numerous people rely heavily on mobile weather alert applications (apps) for accessing information on weather-related incidents such as hurricanes and tornados. Even though it is extremely important to easily interact with the features of these apps and accurately comprehend the displayed information in a timely manner, developers may not pay enough attention to the usability of such apps in the design phase.

In this research, we aimed to evaluate the usability of weather apps using both conventional and advanced usability assessment tools. The widely used app, the Weather Radio, was considered as a case study in this research and evaluated in terms of 4 commonly utilized features: alert settings, map settings, alert notifications, and location search. Several usability issues resulted from users' interaction with the app's interface design and great insight was determined from users' responses to the survey questions.

Findings from this research greatly inform the importance of considering the usability when designing mobile apps, especially the apps associated with some risk to the lives of human beings, such as weather apps.

Contact Information

Name: Abdulrahman Khamaj

Email: khamaj@ou.edu

Lab: Human Factors and Simulation Laboratory

Website: http://humanfactors.oucreate.com/home.html?r

INTRODUCTION

- Being weather-aware is extremely important to one's safety, especially during seasons known to have hostile weather situations in certain geographical areas.
- Weather-related events in the U.S. caused **458** fatalities, **1276** injuries, and around **$280** million in damage costs in 2016 (National Weather Service, 2016).
- Today, a vast number of people rely heavily on mobile weather alert apps in accessing weather information [Ex: nearly **5.2 million** users have installed the Weather Radio app] (Weather Decision Technologies, 2016).
- Only little research is currently available on the usability of weather apps.
- The goal of this research was to thoroughly evaluate the usability of weather apps using both conventional (i.e. efficiency and user satisfaction attributes) and advanced (i.e. eye tracking) usability assessment tools.

METHODS

Participants

- 40 OU students (20 untrained users vs. 20 trained users).

Materials

- A smartphone (iPhone 6) to display the Weather Radio app (the case study used in this research, see Fig. 1).
- A remote eye tracker (Tobii TX300) with four built-in cameras to track users' eye movements.
- A stopwatch device to collect users' response times on the given tasks.

Procedure

Variables

- Two Independent Variables
  1) Training 2) Approach type
- Five Dependent Variables
  1) Task completion time
  2) Likert rating scores
  3) Duration of eye fixations
  4) Number of eye fixations
  5) Scanpath observations

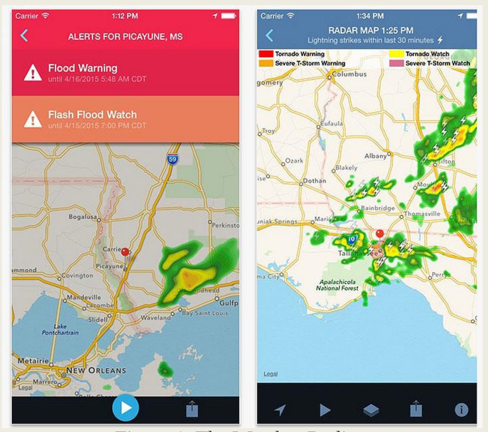


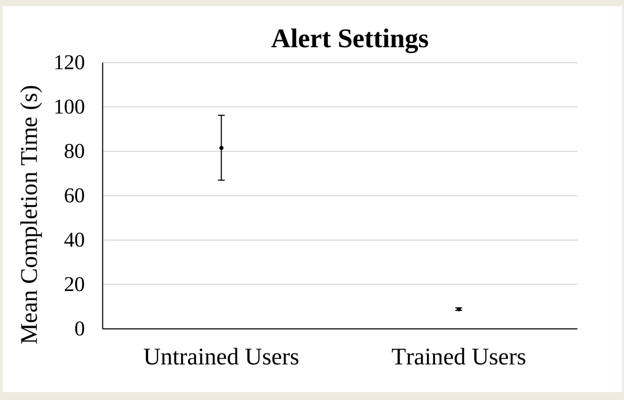
Figure 1. The Weather Radio app

Figure 2. Overall and specific AOIs [Header (H), Text Bar (TB), Main Display (MD), Soft Keyboard (SK), and Bottom Menu (BM)] of the Weather Radio app

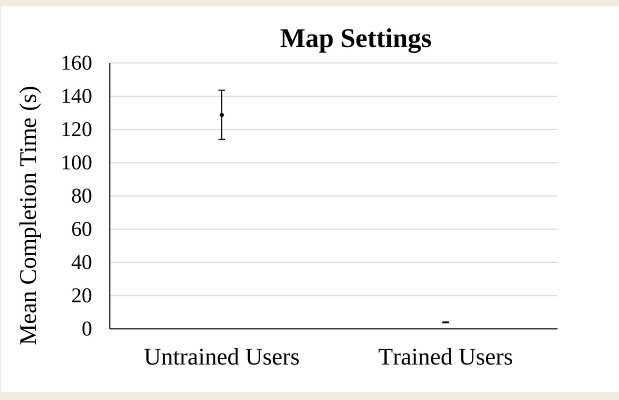
RESULTS

- **Task completion time & Likert rating scores**

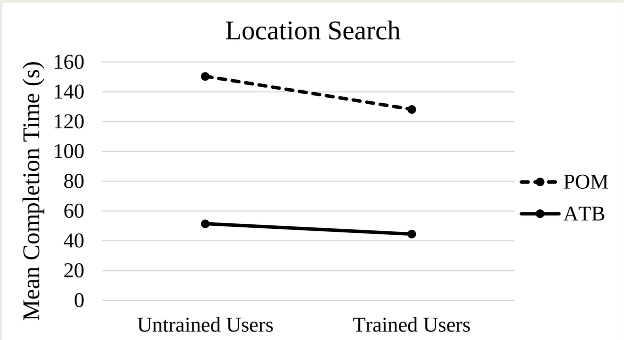
Either Two-way repeated measures ANOVA or independent sample-t test was performed for each task. See Fig. 3 for results.



(a)



(b)



(c)

	Untrained Users			Trained Users		
	M	*SD*	*P*	*M*	*SD*	*P*
NWS Header	2	0.9	<.001	2.8	1.3	<.001
Proposed Header	8.8	1.1		9.2	.8	
NWS Delimiter	3.3	2.2	<.001	4.1	1	<.001
Proposed Delimiter	8.7	1.1		9.1	0.8	
NWS Letter Format	2.9	1.3	<.001	3.8	1.1	<.001
Proposed Letter Format	8.5	1.3		9.1	0.8	
NWS Message Satisfaction	2.8	1	<.001	3.4	0.7	<.001
Proposed Message Satisfaction	8.5	1.1		8.8	0.6	

(d)

Figure 3. Task completion time results for the alert settings (a), map settings (b), and the location search (c). Likert rating score results for the alert notifications (d). Note: POM (pin on map) and ATB (app's text bar).

- **Overall eye fixation duration & numbers**

Either Wilcoxon signed-rank test or Friedman test was performed for each task. See Fig. 4 for results.

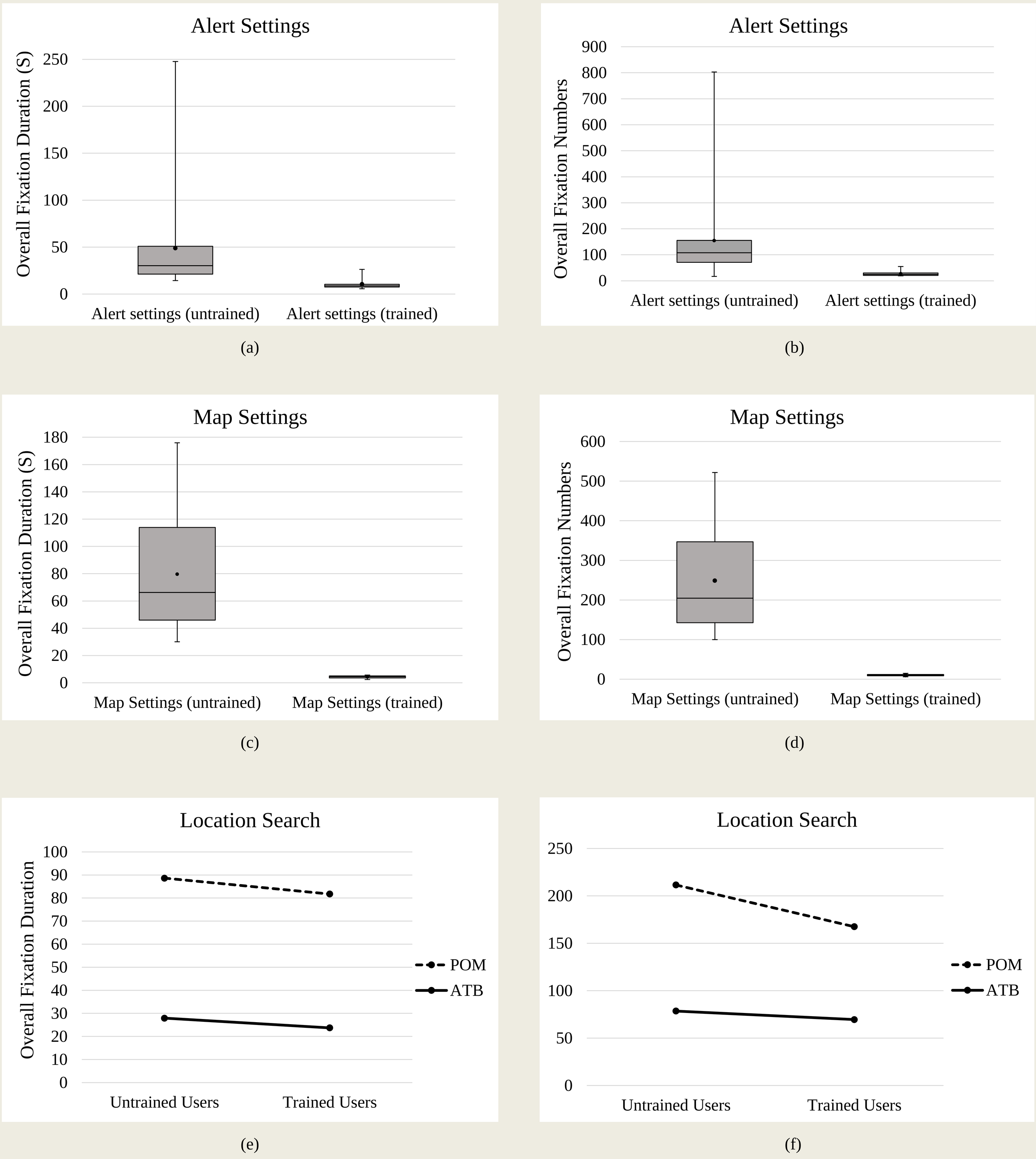


Figure 4. Overall eye fixation duration & numbers results for the alert settings [(a) and (b)] , map settings [(c) and (d)], and the location search [(e) and (f)]. Note: POM (pin on map) and ATB (app's text bar).

- **Visual scanning patterns (scanpath) observations**

Users' visual scanning strategies and decision making processes were determined from their scanpath data (see example in Fig. 5). Fig.6 shows diagrams of the required scanpath for each of the search tasks, and Table 1 shows each user group's scanpath results.

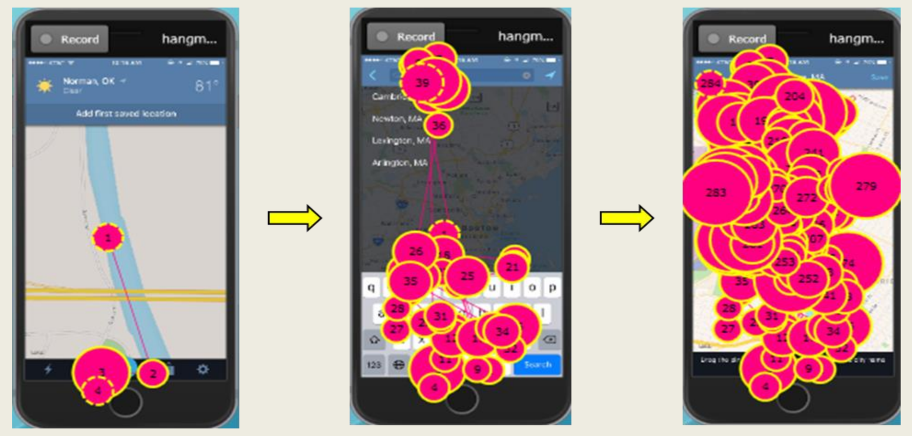


Figure 5. Example of a user's scanpath on the location search task (pin on map)

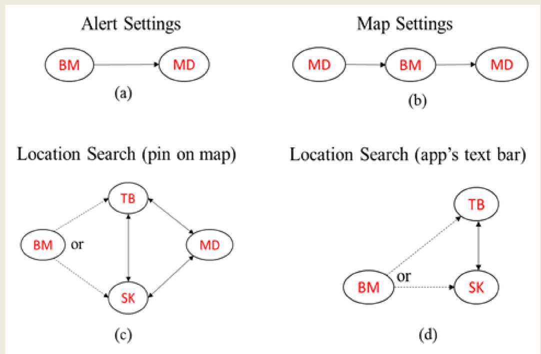


Figure 6. Diagrams of all possible scanpath patterns needed to successfully complete each of the experiment's tasks

Table 1. Users' scanpath results

		Untrained users		Trained users	
		Followed required scanpath (%)	Average number of deviations	Followed required scanpath (%)	Average number of deviations
Alert settings		20	9.60	100	0
Map settings		0	19.05	100	0
Location search	Pin on map	75	0.85	65	0.25
	App's text bar	70	0.55	85	0.15

DISCUSSION & CONCLUSION

Multiple usability issues were observed based on users' interaction with the app's interface. Examples of usability issues are discussed below.

- **Alert settings**
  - Confusion of reaching alert settings menu (i.e. jargons).
  - Overwhelming number of alerts and sub-alerts.
- **Map settings**
  - Confusion of reaching map settings menu (i.e. hidden menu).
  - Counter-intuitive icon functionality (i.e. "i" icon).
- **Alert notifications**
  - Lack of text clarity and organization.
  - Presence of undefined codes and technical information.
- **Location search**
  - Multiple navigational steps to use the pin on map.
  - Counter-intuitive icon functionality (i.e. pin icon).

Future Work

1. Designing a new weather app following the usability guidelines for mobile applications.
2. Examining the effect of different screen sizes such as iPads, tablets, and desktop computer displays on the performance of users.