Water Service platform for underserviced communities

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1 Introduction

This report presents the prototyping of an application addressing the crowd- sourcing of the inspection and detection of water service malfunctions, in under- resourced communities. The application has options for civilians, who wish to report malfunctions and leakages, and plumbers to register with the KWSTF, to provide timely services to repairs, based on standard remuneration. Thus, this application is conceptualized to function as a mediator between the public, who thrive to maintain the water services for the community, and the plumbers available in the region. Not only does this accelerate the provision of services for maintaining water infrastructure when resources are constrained, but it could also helps in providing jobs and visibility to the plumbing community.

The applica- tion begins with Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

2 Background

In the design of the UI, we have explored the following guidelines:

1. **Four Principles of Good Design (Shneiderman 1998)**
    - State and the action alternatives should be visible
    - Should be a good conceptual model with a consistent system image
    - Interface should include good mappings that reveal the relationships between stages
    - User should receive continuous feedback
2. **Nielsens Ten Heuristic Rules (1993)**
    - Simple and natural dialog
    - Speak the users language
    - Minimize users memory load
    - Consistency
    - Feedback
    - Clearly marked exits
    - Shortcuts

- Good error messages
- Prevent errors
- Help and documentation

3. **Jakob Nielsens Ten Usability Heuristics**
    - Visibility of system status (Feedback)
    - Match between system and the real world (METAPHOR)
    - User control and freedom (NAVIGATION)
    - Consistency and standards (CONSISTENCY)
    - Error prevention (PREVENTION)
    - Recognition rather than recall (MEMORY)
    - Flexibility and efficiency of use (EFFICIENCY)
    - Aesthetic and minimalist design (DESIGN)
    - Help users recognize, diagnose, and recover from errors (RECOVERY)
    - Help and documentation (Help)
4. **Shneidermans Eight Golden Rules**
    - Strive for consistency
    - Enable frequent users to use shortcuts
    - Offer informative feedback
    - Design dialog to yield closure
    - Offer simple error handling
    - Permit easy reversal of actions
    - Support internal locus of control
    - Reduce short-term memory load
5. **Smith & Mosier: Data Display**
    - 2.0/1Necessary Data Displayed
    - 2.0/2 Only Necessary Data Displayed
    - 2.0/3 Data Displayed in Usable Form
    - 2.0/4 Data Display Consistent with User Conventions2.0/6 Consistent Display Format
    - 2.0/8 User Control of Data Display
    - 2.0/12 Familiar Wording
    - 2.0/15 Consistent Grammatical Structure

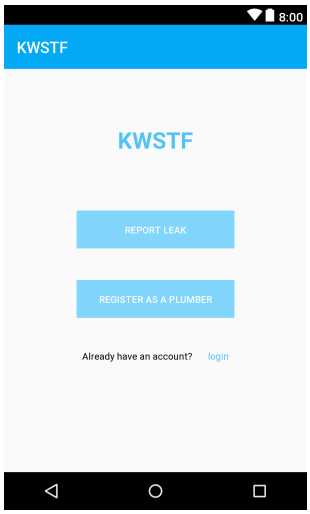
3 Methodology

The tools we are using includes design tools and software engineering tools. For the design tools, we used paper and hand drawing to draw the framework of the initial pages, and then we organize the initial pages together to a flow diagram, with a clear indication of how the pages are interacting with each other. For the engineering tools, we used Android Studio to put the design we made into an android project. We used xml language to define the layout of the page and then we used java language to create the function behind the layout.

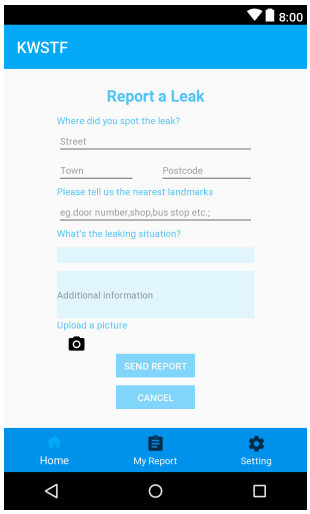
3.1 Guideline 01

Four Principles of Good Design (Shneiderman 1998):
2. Should be a good conceptual model with a consistent system image.

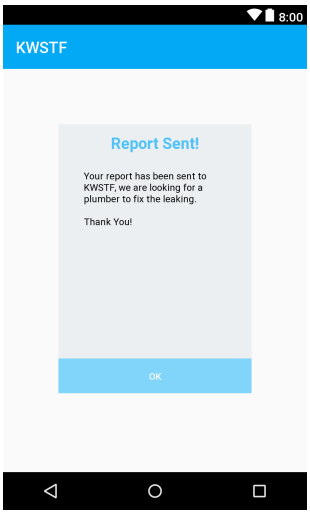
Implementation	
Content Items	**Style**
Page Title	20sp, dark blue color #4FC3F7, bold
Page content subtitle	12sp, blue color, #4FC3F7
Page content plain text	12sp, black color #000000
Buttons	background: blue color, #81D4FA text: 12sp, white color #FFFFFF
Text Links	12sp, blue color, #4FC3F7
Input Text Box	background: light blue color, #E1F5FE
Dropdown list	background: light blue color, #E1F5FE
Radio Buttons	12sp, black color #000000
Contact card	background: light blue color, #E1F5FE



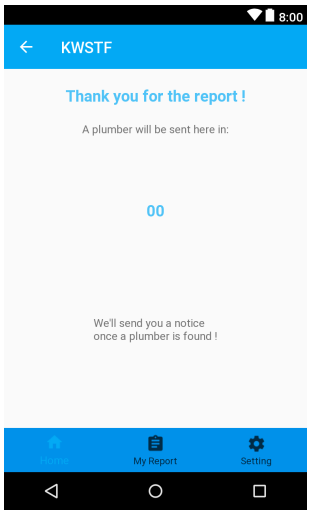
(a) label 1



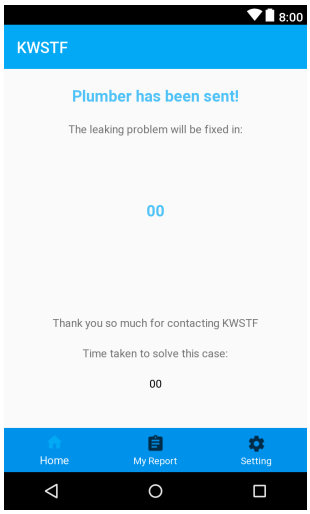
(b) label 2



(c) label 3

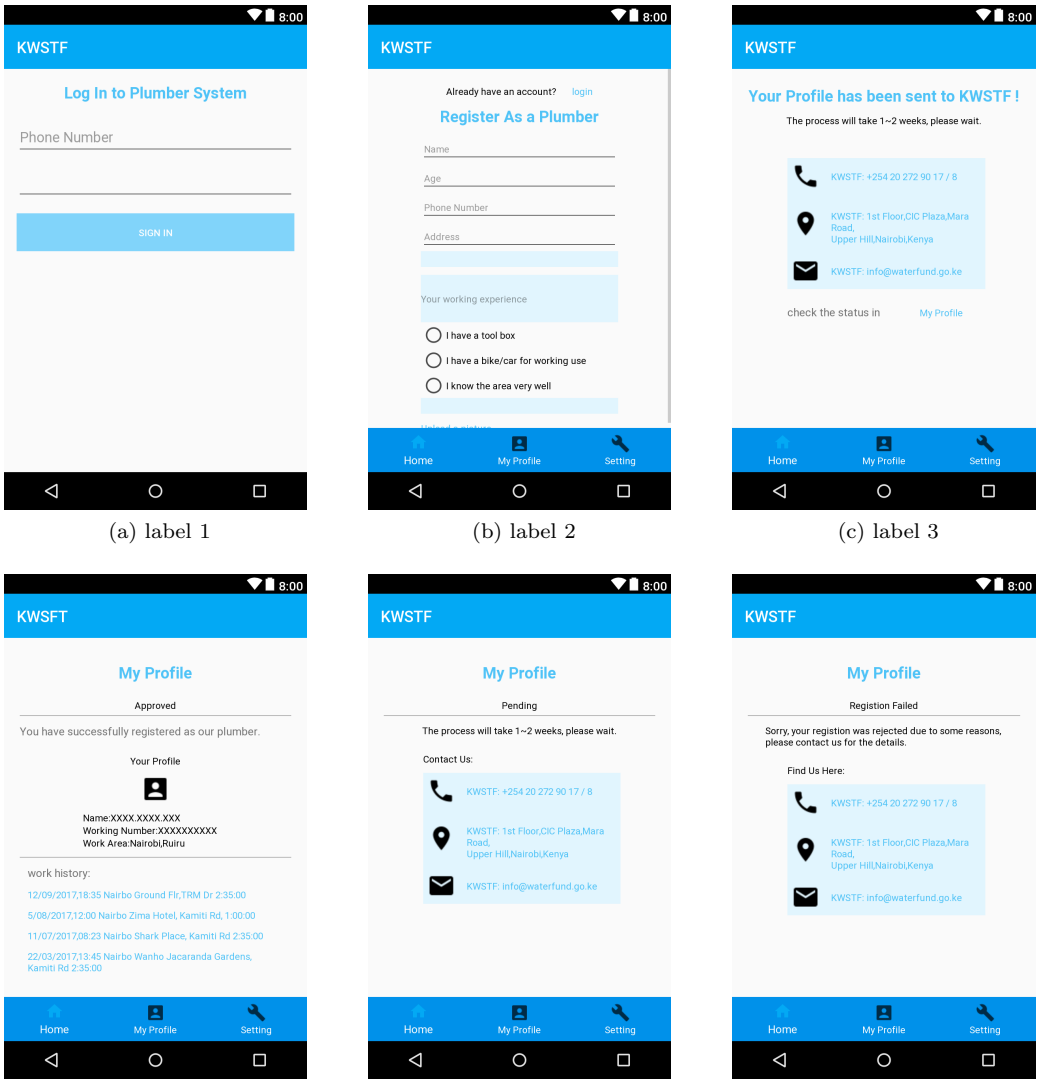


(d) label 4



(e) label 5

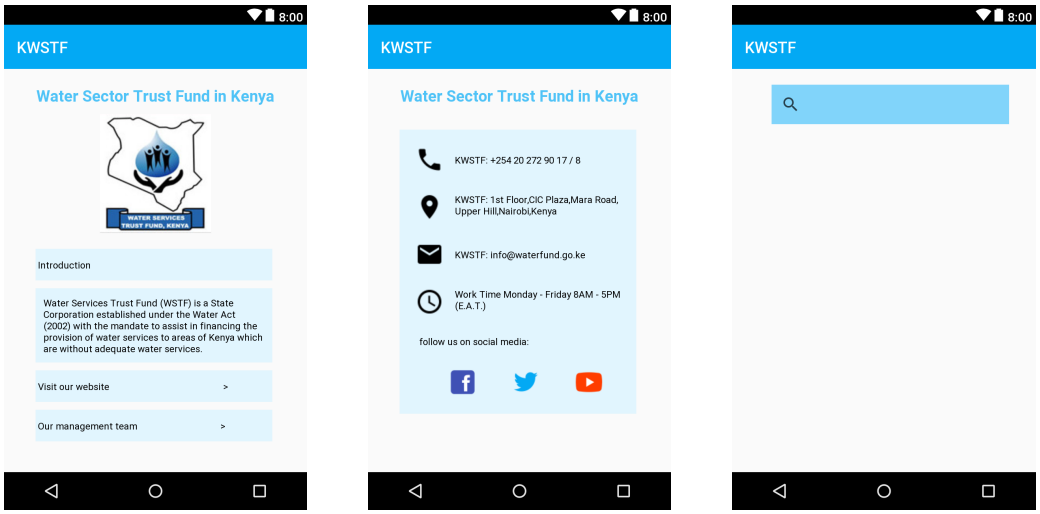
Figure 1: Guideline 01: Report Leak



(a) label 1 (b) label 2 (c) label 3

(d) label 4 (e) label 5 (f) label 6

Figure 2: Guideline 01: Register as a plumber



(a) label 1 (b) label 2 (c) label 3

Figure 3: Guideline 01: Menu

3.2 Guideline 02

Four Principles of Good Design (Shneiderman 1998):
4. User should receive continuous feedback.

Implementation:

- Popup-window
- Time-track and Estimated Time Notice

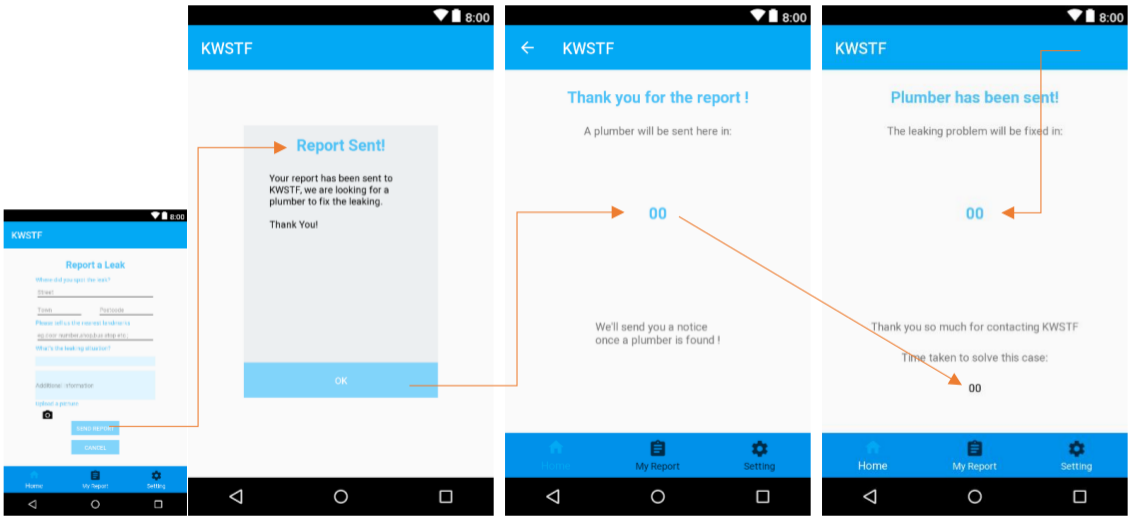


Figure 4: Guideline 02: When the user want to report a leak and right after the user hit the Send Report button, a pop-up window will be activated and displayed on My Report page, give the user positive respond that the report has been sent. At the same time, the timer was sent to track the time that has passed since the user submitted the case, so the user could have a clear image that how fast the KWSTF are responding to the report. After KWSTF has found a plumber, My Report will be updated, a Count-down timer will be activated according to the time the plumber estimated to spend on fixing the leak, so the user could be clear that the leak will be fixed in a specific time. At the same time, the previous timer will stop counting and display the time used to find a plumber.

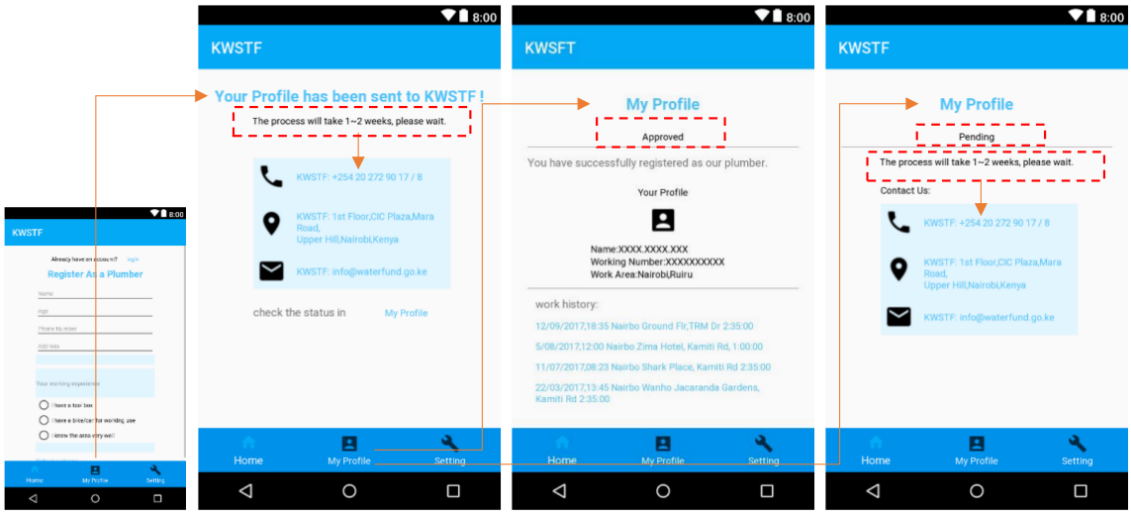


Figure 5: Guideline 02: After the plumber has submitted the registrations form, the user will be sent to My Profile, with a notification on the title saying the profile has been sent to KWSTF, the estimated time for the process will be displayed under the title, so the user would be clear when he could get the respond from KWSFT, besides that, the contact information are displayed under, the user could choose to call or send an email to inquire about his case. When a decision is made by KWSTF, My Profile page will be updated, with Approved or Pending or Rejected status displayed under, if its still in Pending, KWSTF contact info are available on the page for user to take the next step.

3.3 Guideline 03

Nielsens Ten Heuristic Rules (1993):
1. Simple and natural dialog 2. Speak the users language 3. Minimize users memory load 7. Shortcuts
Implementation:

- Bottom Navigation Bar
- Menu Items
- Page Update

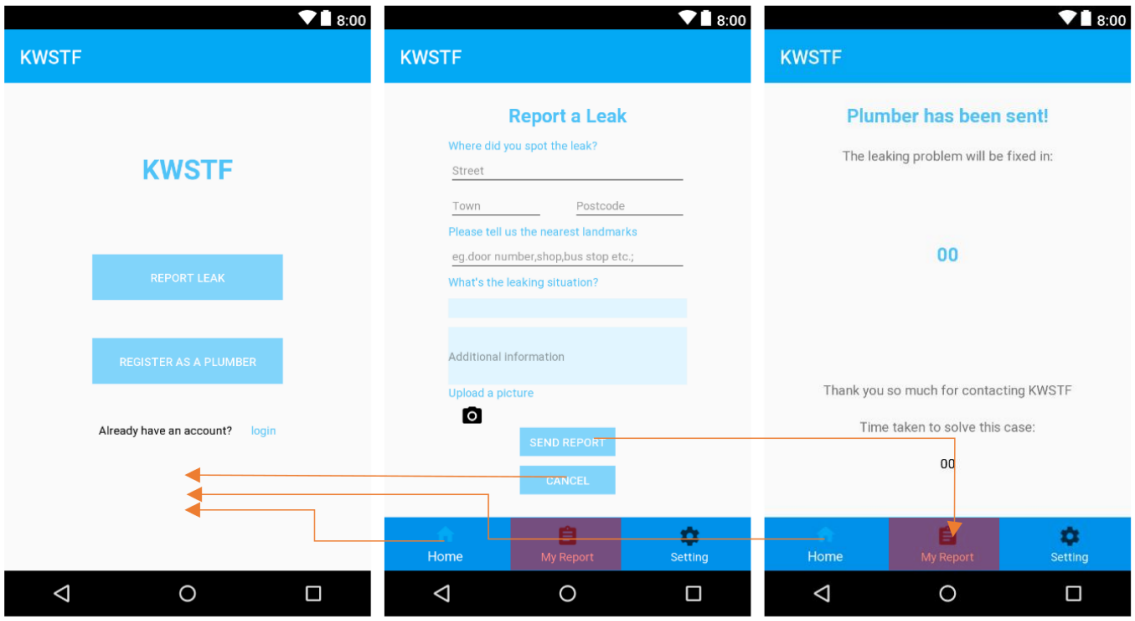


Figure 6: Guideline 03: The app use users language and give users hint with blue text to prevent erros. Bottom Navigation bar is the shortcut for the pages. User can always go back to home page and start over again. After the report was sent, it will be stored in My Report, users could go to the page and check the updates.

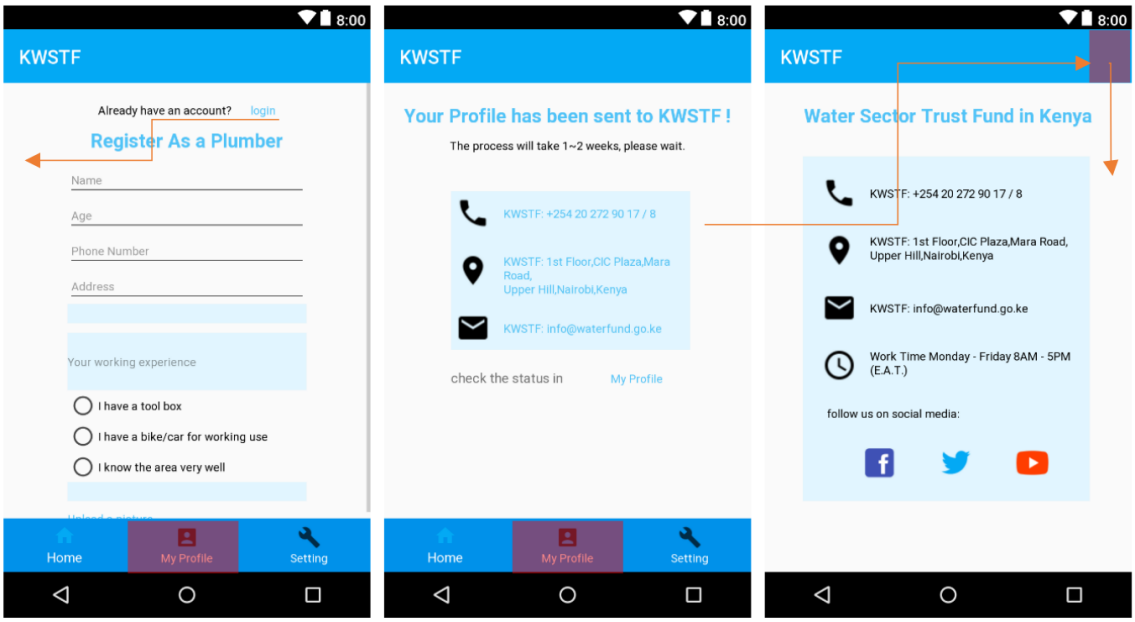


Figure 7: Guideline 03: Login link was listed on top of the page, so if the user already have an account, he can use the shortcut to login. The KWSTF contact card will be displayed every time there is a need, and the contact info are listed in the menu items, users can also use Menu to quickly locate the contact info.

3.4 Guideline 04

Jakob Nielsens Ten Usability Heuristics:
2. Match between system and the real world (METAPHOR) 6. Recognition rather than recall (MEMORY) 8. Aesthetic and minimalist design (DESIGN)
Implementation:

- Drop-down list
- Radio Button

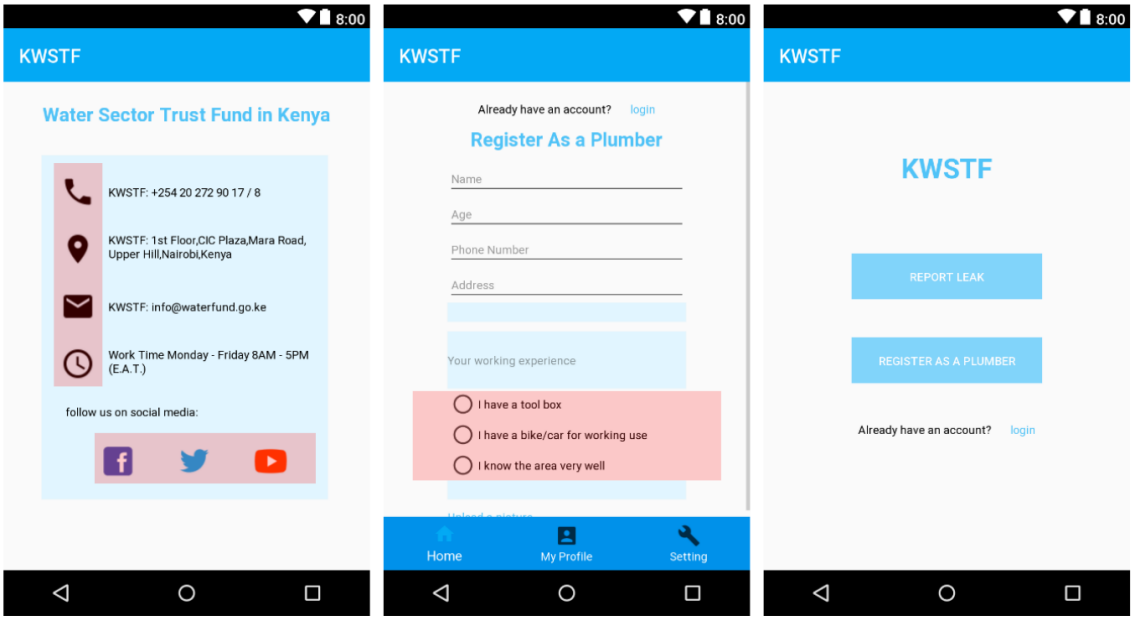


Figure 8: Guideline 04: A lot of Icons are used to make the app works closely with users real life. When we need to have the input from users, we provide Dropdown menu or Radio Button, so the users dont need to recall but only to choose from the current. The design have only one main theme color: blue, when there is a need to distinguish, different blue tone is used instead of other colors, which makes the app design is simple and not color-blind users.

3.5 Guideline 05

Smith & Mosier: Data Display
2.0/13 Consistent Wording 2.0/15 Consistent Grammatical Structure Implementation:

- Grammatical Structure goes like: Report/Register + A leak/ As a plumber
- Wording goes like: I have/know + tool box/the area

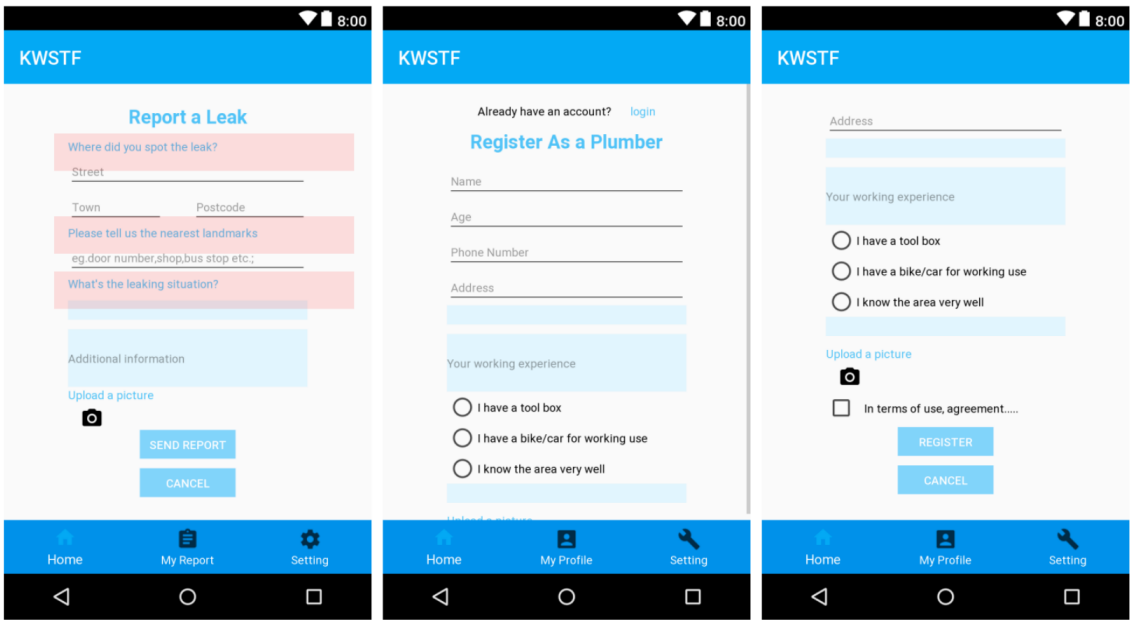


Figure 9: Guideline 05

References

[1] Google. Android developers, 2017.

[2] Google. Material design: Color - style - material design, 2017.

[3] Jakob Nielsen. Ten usability heuristics, 2005.

[4] Ben Shneiderman. Shneiderman's eight golden rules of interface design. *Retrieved July*, 25:2009, 2005.

[5] Ben Shneiderman. *Designing the user interface: strategies for effective human-computer interaction*. Pearson Education India, 2010.

[6] Sidney L Smith and Jane N Mosier. *Guidelines for designing user interface software*. Mitre Corporation Bedford, MA, 1986.

[7] Bruce Tognazzini. First principles of interaction design. *Interaction design solutions for the real world, AskTog*, 2003.