

① Categorization of Failure Effects on Users

Failure (55)



Visual Aesthetics (20)



Error Prone (50)

- Time Consuming (12)
- Work Around Possible (21)



② Oracle Analyses and Failure Categorization

Text Analysis (92)



Incorrect Functionality (21)



- Screen (1)
- Bottom Nav. (2)
- Button (1)
- File (2)
- Image Button (1)
- List (1)
- Scroll View (1)
- Image (1)
- Dialog Box (2)
- Text Element (5)
- Toast (1)
- Editable Text (2)
- List Item (1)

Layout (4)



Component Location (3)

- List (1)
- Button (1)
- List Item (1)

Component Size (1)

- Button (1)

Resource (14)



Component State (2)

- Editable Text (1)

Extraneous Component (6)

- List Item (1)
- Text Element (3)
- Dialog Box (1)
- Toast (1)

Missing Component (6)

- Text Element (4)
- List (1)
- Image (1)

Text (53)



Extraneous Text (4)

- Text Element (1)
- Toast (2)

Incorrect Text (35)

- Text Element (20)
- Editable Text (8)
- Dialog Box (2)
- Spinner (3)
- Tool Tip (1)
- List Item (1)

Missing Text (10)

- Text Element (7)
- Editable Text (8)
- Tabbed View (1)
- Chckbx Text (1)

Incorrect Language (3)

- Text Element (1)

Missing Component (1)

- Tabbed View (1)

Visibility Analysis (70)



Incorrect Functionality (14)



- Screen (1)
- Bottom Nav. (1)
- File (1)
- Text Element (1)
- Dialog Box (1)
- Toolbar (1)
- Keyboard (1)
- Image (1)
- List Item (1)

Layout (6)

Component Location (2)

- List (1)
- Button (1)

Component Size (4)

- Context Menu (1)
- ListView (1)
- List Item (1)
- Button (1)

Resource (42)

Component Theme (1)

- Screen (1)

Extraneous Component (9)

- Keyboard (2)
- Item in List (2)
- Image (1)
- List (1)
- Spinner (1)
- Image Button (1)
- Dialog Box (1)

Missing Component (26)

- Dialog Box (5)
- Text Element (5)
- Image (4)
- List Item (3)
- Option Menu (1)
- Button (1)
- Image (1)
- List (1)
- Tabbed View (1)
- Editable Text (1)
- Slide View (1)

Text (8)

Extraneous Text (3)

- Text Element (2)
- Toast (1)

Incorrect Text (2)

- Text Element (2)

Missing Text (3)

- Editable Text (1)
- Keyboard (1)
- Tabbed View (1)

Image Analysis (48)



Incorrect Functionality (15)



- Screen (2)
- Image (2)
- Text Element (2)
- File (1)
- Image Button (1)
- Seek Bar (1)
- List (1)
- Scroll View (1)
- ToggleButton (1)
- Toast (1)
- Editable Text (1)
- Dialog Box (1)

Layout (1)

Component Location (1)

- List (1)

Resource (23)

Component State (6)

- Editable Text (3)
- Keyboard (1)
- Spinner (1)
- Image (1)

Extraneous Component (3)

- Keyboard (1)
- Text Element (1)
- List Item (1)

Missing Component (7)

- Image (3)
- List (1)
- Keyboard (1)
- Editable Text (1)
- Dialogue (1)

Image Color (2)

- Image (2)

Incorrect Image (3)

- Image (2)
- List Item (1)

Incorrect WebView (1)

- WebView (1)

Text (9)

Extraneous Text (2)

- Text Element (1)
- Toast (1)

Incorrect Text (2)

- Text Element (1)

Missing Text (4)

- Text Element (2)
- Editable Text (2)

Incorrect Language (1)

- Text Element (1)

Color Analysis (8)



Resource (8)



Component Theme (8)

- List Item (3)
- Screen (1)
- Text Element (1)
- Radio Button (1)
- Toolbar (1)
- Chckbx Text (1)

Position Analysis (5)



Layout (5)

Component Location (5)

- Image Button (3)
- Menu (1)
- List Item (1)
- Text Element (1)

Webview Analysis (8)



Incorrect Functionality (3)

- Bottom Nav (2)
- Image Button (1)

State Analysis (6)



Incorrect Functionality (1)

- Toggle Button (1)

Resource (8)



Comp State Enabled/Disabled (3)

- Image Button (1)
- Switch (1)
- Spinner (1)

Component State Selected (2)

- Checkbox (1)
- Radio Button (1)

Size Analysis (5)



Layout (5)

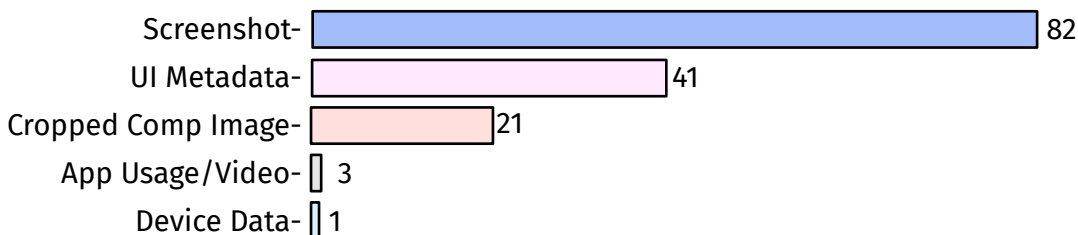
Component Size (4)

- List (1)
- Menu (1)
- List Item (1)
- Text Element (1)

Text Padding (1)

- List Item (1)

③ Resources Needed for Oracle



④ App Behavior Invariants

- 1) User-entered data should display correctly (12) ✓
- 2) Action name and action should match (10)
- 3) Theme change should be reflected on all screens (9) ✓
- 4) The screen content should not change on rotation (6) ✓
- 5) Dialog Box should only appear after certain actions (5)
- 6) GUI elements should not be missing (5)
- 7) The language change should be reflected on all screens (4) ✓
- 8) Pressing back should lead to the previous screen (4) ✓
- 9) Padding of items in List should be consistent (3)
- 10) Duplicate elements should not be present (3)
- 11) Element size should match expected size (3)
- 12) Certain GUI elements should only appear in pairs (3)
- 13) App state should (not) restore after certain actions (3)
- 14) Cursor Position should be consistent with user input (3)