

Unit 7:

Designing Mobile Applications – User Interface Design



Mobile Application Development (MAD)
CCIT 4059, 2025-2026

Outline

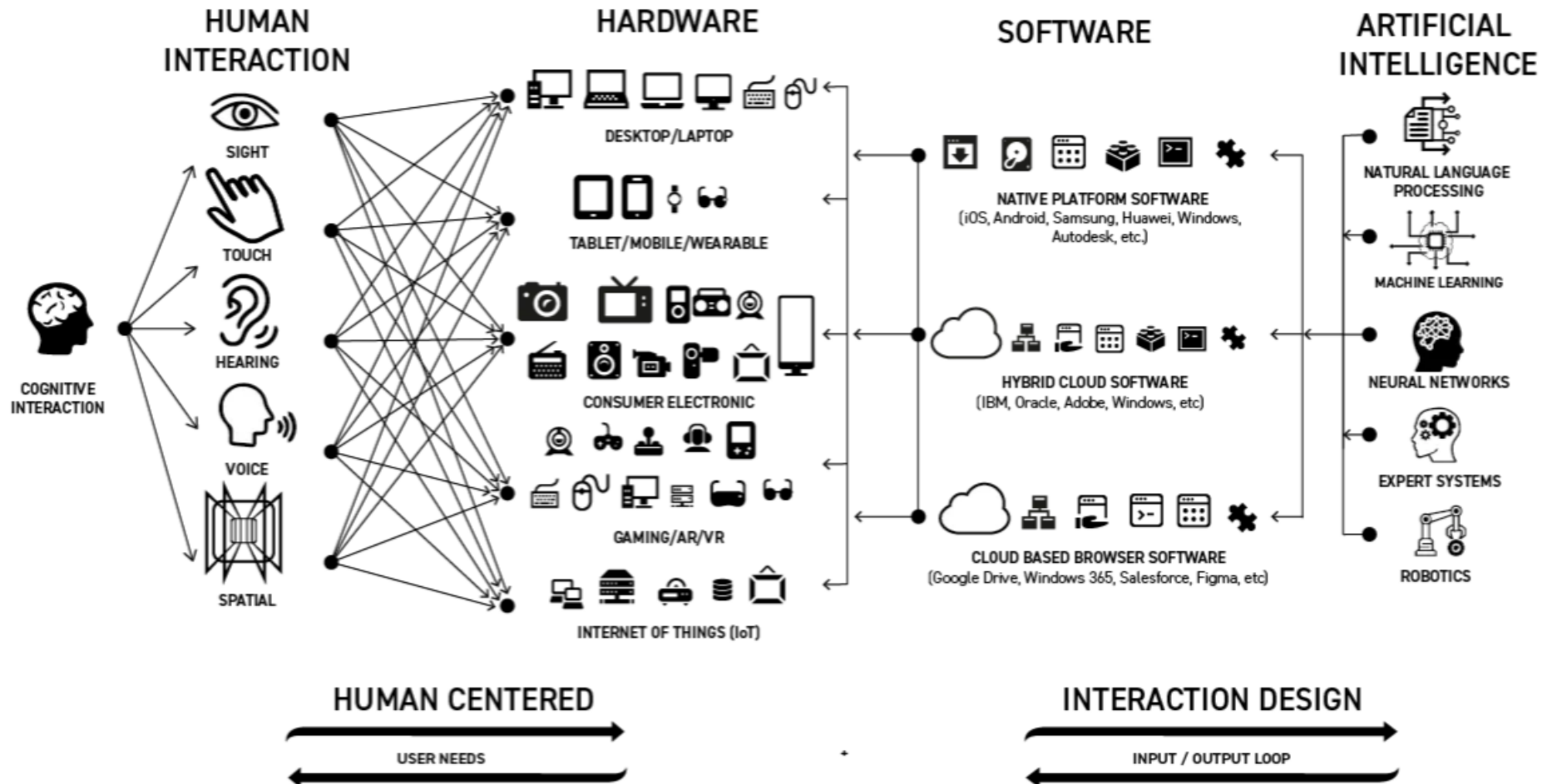
- User Interface Design
 - General Guidelines
 - Issues specific to Mobile Apps
- From Design Concept to Production
 - Wireframes / Storyboards
 - Prototypes

User Interface Design

- Appropriate user interface also determines the success of a mobile app
- Creating great user interface follows with the basic principles of design in visual content, as well as Human Computer Interaction (HCI)
 - It interacts with mobile computing devices) which focuses on how people behave and interact (think and work)
- Beautiful, intuitive, compelling user interface enhances app's functionality and inspires a positive emotional attachment in users
- General user interface design considers the basic issues of End-User and Context:
 - Again, put the end-user in the highest priority
 - Who are the real users?
 - What do users in the context actually need?
 - How, when and where is the app used?

User Interface Design

INTERACTION DESIGN PARADIGMS



User Interface Design (General Guidelines)

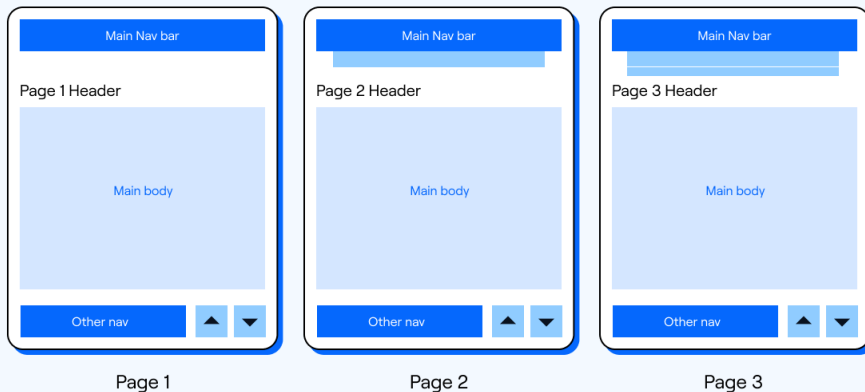
- General guidelines for user interface design
 - Strive for consistency
 - Enable frequent users to use shortcuts
 - Offer informative feedback
 - Make users feel they are in control
 - Design dialog to yield closure
 - Strive to prevent errors, and help users to recover quickly from them
 - Allow 'undo' and 'home' if possible
 - Reduce short term memory load by designing screens where options are clearly visible, or using pull-down menus and icons.

User Interface Design (General Guidelines)

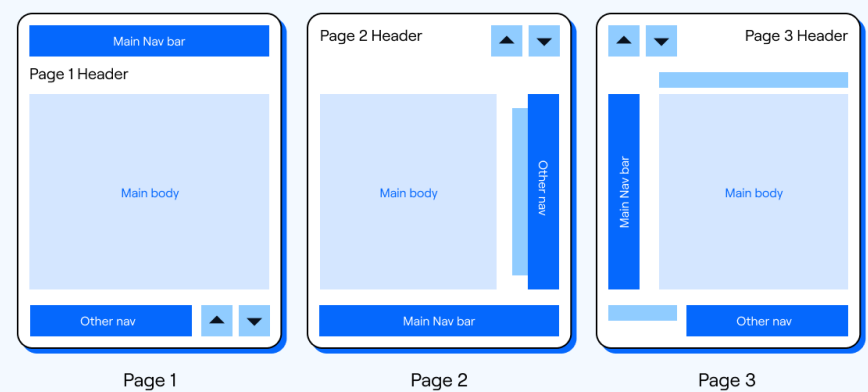
- Strive for consistency
 - Internal:
 - make sure the application is internally consistent, e.g. by using the same terms for the same things
 - External:
 - Be consistent with other applications users might come across – Do not do things differently, without a good reason
 - Be consistent with users' wider life knowledge and experience



Consistent page design

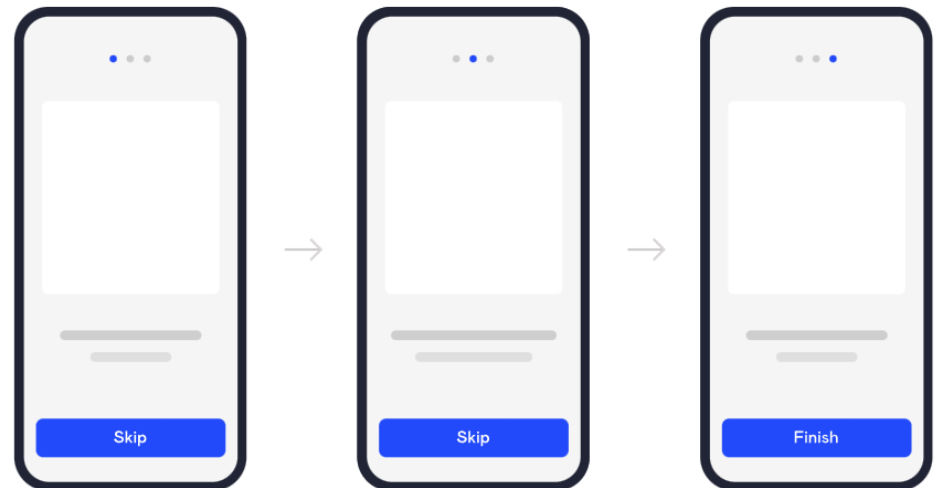
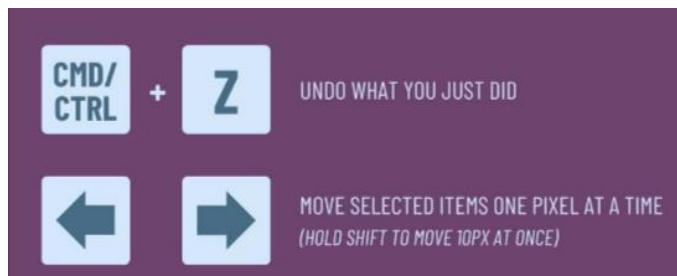


Inconsistent page design



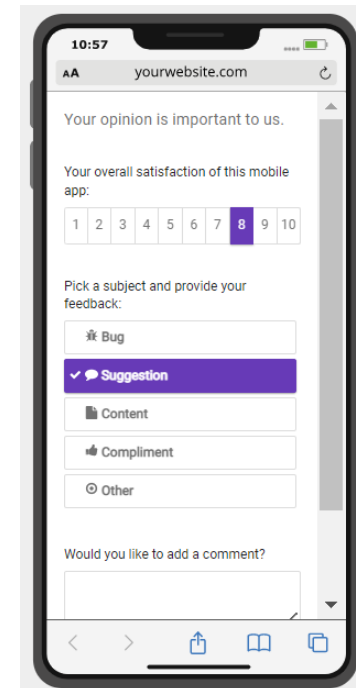
User Interface Design (General Guidelines)

- Enable frequent users to use shortcuts
 - Designers have long used shortcuts (hotkeys) to cut down on menu navigation
 - This is particularly helpful to frequent users
 - Allow users to define ‘favorites’ or most-used features if possible; consider tracking usage and providing access to most-used functions directly
 - However, for mobile apps, shortcut keys may not apply but a “skip” button surely helps



User Interface Design (General Guidelines)

- Offer informative feedback
 - Provide proper feedback as quickly as possible
 - Indicate any delay to the user with a realistic presentation of progress if needed
 - Avoid jargon – relate error and other messages to the user's interest and the task



User Interface Design (General Guidelines)

- Make users feel they are in control of a responsive system
 - Despite of the increased processing/memory power available there is always a danger of sluggish, slow-responded systems
 - Consider the possible delays in many video applications while video are stored or retrieved
 - Careful and resource-efficient approaches are needed, to make the interaction more responsive

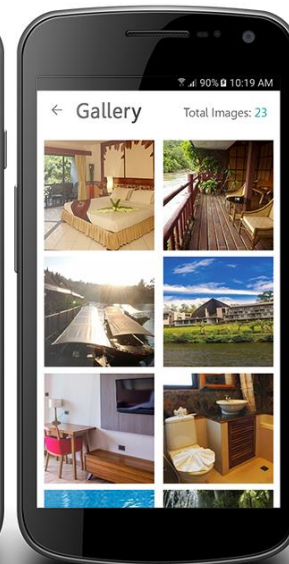


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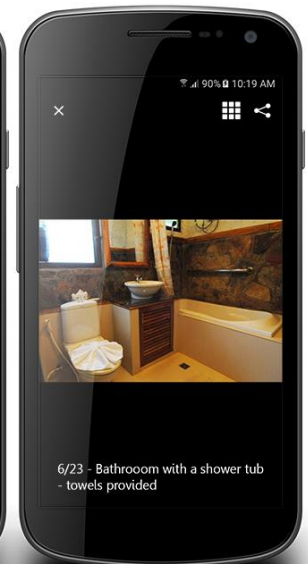
Screen 5

On the home page, users can either maximize the image or browse through the gallery.



Screen 6

The gallery page displays the available images in a grid view. Users can select an image to maximize it.

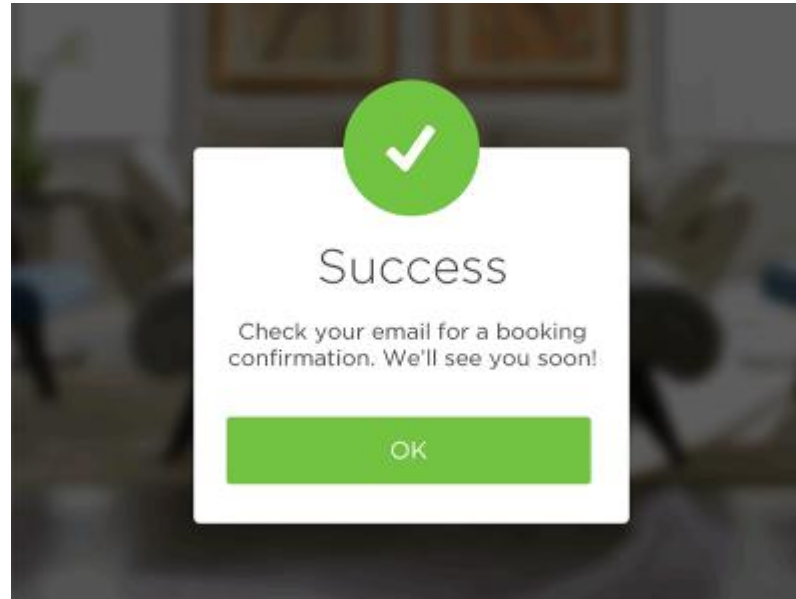


Screen 7

In maximized view, users can go browse through the images by swiping back and forth.

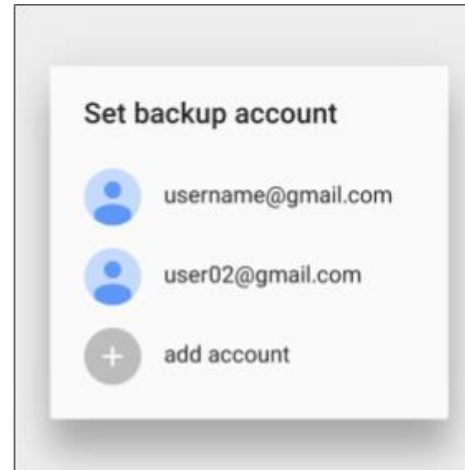
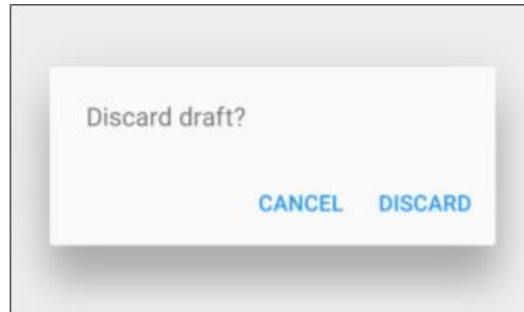
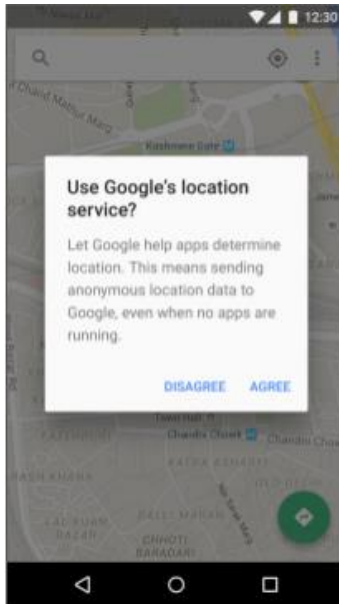
User Interface Design (General Guidelines)

- Design dialogs to yield closure
 - Give users a sense of complete interaction process - with beginning, middle and end in their interactions
 - Text messaging task flow in many devices is a good example of a well-structured, simple dialog



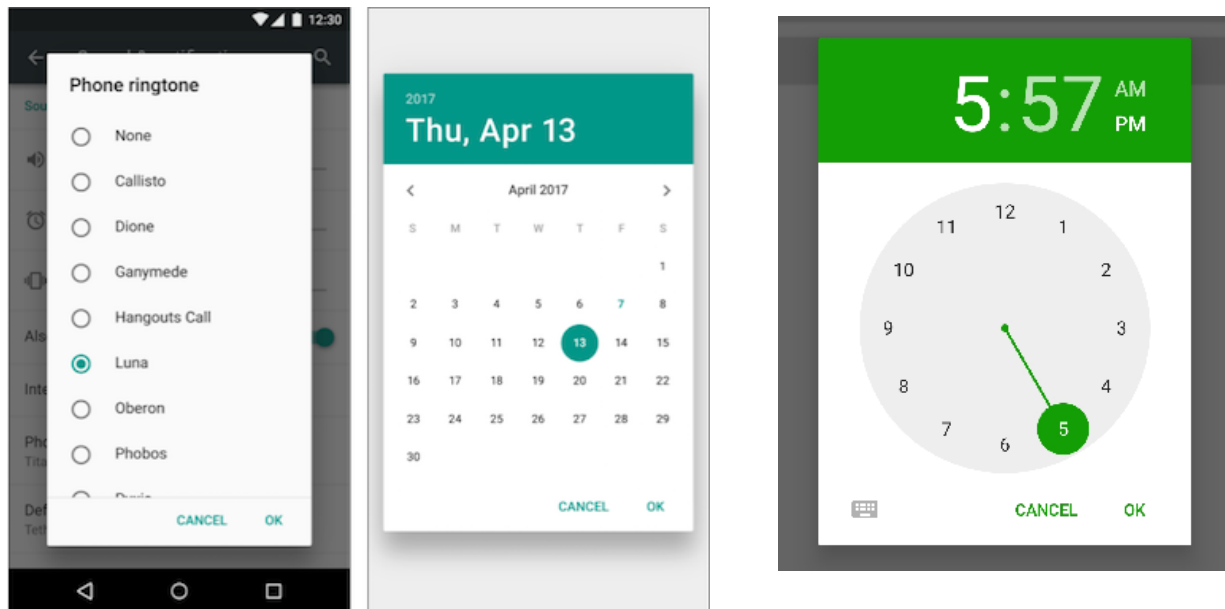
Dialogs and pickers

- A dialog is a window that appears on top of the display or fills the display, interrupting the flow of Activity. Dialogs inform users about a specific task and may contain critical information, require decisions, or involve multiple tasks.
- E.g. an alert dialog might require the user to click **Continue** after reading it, or give the user a choice to agree with an action by clicking a positive button



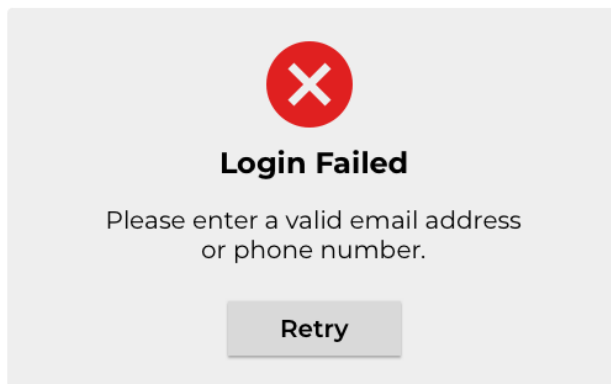
Dialogs and pickers

- Pickers allow users to enter information in a predetermined, consistent format that reduces the chance for input error.
- Android provides ready-to-use dialogs, called *pickers*, for picking a time or a date. Use them to ensure that your users pick a valid time or date that is formatted correctly and adjusted to the user's locale.

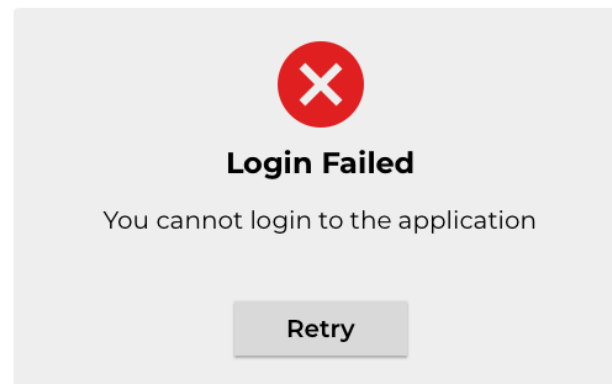


User Interface Design (General Guidelines)

- Strive to prevent interaction errors, and help users to recover quickly from them
 - Watch for potential mistaken input
 - On screen, avoid making controls too small or placing them too closely together (esp. for small devices like mobile phones)
 - Give helpful feedback on invalid input, highlighting it and requiring that only the erroneous input is fixed



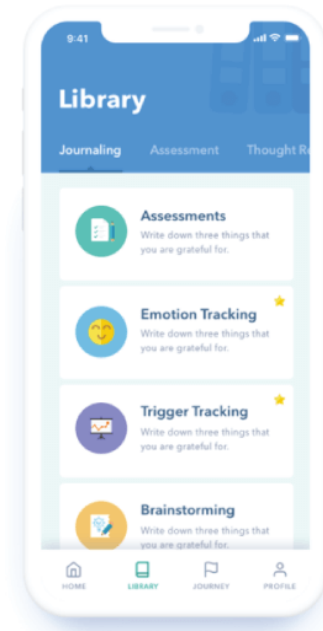
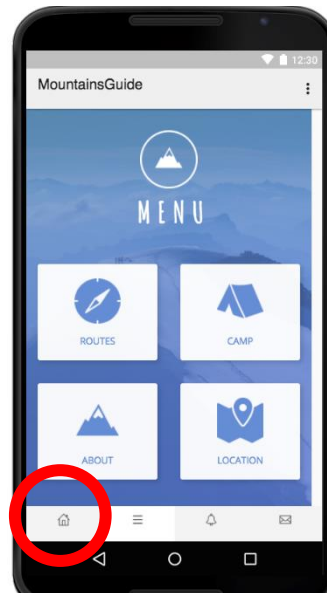
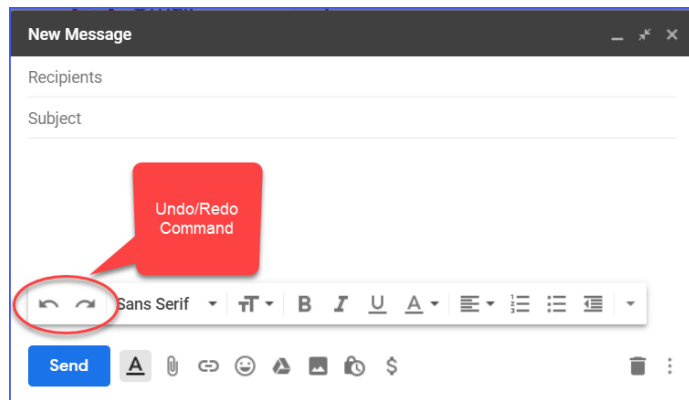
✓ The reason for login failure is clear and user can enter correct username and password



✗ The reason for login failure is not clear. The user cannot find a solution without hit and trial.

User Interface Design (General Guidelines)

- Allow 'undo' and 'home'
 - Make it easy for the user to reverse mistaken input or actions
 - Whenever possible, there is always a safe way to go back 'home' of the app
- Reduce short-term memory load
 - Avoid burdening the user with complicated numbers, codes, sequences, etc., as far as possible

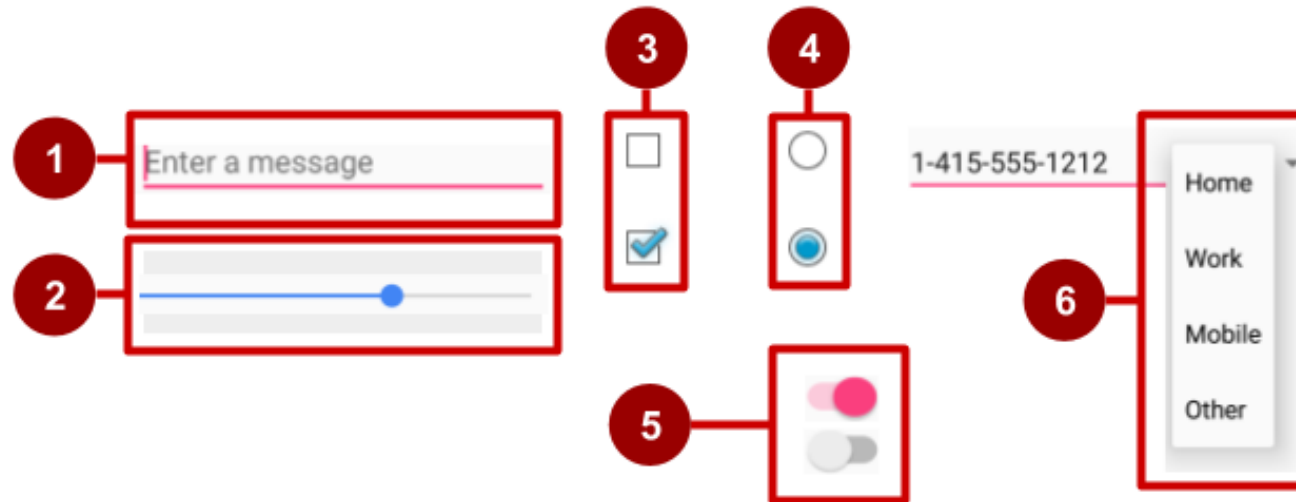


User Interface Design

(Input controls)

- Input controls are interactive elements in your app's UI that accept data input.
- Users input data to apps by entering text or numbers into fields using the on-screen keyboard.
- Users also select options from checkboxes, radio buttons, and drop-down menus, and they change settings and turn on or turn off certain features.

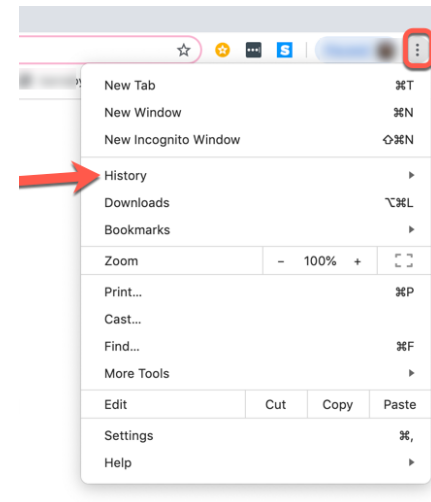
User Interface Design (Input controls)



- `EditText` field (subclass of `TextView`) for entering text using a keyboard
- `SeekBar` for sliding left or right to a setting
- `CheckBox` elements for selecting one or more options
- `RadioGroup` of `RadioButton` elements for selecting one option
- `Switch` for turning on or turning off an option
- `Spinner` drop-down menu for selecting one option

User Interface Design (Human Memory)

- Sensory memory
 - Corresponds approximately to the initial half a second after an item is perceived
- Short-term (working) memory
 - Short-term memory allows recall for a period of several seconds to a minute without rehearsal
- Long-term memory
 - Store much larger quantities of information for potentially unlimited duration (sometimes a whole life span)



User Interface Design (Human Memory)

- Sensory memory
 - Related to the ability to sense and memorize,
 - e.g. the ability to “see” (“look at”) an item, and remember what it looked like with just a second of observation, or memorization, is an example of sensory memory
 - This type of memory cannot be prolonged via rehearsal
 - Iconic memory: visual sense of sight
 - Echoic memory: auditory sense of hearing
 - Haptic memory: tactile sense of touch

User Interface Design (Human Memory)

- Short term memory (STM)
 - Short-term memory (or “primary”, “active” memory) is the capacity for holding a small amount of information in mind in an active, readily available state for a short period of time
 - Modern estimates of the capacity of short-term memory are lower, typically on the order of 4–5 items, except with some specific training
 - In contrast, long-term memory stores a seemingly unlimited amount of information

User Interface Design (Human Memory)

- Long term memory (LTM)
 - The information that we want to remember must be encoded, stored, and then retrieved. From an information processing perspective there are three main stages in the formation and retrieval of memory:
 - Encoding or registration (receiving, processing and combining of received information)
 - Storage (creation of a permanent record of the encoded information)
 - Retrieval, recall or recollection (calling back the stored information in response to some cue for use in a process or activity)

User Interface Design

(Interface Metaphor vs. Affordance)

- Interface metaphor
 - A set of user interface visuals, actions and procedures that exploit specific knowledge that users already have of other domains
 - The purpose of the interface metaphor is to give the user instantaneous knowledge about how to interact with the user interface, without much training (or guidelines) required

User Interface Design

(Interface Metaphor vs. Affordance)

- Interface metaphor: Examples (to most modern people)
 - Visual symbols of pausing, playing, and stoping a music or video
 - The folders and the file cabinets often represent the file system
 - Symbols of “green-leaves” and “cyclic-arrows” represent or relate to environmental protection, green-living and recycle



User Interface Design

(Interface Metaphor vs. Affordance)

- Affordance
 - Affordance is the quality of an object, or an environment, which allows an individual to perform an action
 - Affordance simply could be treated as perceived action possibilities
 - In product design for example, a knob affords twisting, and perhaps pushing, while a strip or a rope affords pulling



User Interface Design

(Interface Metaphor vs. Affordance)

- Affordance in User Interface Design
 - Similar to metaphor, affordance could provide indication of what could be done (or acted) with proper visual elements
 - Affordances in interface design could be visual clues to the function (action) of an object
 - For example, in application software design a “3D-like” visual button on the screen looks like (affords) it can be pushed by end-users, better than a “flat-2D” shape button

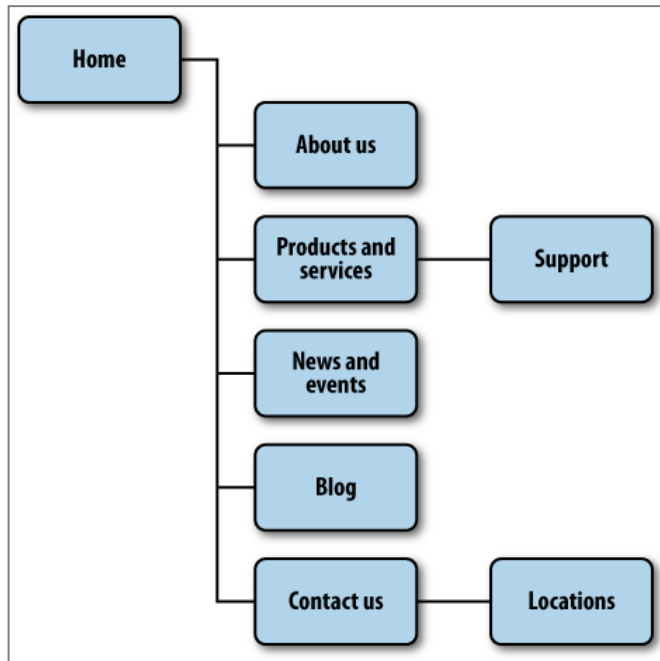


User Interface Design (Information Structure)

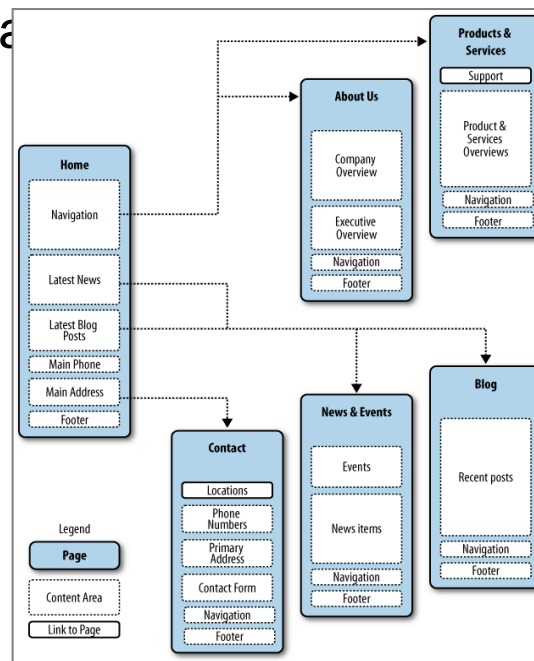
- Information presented to end-users should be logically well-structure
 - Similar to “visual hierarchy” in visual design, it is also useful to prioritize information in terms of their importance with “importance hierarchy”
- Information Structure
 - It needs special treatment in structuring and presenting information in mobile apps, because of the screen size and end-user behaviour
 - Keep it simple on each screen, for major purposes only
 - Consider to use clear and simple labels (textual or graphical)
 - Simple, clear and direct site maps

User Interface Design (Information Structure)

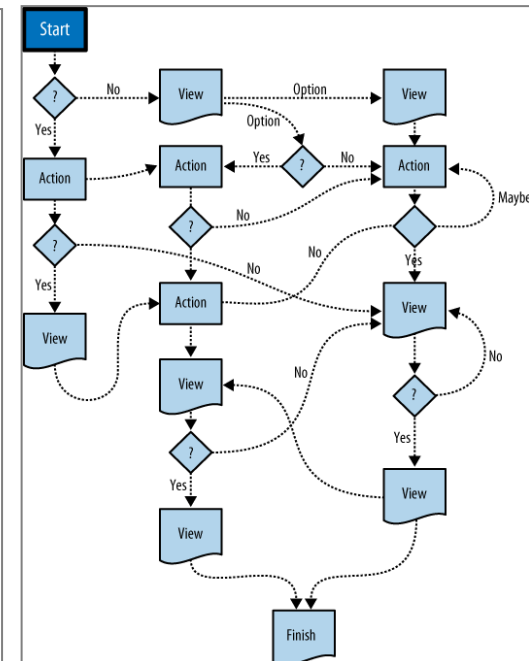
- Information presented to end-users should be logically well-structure
 - Similar to “visual hierarchy” in visual design, it is also useful to prioritize information in terms of their importance with “importance hierarchy”
- Site maps for info structure (pictures 1 & 2) It is simple, clear and direct
- Process flow diagram (picture 3) may also help in structuring information,



1



2



3

User Interface Design

(Issues specific to Mobile Apps)

- Given the hardware / software constraints, user interface for mobile apps should also:
 - Provide only essential content in a page
 - Linearize your content
 - Optimize the hardware performance as much as possible
 - Optimize the most common interaction sequences

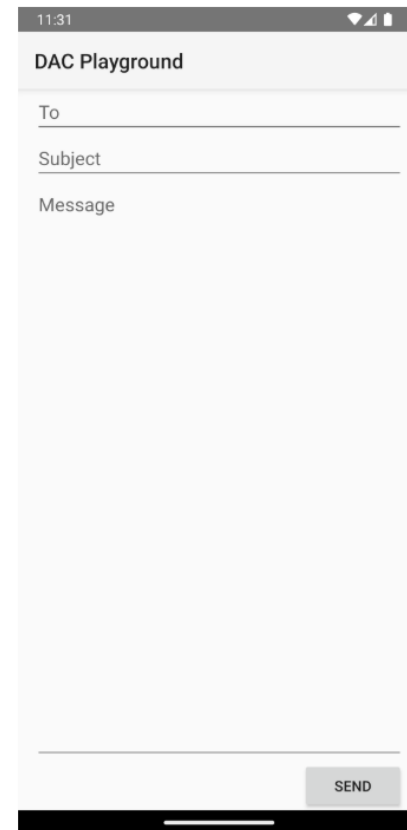
1) Provide essential content only

- Strip the site or app down to its essence
- Focus tightly on the few tasks that mobile users will need from the app, and chuck the rest
- One focus per screen
- If needed, separate contents into different screens
- Make sure that even on the first working page of an app, only relevant content appears high on the screen

User Interface Design (Issues specific to Mobile Apps)

2) Linearize your content

- Most mobile devices would not provide enough width to do any side-by-side layouts (e.g. double columns)
- Content will often be laid out vertically



Three text fields and a button in a vertically oriented `LinearLayout`.

User Interface Design

(Issues specific to Mobile Apps)

3) Optimize the hardware performance

- Use the device's hardware as much as you can (particularly for native apps)
- Modern mobile devices offer great features that not even got on the desktop
 - Location, camera, voice integration, gestural input, haptic feedback such as bumps and vibrations, and other features may be available to you
 - Some devices support multitasking, so that the app to be developed can be running in the background while the user is doing other things

User Interface Design

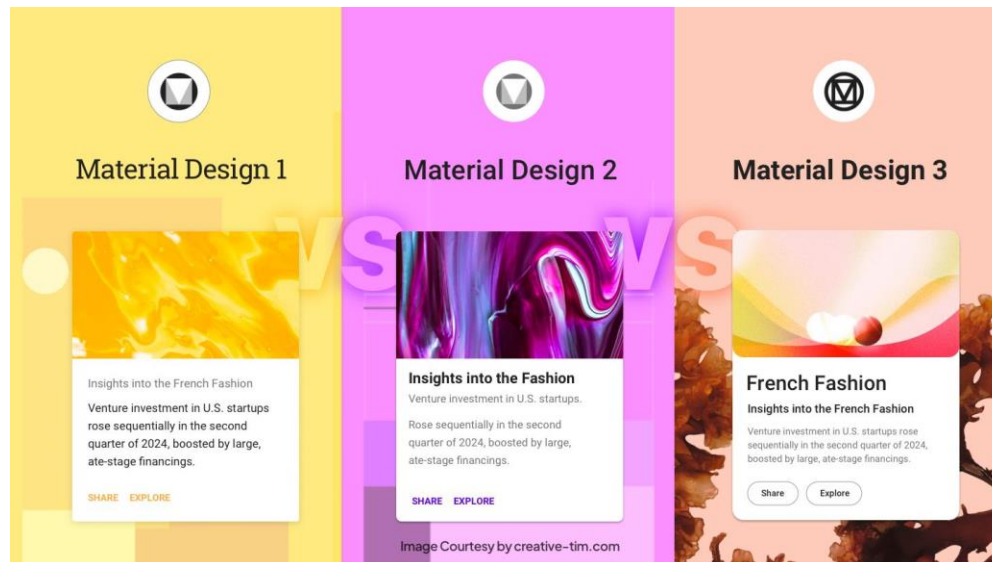
(Issues specific to Mobile Apps)

4) Optimize the most common interaction sequences, as easy as possible:

- Reduce typing, as few characters as possible
- Use as few page loads as possible, and do not inflate pages with unnecessary
- Reduce scrolling and sideways dragging within a page if possible
- Reduce number of steps to reach desired information or accomplish a task

User Interface Design (Material Design)

- Material Design is a design system created by Google to help developers build high-quality digital experiences.
 - It provides guidelines, components and principles for creating visually appealing, consistent, and user-friendly interfaces across different devices and platforms.
- It also includes a set of guidelines for style, layout, motion, and other aspects of app design.
 - Material Design is for desktop web applications as well as for mobile apps.



User Interface Design (Material Design)

- Material Design is tightly integrated into Android:
 - It's native to Android UI development
 - Android UI libraries (like Material Components) implement it directly
 - Apps that follow Material Design feel familiar and easy to use to Android users
- Material as a metaphor
 - UI elements behave like physical objects
 - Surfaces have elevation, shadows, and depth
 - Helps users understand hierarchy and interaction

Example: A floating action button (FAB) appears above other content using shadow and elevation.

User Interface Design (Material Design Versions)

Self-learning

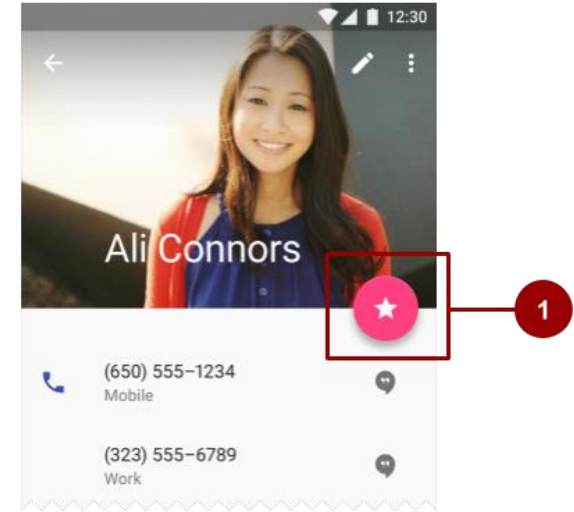
- Material Design (2014)
 - Original design system
 - Introduced cards, FABs, ripple effects
- Material Design 2 (Material Theming)
 - Customizable colours, typography, shapes
 - Brand-specific theming while keeping consistency
- Material You (Material Design 3)
 - Introduced with Android 12
 - Dynamic colours based on user wallpaper
 - Greater personalization
 - Modern, adaptive UI

Most modern Android apps now use Material Design 3.

User Interface Design

(Design For Specific Platform)

- Consistency: Ensures a uniform look and feel across all Android apps by following the same design principles.
- Components: Offers a set of pre-designed UI elements like buttons, cards, and navigation drawers that you can use in your app.
- Theming: Allows you to customize colours, typography, and shapes to match your brand's identity.
- Motion: Uses animations and transitions to provide a smooth and intuitive user experience.
- Accessibility: Focuses on making apps usable for everyone, including people with disabilities.

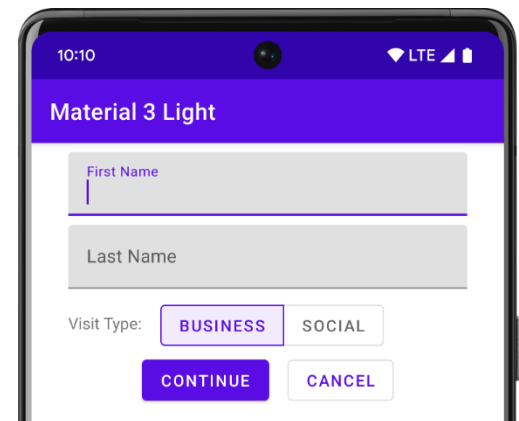
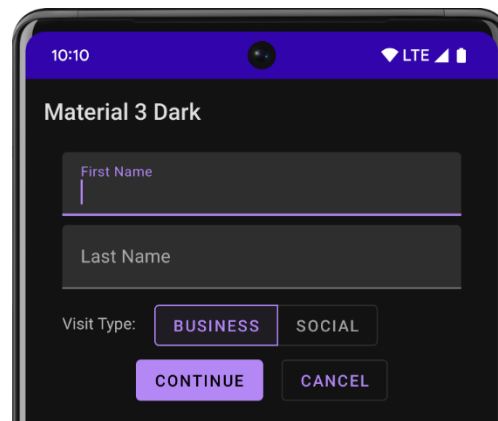
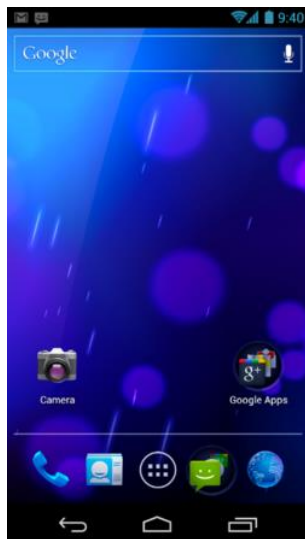


Floating Action Button with a pink accent color.

User Interface Design

(Design For Specific Platform)

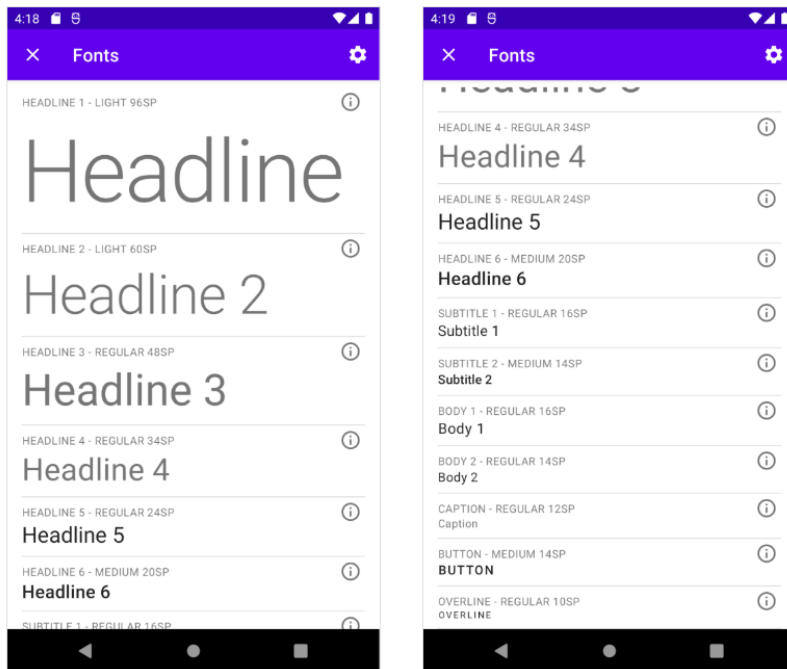
- Material Design can be used with various versions of Android, but it was first introduced with Android 5.0 Lollipop. Since then, it has evolved and is supported in all subsequent versions of Android.
- For the latest features and components of Material Design, including Material Design 3 (Material You for Android 12 and above). This version includes dynamic colour theming and updated components that integrate seamlessly with the system UI.



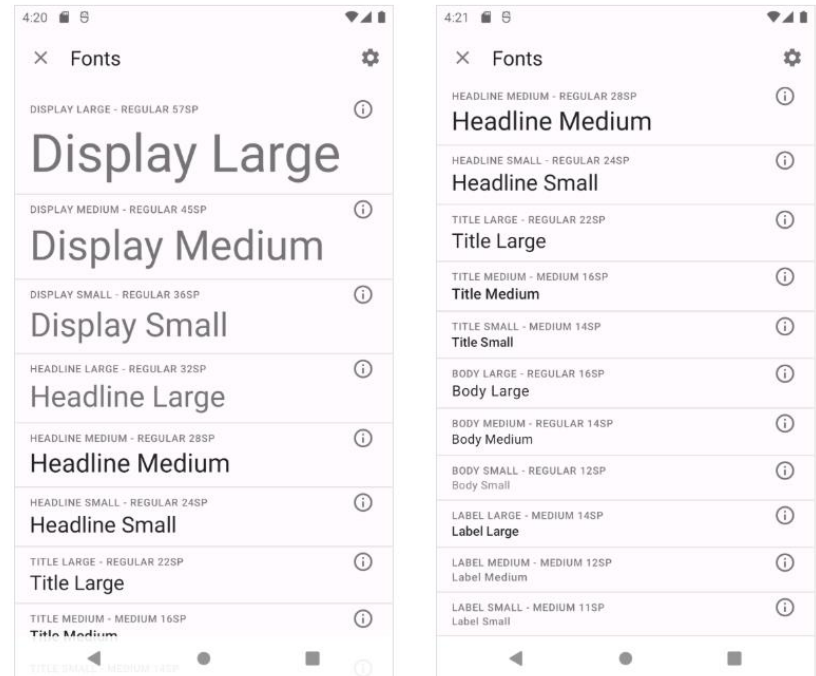
Material-based theme of an app.

Material Design Typography

- Typography styles have undergone a simplification.
 - Before Material 3, there were 6 Headline variations, 2 Subtitle variations, 2 Body variations, Button, Caption, and Overline styles.
 - In Material 3, there is a more regular and smaller number of variants for each classification, namely Small, Medium, and Large.



Material 2 - Typescale

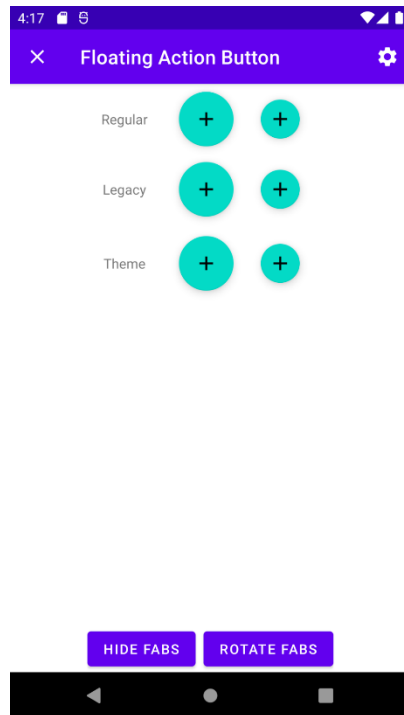


Material 3 - Typescale

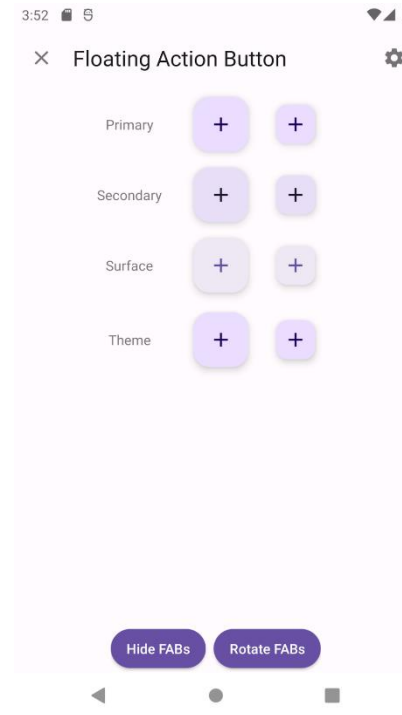
Material Design

Buttons on Screen

- The new Floating Action Button (FAB) has less corner radius and now resembles a rounded rectangle versus the circular shape of existing FABs.
- There are preset styles to theme your FAB using tones from the Primary colour, Secondary colour, or surface colour.



M2 examples - buttons

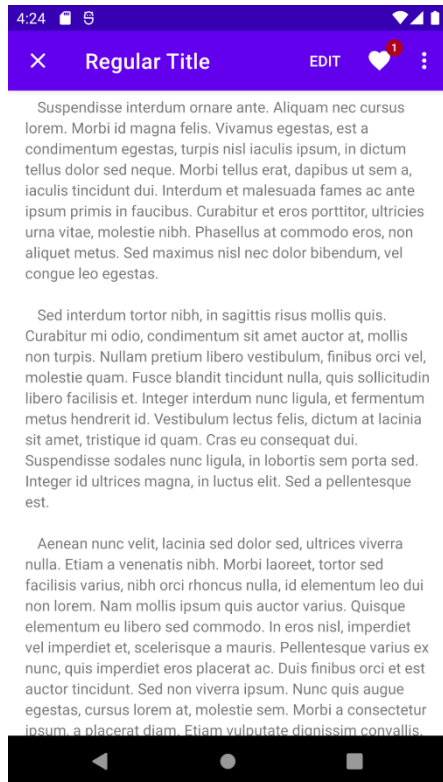


M3 examples - buttons

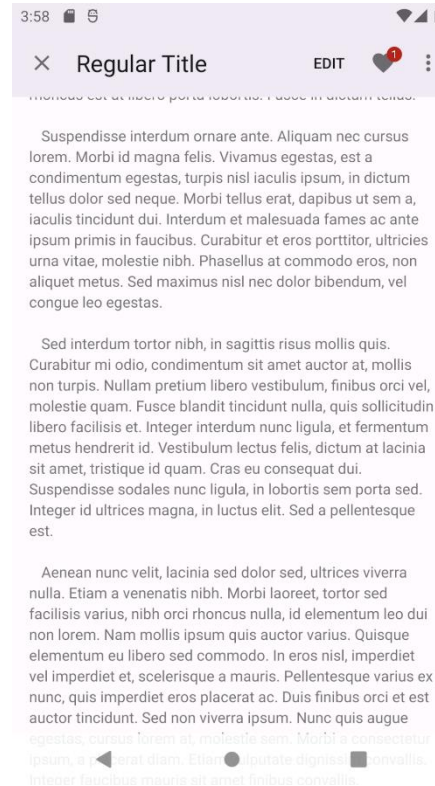
Material Design

Top App Bar

- Top app bars have undergone a Material You refresh to better align with colour.
 - E.g. Before Material 3, top app bars used shadow to differentiate between the app bar and content.



M2 example of top app bar



M3 example of top app bar

Colour is now the primary indicator of elevation using newly created surface tones.

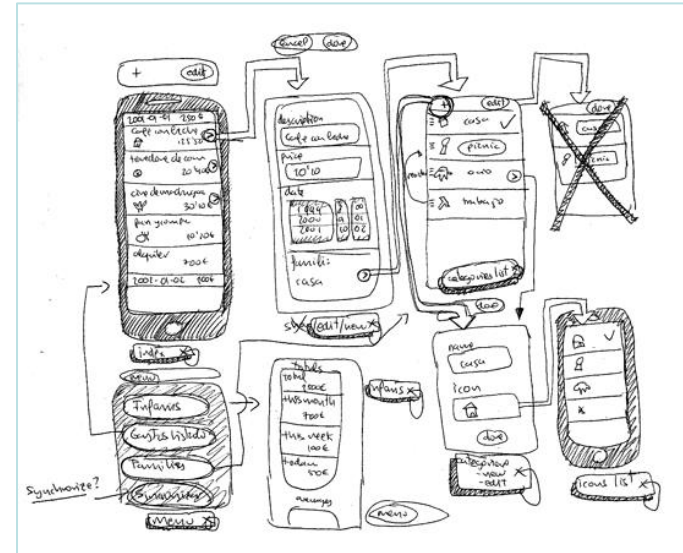
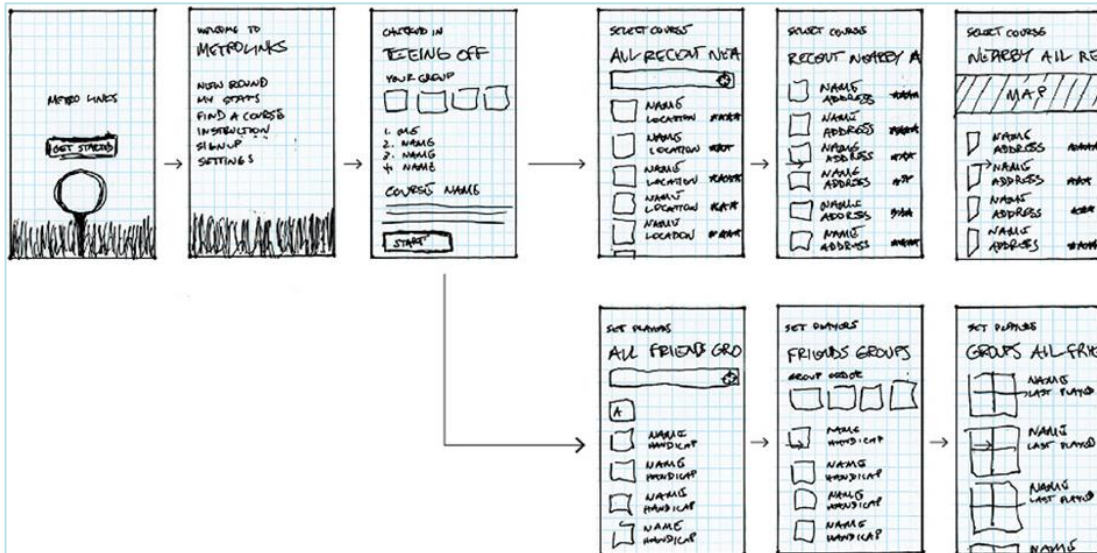
From Design Concept to Production

- Design solution of a mobile application could be realized in various forms
 - From a rough sketching (wireframes/thumbnaill) to a physically product-like model (prototype)
 - They present the possible solution (product) at various levels of abstraction



From Design Concept to Production (Wireframes / Storyboards)

- Wireframes (Storyboards in video & animation)
 - One or a series of illustrations, sketches, pictures that summarize and condense the related representative scenes or pages
 - Wireframes allow you to make critical decisions about your app's user flow



From Design Concept to Production (Prototypes)

- Prototypes is an abstract model built in early development stage, often a physically product-like model, and can be used to check the feasibility of a concept / design
 - Solve the problem that wireframes and storyboards generally lack the capability to communicate more complex “interactions”
- Paper prototypes
 - Most basic form of prototypes
 - Take the printed-out wireframes or drawings of the interface



From Design Concept to Production (Prototypes)

- Context prototype
 - Put the prototype to the targeted context of final product, and simulate the expected situation
 - E.g. Take wireframes and load them into a similar device, walk to the street like an expected end-user under the expected operating environment
 - Pay attention to what the end-users are thinking and their physical behavior during using the prototype interface (record them down if necessary)



From Design Concept to Production (Prototypes)

- Serious projects may require prototypes in a form which closely reflects the final product as much as possible
 - For application software, a prototype may be a “workable” program with simulated working modules offering “reasonable” output contents
 - E.g. a mobile app prototype may be one running in simulator, that simply loads screen images or animations produced with editing software, to create visual contents which are supposed to be done computationally within a real operating mobile app



- For native Android mobile applications, Android SDK (together with IDE, and Emulator) is the main production environment

References

- Part of this slide set is prepared and extracted from the followings:
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 - Google Inc. ‘Website for Android Sources’, <https://source.android.com/>
 - Apple Inc. ‘Website for Apple Developers’, Website: <https://developer.apple.com/>
 - Microsoft Corp. ‘Website for Windows Developers’, <https://developer.microsoft.com/en-us/windows>
 - Wikipedia Website: <http://en.wikipedia.org>
- This set of slides is for teaching purpose only