

Mobile App Design

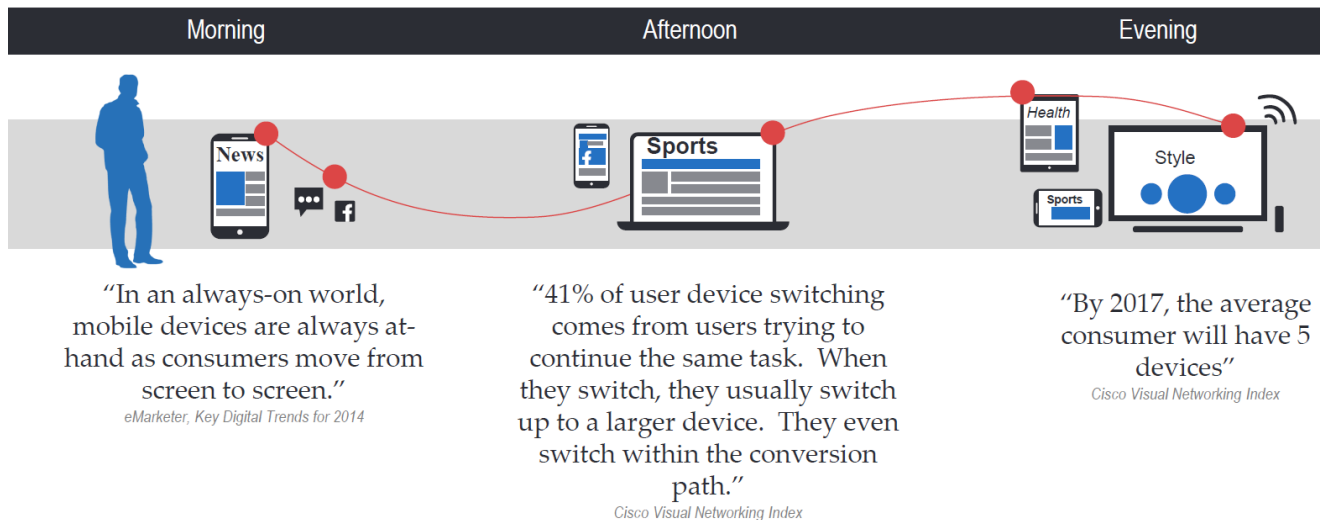
Chapter 18

Today

- Mobile app design- what and why?
- The Challenges
 - Development Considerations
 - Technical Considerations
- Developing MobileApps
 - MobileApp Quality
 - User Interface Design
 - Context-Aware Apps
- MobileApp Design—Best Practices
- Mobility Environments
- The Cloud

User Behavior is Changing

- Computing devices
 - smartphones, personal computer, wearables
- multiple devices in different contexts and web apps is unable to meet the challenge



What is MobileApp design

encompasses technical and nontechnical activities that include:

- **Establishing** the look and feel of the mobile application,
- **creating** the aesthetic layout of the user interface,
- **defining** the overall architectural structure,
- **developing** the content and functionality that reside within the architecture,
- **planning** the navigation that occurs within the mobileApp.

Special attention needs to be given to the elements that add **context awareness** to the MobileApp

Context awareness

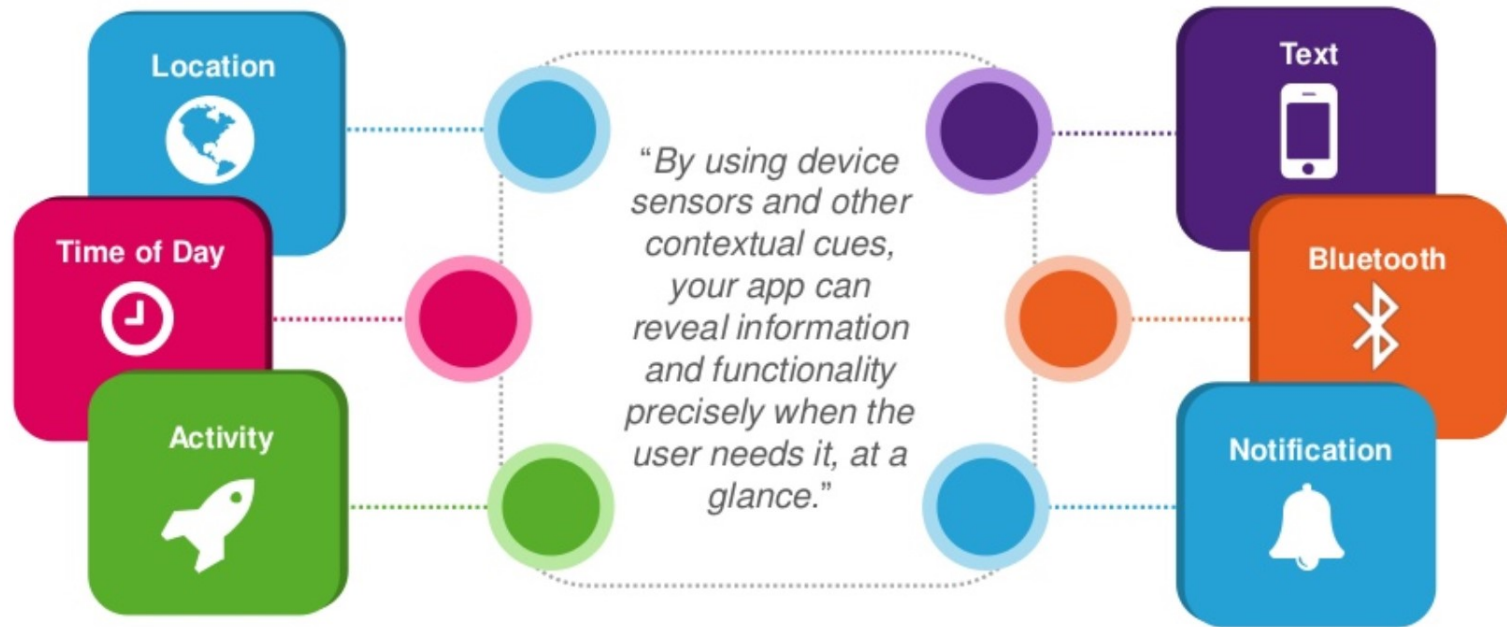
- merges the real and virtual worlds by providing functionality that allows a device to be aware of its location, time, and other objects in its surroundings.
- Ability of mobile computing devices to be aware of the users environment and react according to the constant changes

Schilit et al. (1994) describe context awareness as the ability to “adapt according to the location of use, the collection of nearby people, host and accessible devices, as well as such things over to me.”



An iPad switching orientation of the screen

Context awareness in action



- To achieve context awareness, mobile systems must produce reliable information in the presence of uncertain and rapidly changing data from a variety of heterogeneous sources.

The challenges

- Development Considerations

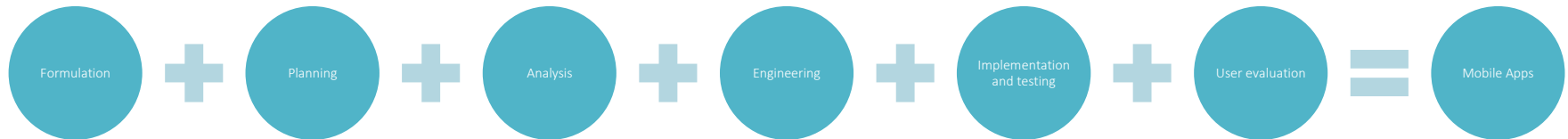
- Mobile platforms are very complex (two most popular platform- IOS and Android)
 - mobile devices use different operating systems and platform dependent development environments
- smaller and more varied screen sizes than personal computers.
- interface design issues, including decisions to limit display of some content
- Connectivity outages, limitations on battery life, and other device constraints
- System components in mobile computing environments are likely to change their locations while MobileApps are running
- Security, privacy

The challenges

- Technical Considerations

- Among the many technical considerations that Mobile-Apps should address are the following:
 - Multiple hardware and software platforms.
 - Many development frameworks and programming languages
 - Many app stores with different rules and tools
 - Very short development cycles
 - UI limitations and complexities of interaction with sensors and cameras.
 - Effective use of context
 - Power management
 - Security and privacy models and policies
 - Computational and storage limitations
 - Applications that depend on external services
 - Testing complexity

Developing mobile apps



- Formulation
 - Involves architectural design, navigation design, the goals, features, and functions of the MobileApp are identified to determine the scope and the size of the first increment.
- Planning
 - total project costs, timeline and risks are determined
- Analysis
 - All mobile user requirements are specified and the content items that will be needed are identified.
 - content analysis, interaction analysis, functional analysis, and configuration analysis
 - build a thin or fat client.

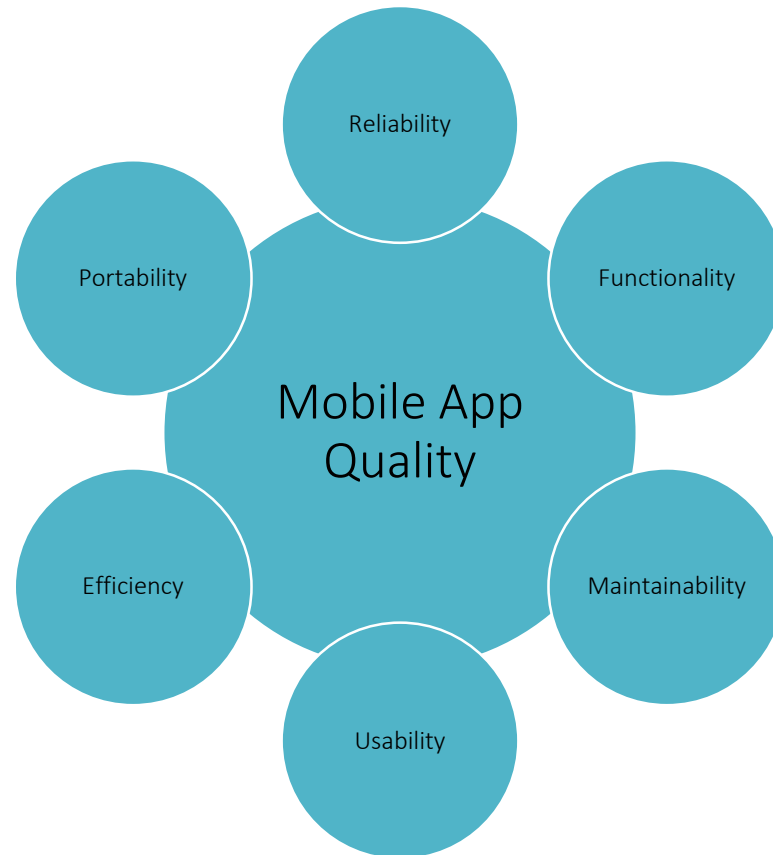
Developing mobile apps

- Engineering
 - architectural design, navigation design, interface design, content design, and content production
 - constraints imposed by the targeted mobile devices, including considerations imposed by the wireless network technologies chosen and the nature of the Web services required to implement the MobileApp
- Implementation and Testing
 - MobileApp is coded and tested
- User evaluation
 - assessed for usability and accessibility

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MobileApp Design Quality



If you want to learn more on Quality attributes:

<https://www.nngroup.com/articles/usability-101-introduction-to-usability/>

Mobile App UI design



MobileApp User Interface Design Considerations

Design choices affect performance and should be examined early in the UI design process. Ivo Weevers [Wee11] posted several mobile user-interface design practices that have proven to be helpful when designing mobile applications:

- **Define user interface brand signatures.** Differentiate the app from its competitors. Make the core signature elements of the brand the most responsive, since users will use them over and over.
- **Focus the portfolio of products.** Target the platforms that are most important to the success of the app and the company. Not all platforms have the same number of users.
- **Identify the core user stories.** Make use of techniques such as quality function deployment (Chapter 8) to reduce a lengthy list of requirements to implement using the constrained resources available on mobile devices.
- **Optimize UI flows and elements.** Users do not like to wait. Identify potential bottlenecks in user work flow and make sure the user is given indication of progress when delays occur. Make sure that the time to display screen elements is justified in terms of user benefits.
- **Define scaling rules.** Determine the options that will be used when information to be displayed is too large to fit on the screen. Managing functionality, aesthetics, usability, and performance is a continual balancing act.
- **Use a performance dashboard.** Used to communicate the product's current state of completion (e.g., number of use stories implemented), its performance relative to its targets, and perhaps comparisons to its competitors.
- **Champion dedicated UI engineering skills.** It is important to understand that the implementation of layout, graphics, and animation has performance implications. Techniques to interleave rendering of display items and program execution can be helpful.

INFO

MobileApp design- best practices

- guidelines for developing MobileApps 16 and for developing apps for specific platforms like Apple's iOS or Google's Android.
 - <https://developer.apple.com/library/iOS/navigation/>
 - <http://developer.android.com/guide/components/index.html>
- considerations when designing mobile touch-screen applications listed by Schumacher
 - Identify your audience
 - Design for context of use
 - There is a fine line between simplicity and laziness
 - Use the platform as an advantage
 - Make scrollbars and selection highlighting more salient
 - Increase discoverability of advanced functionality
 - Use clear and consistent labels
 - Clever icons should never be developed at the expense of user understanding
 - Support user expectations for personalization
 - Long scrolling forms trump multiple screens on mobile devices

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Mobility Environments

- Choosing a platform (or platforms) requires careful thought by mobile developers.
- Constraints: Hardware, business goals, user, supportability, context of use
- Yuan [Yua02] uses the following criteria to assess several mobile interactive development environments (MIDEs):
 - **General productivity features** - The MIDE should contain tools to support editing, project management, debugging, architectural design, documentation, and unit testing.
 - **Third-party SDK integration** - Each network or cloud service is likely to require the use of a specific API or SDK. It is easier to continue working in the one IDE, rather than several.
 - **Post-compilation tools** - An effective MIDE contains tools that allow the source code for a completed app to be optimized for a specific mobile device or service.

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Mobility Environments

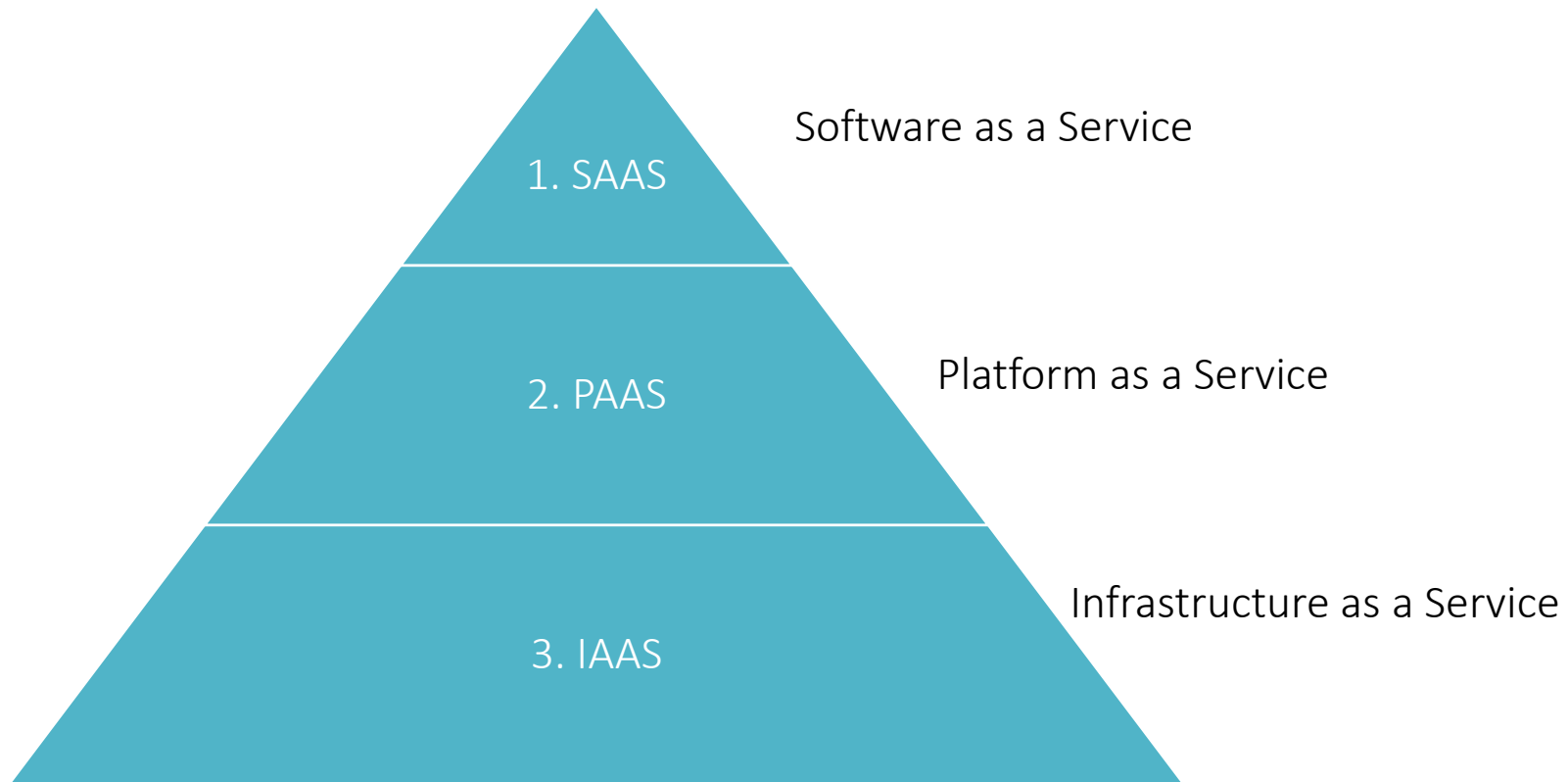
- **Over-the-air deployment support** - A good MIDE should allow the testing of the deployed app within the development environment. This can be tricky when the MobileApp needs to access Web services or other applications.
- **End-to-end mobile application development**- Mobile devices are often not powerful enough to process or store large amounts of information locally. It is important to allow developers to create, test, and deploy entire mobile projects using a desktop MIDE.
- **Documentation and tutorials** - Even free development tools need to be easy to learn and easy to use. Having adequate support materials is essential.
- **Graphical user interface builders**- If the MIDE supports visual construction of user screens, prototypes can be constructed and tested quickly

The Cloud

- Cloud computing is a paradigm that allow on demand network access to shared computing resources.
- A model for managing, storing and processing data online via the internet.
- Characteristics of Cloud computing
 - **On demand service** : you use it when you need it
 - **Network access** : uses internet as medium
 - **Shared resources**: resources are pooled together (used by multiple clients)
 - **Scalability**: Allows elasticity of resources

The Cloud

- Cloud computing service categories



The Cloud

- Cloud computing service categories



1. SAAS

Pros:

- Affordability
- Accessibility
- Collaborative

Cons:

- Portability and browser issues
- Connectivity
- Compliance restrictions

- On demand service
- Pay per use of application software to users
- Don't need to install software on pc
- Runs a single instance of software
- Available for multiple end users

Who: End users

Example:

- Microsoft 365, salesforce, google doc, Severa

<https://severa.visma.fi/en/>

The Cloud

- Cloud computing service categories



Pros:

- Cost effective
- Fast market for developers
- Easy deployment of web applications

Cons:

- Limited to the providers language
- Migration issue- such as the risk of vendor lock-in

- Service is made up of a programming language execution environment, An operating system, A web server and database.
- Encapsulate the environment where users can build and run their programs without worrying of the underlying infrastructures.
- Manage data and the application resources, all other resources are managed by the vendor.

Who: Developers

Example:

- Google App engine, AWS elastic beanstalk, Heroku <https://www.heroku.com/>

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The Cloud

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3. IAAS

- offers the computing architecture and infrastructure.
- all computing resources but in a virtual environment so that multiple users can access them.
- resources include; data storage, virtualization, servers, and networking. Most vendors are responsible for managing the above four resources

Pros:

- The Cloud provides the infrastructure.
- Enhanced scalability – dynamic workloads are supported.
- IaaS is flexible.

Cons:

- Security issues
- Network and service delays.

Who: SysAdmins

Example:

- Amazon EC2, Go Grid, and Rackspace.com
www.Rackspace.com

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The Cloud

- Mobile cloud computing at its simplest, refers to an infrastructure where both the data storage and data processing happen outside of the mobile device.
- Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and MC to not just smartphone users but a much broader range of mobile subscribers’.
- several existing definitions of mobile cloud computing, and different research alludes to different concepts of the ‘mobile cloud’:

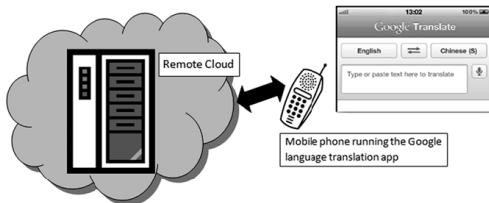


Fig. 1. A remote cloud server catering to mobile devices through the internet.

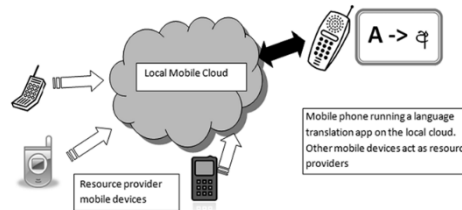


Fig. 2. A virtual resource cloud made up of mobile devices in the vicinity.

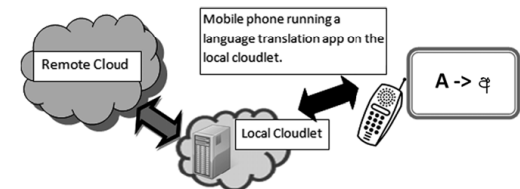


Fig. 3. A cloudlet enabling mobile devices to bypass latency and bandwidth issues while benefiting from its resources.

Cloudlet is limited resource local computing and storage platform that eliminated outsourcing certain resource intensive tasks to the enterprise cloud.

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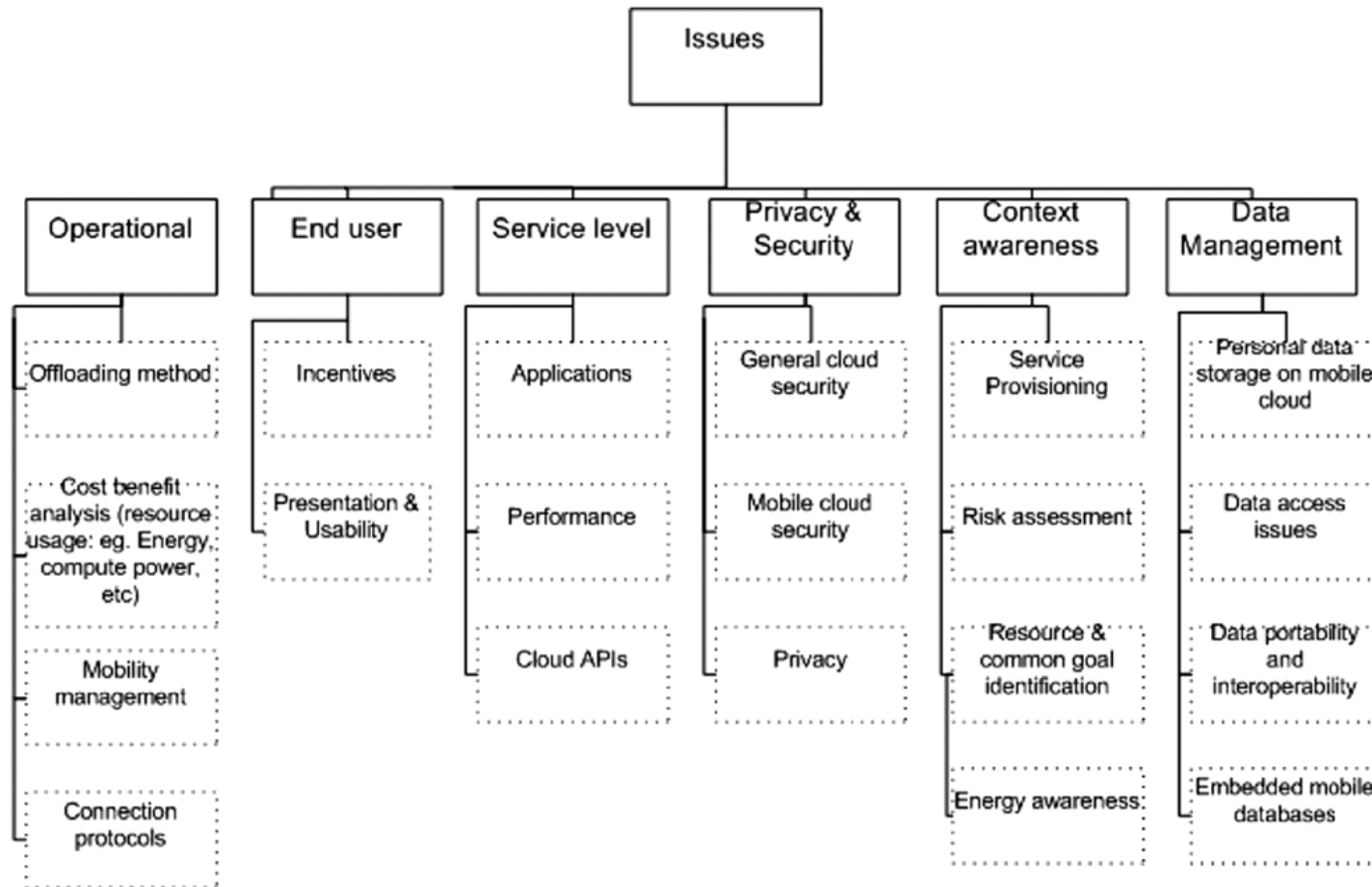
Applications of MCC

- Mobile commerce
- Mobile learning
- Mobile healthcare
- Mobile gaming
- Voice-based searching
- Keyword-based searching

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Mobile Cloud computing issues



Summary

- To achieve these quality attributes (**usability, functionality, reliability, efficiency, maintainability, security, scalability, portability**), a mobileApp design should exhibit the following characteristics: **simplicity, consistency, identity, robustness, navigability, and visual appeal**.
- Always remember:
business goal, user, platforms, social and ethical implications, hardware limitations, context of use, time to market, rich or thin mobile client, cost.....
- Developing MobileApps is:

