A Primer on User-Centered Mobile App Design

Prof. Dr. Stephan Böhm
RheinMain University of Applied Science
Center of Advanced E-Business Studies
Founded in 1971
All in all about 12,000 students, roughly 1,200 international students
60 degree programs
Total of 250 professors (600 employees in total)
Location: State of Hesse

- Roughly at the **geographical center** of Germany
- About **6.3 million residents**
- Hesse's largest city: Frankfurt am Main
- Hesse's economic powerhouse: **the Rhine-Main area**
- **Lots of options for interesting day trips:**
  - Frankfurt, Wiesbaden, Marburg, Kassel, Darmstadt etc.
  - the Taunus uplands, the Rheingau, the Bergstraße etc.
Mission Statement

The mission of Center for Advanced E-Business Studies (CAEBUS) is to develop innovative and sustainable e-business models and solutions in line with economic and regulatory frameworks. The center is committed to providing these solutions through in-depth studies of consumer needs, cultural requirements, and conditions for economic efficiency. CAEBUS defines roadmaps for the successful implementation of e-business solutions in accordance with organizational structures and business processes.

Please contact us if you like to cooperate! (www.caebus.de, stephan.boehm@hs-rm.de)
1. Introduction
2. Designing & Developing Mobile Apps
3. Mobile App Prototyping
4. Mobile App Marketing
History of Mobile Apps

Mobile applications are already offered a longer time – but only the app store concept was the breakthrough.

Mobile App/Application:

Application software to run on mobile devices, such as Smartphones, with which the functionality given by hardware and operating software can be applied to solve user-specific problems.

Typically, Mobile Apps consist of programs and data that will be installed by the end users themselves to the devices and thus are also an important element of handset personalization.

Source of pictures: http://tweakyourbiz.com
The major app stores now offer quite a vast number of applications.

- **App Store**: > 1,400,000 Apps (Mid of 2015)
- **Google Play**: > 1,600,000 Apps
- **Windows Phone Marketplace**: > 350,000 Apps

Sources: Unternehmenswebsites; Source of pictures: http://blog.mobiles.co.uk/app-reviews/how-many-apps-2012/
Advanced Mobile Apps

Many Mobile Apps establish a direct relation to the real mobile usage context in other word the provide a "Real World Connection".
Augmented Service Offerings provide functionalities that are based on an access to other connected devices.

Next Generation Mobile Apps: Wearable Devices

- Potential disruptive technology
- Social impact (privacy)
- Lifestyle product („Cool or Creepy“)
- New user experience/usability
- New areas of application (in both – business and consumer segments)
- New eco system

“We removed everything that wasn't absolutely essential.”

Isabelle Olsson, senior industrial designer, Google Glass

Next Generation Mobile Apps: Mobile Device Trends

- New interaction/usage scenarios
- Screen independent interaction
- Non-intrusiveness
- Smartphone as a hub
- Increasing device fragmentation

Fokus Today: Simple Apps for Smartphones

Quellen: https://www.thalmic.com/de/myo/, http://www.interaxon.ca/muse/
Consumerisation of IT

Driven by the success of mobile apps in the consumer segments those concepts are conquering the corporate context ("consumerisation of IT").

![Illustrative Beispiele](http://www.appcentral.com/)


## Consumer vs. Business App Environments

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Consumer</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Horizon</td>
<td>Short term „Fire-and-Forget“/Updates</td>
<td>Long term Versioning/Releases</td>
</tr>
<tr>
<td>Value Add</td>
<td>Multidimensional (e.g. Enjoyment)</td>
<td>Measurable contribution to corporate success</td>
</tr>
<tr>
<td>Complexity</td>
<td>Rather low („Stand-alone“)</td>
<td>Rather high („Backend integration“)</td>
</tr>
<tr>
<td>Security</td>
<td>„Hygiene factor“ (except banking/payment)</td>
<td>Business critical („condicio sine qua non“)</td>
</tr>
<tr>
<td>Distribution</td>
<td>Epidemic/Public App Stores</td>
<td>Rollout (planned)/Enterprise App Store</td>
</tr>
<tr>
<td>Usage/Distribution</td>
<td>Self-determined/attract and retain customers</td>
<td>Predetermined/create acceptance</td>
</tr>
</tbody>
</table>
## Strategic Alignment and Dimensions of Mobile App Projects

### Strategic Alignment

- **Reactive**
  (Maintain user base/shift desktop to mobile)
- **Expansive**
  (Extension of user base/existing customer groups)
- **Innovative**
  (Development of new customer groups)
- **Operationally**
  (For example, cost savings)
- **Competitive**
  (e.g. "Copycat"/users of competitors to poach)
- **Experimental**
  ("Trial balloon", launch & learn approach)
  - ...

### Project Dimensions

- Integration in overall strategy
- Project sponsorship
- Project organization
- Budgeting
- Technical Realization
- Back-end integration
- Security concept
- Design (CI / CD specifications)
- Outsourcing
- Marketing/distribution
- Success controlling (KPIs)
  - ...
Complexity Drivers of Mobile App Projects

- Innovativeness
  - established ←→ novel
- Functions
  - standardized ←→ specialized
- User groups
  - homogeneous ←→ heterogeneous
- Backend connection
  - isolated ←→ integrated
- Process
  - routine ←→ ad-hoc
- Stakeholder
  - few ←→ many
- Legal requirements
  - unregulated ←→ regulated
- Safety requirements
  - low ←→ high
- Device platforms
  - few ←→ many
- Device fragmentation
  - low ←→ high

Low complexity, standard software “Mobile Apps”

High complexity, customized solutions “Mobile Solutions”
Mobile Apps: Backend vs. Frontend

In most of the cases the app is only the frontend of a more comprehensive IT solution!
Agenda

1. Introduction
2. Designing & Developing Mobile Apps
3. Mobile App Prototyping
4. Mobile App Marketing
**Types of Mobile Apps**

Technically, a mobile app can be realized in very different ways.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Web Page</th>
<th>Web App</th>
<th>Hybrid App</th>
<th>Native App</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Platform</td>
<td>Web editor, construction kit</td>
<td>Frameworks, plugins etc. (z.B. jQuery)</td>
<td>Cross development platforms (z.B. PhoneGap)</td>
<td>SDK (z.B. Android SDK)</td>
</tr>
<tr>
<td>Coding</td>
<td>Web Technologies (HTML5, CSS3, JavaScript)</td>
<td>Software Language (e.g. Java)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td>Web</td>
<td>App Store</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware Access</td>
<td>Usually not possible</td>
<td>Widely</td>
<td>Fully</td>
<td></td>
</tr>
<tr>
<td>Offline Capabilities</td>
<td>Online only</td>
<td>Restricted (Caching)</td>
<td>Fully (if no server access required)</td>
<td></td>
</tr>
</tbody>
</table>
Mobile Web Apps

Mobile web apps offer a similar look and feel as native applications, provide limited offline use and run encapsulated from the hardware in the browser.

- Ease of development
- Icon/shortcut possible
- Easy to publish via a link
- Operating system independent (run in "any" browser)
- Always up to date

- No sale on App Stores
- Limited offline-capabilities (only caching code and content)
- No access to handset functions such as camera (localization possible)
- Poor/limited performance
Mobile Web Apps: jQueryMobile

https://jquerymobile.com/
Hybrid Apps

Hybrid apps combine advantages of web apps and mobile apps allow access to terminal functions and promise a simple cross-platform portability.

- Relatively simple development
- Cross-platform portability
- Sale on app stores possible
- Comprehensive access to handset functions (depending on Framework)
- Offline capability

- High dependence on framework (e.g. for debugging, OS updates)
- Limited performance
- Porting requires typically more comprehensive interventions (e.g. GUI)
- Dependencies on App Store, and OS vendors (e.g. app review)
Hybrid Apps: PhoneGap/PhoneGap Build (Cloud)

https://build.phonegap.com/, http://phonegap.com/
Native Apps (mobile apps in the narrower sense) are specifically programmed, compiled, and installed on the device for a specific operating system platform.

- Comprehensive developer tools
- Most comprehensive functionality
- Comprehensive devices access
- User experience can be optimized for a specific handset very well
- Very good performance
- Most comprehensive commerciality
- Offline capability

- Knowledge in specific programming language required
- Separate development for each operating system platform required
- Dependencies on App Store, and OS vendors (e.g. app review)
- Device specific adaptation required (to fully exploit the potential)
Device Fragmentation (Android)

The large terminal fragmentation in Android devices is a problem which complicates the development of Android apps.

Device fragmentation based on the downloads for the software “OpenSignalMaps” (681,900 downloads in 6 month, 3.992 different handsets, 61.389 downloads by GT-i9100 [Galaxy SII]).

Source: http://opensignal.com/reports/fragmentation.php
**App Development Process**

Between the idea to the market launch of an app are various steps that slightly vary by the specific mobile platform.

### Selected Steps of an iPhone App Development

- **Developer Account**
  - **Framework:** Cocoa Touch
  - **Tools:** Xcode, Interface Builder, ...
- **iPhone SDK**
  - **Software Language:** Objective-C
  - **Testing:** iPhone Simulator, Instruments, ...
- **Concept Definition**
  - **Functionality,** Content, User Interface Design, an other Interfaces
- **Coding/Testing**
  - **iTunes Connect:** Apple Review Team (days up to several weeks)
- **Store Launch**
- **App Marketing**
  - **Application Icon,** Description, Screenshots, Keywords, Price, Distribution Build
  - **Revenue:** 70% Developer, 30% Apple

---

**Commercial Development:**
Apple Developer Program (ab 99 USD/Jahr)
Standardized "modular systems" and construction kits are the simplest solution offered for mobile app development.
Mobile App Development: IT Service Provides

Depending on the specific requirement criteria the app development can be provided by different IT service providers.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Freelancer</th>
<th>(Digital-) Agency</th>
<th>IT System House</th>
<th>IT System Integrator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project budget</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td>Complexity</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td>Life span</td>
<td>Short</td>
<td>Medium</td>
<td>Medium</td>
<td>Long</td>
</tr>
<tr>
<td>Design requirements</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Security requirements</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Business criticality</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
Mobile App Development Costs: Categories

Development costs vary depending on the platform - programming and debugging account for about half the cost.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools</td>
<td>Computer cost, developer registration fees and tools licenses.</td>
</tr>
<tr>
<td>Development &amp; Debugging</td>
<td>The bulk of app production costs (upwards of 55%). Practically speaking, the cost of person-hours devoted to the project.</td>
</tr>
<tr>
<td>UX design</td>
<td>Storyboards, user interaction and graphic design typically make up 25% of total app cost.</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Typically 10% of the initial app cost, on an annual basis</td>
</tr>
<tr>
<td>Marketing</td>
<td>We estimate that marketing costs average 10% of app production expenses. In practice, marketing costs differ based on the developer segment – Hobbyists and Explorers will use Facebook as the lowest hanging fruit, whereas Hunters will use more sophisticated and premium channels such as professional PR services and incentivised downloads.</td>
</tr>
<tr>
<td>Back-end</td>
<td>Back-end costs vary depending on the application’s requirements – from lightweight (user management services on Appcelerator, Spire.io or Parse.com) to heavy (applications written from scratch on Amazon Web Services (AWS) or Google App Engine).</td>
</tr>
</tbody>
</table>

Source: VisionMobile

iOS apps are the most expensive to develop
Average cost to develop an app for 95% of apps excluding those with highest development time (n=1,510)

<table>
<thead>
<tr>
<th>Platform</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android</td>
<td>$0</td>
</tr>
<tr>
<td>BlackBerry OS</td>
<td>$5,000</td>
</tr>
<tr>
<td>iOS</td>
<td>$10,000</td>
</tr>
<tr>
<td>Windows Phone</td>
<td>$15,000</td>
</tr>
<tr>
<td></td>
<td>$20,000</td>
</tr>
<tr>
<td></td>
<td>$25,000</td>
</tr>
<tr>
<td></td>
<td>$30,000</td>
</tr>
</tbody>
</table>

Licensed under Creative Commons Attribution 3.0 License

Mobile App Development Costs: iBusiness Study

In Germany, average development costs of 7,800-49,000 EUR were identified – the cost vary based on the complexity of the app.

iBusiness study on app development costs in 2013

- Survey of agencies and design studios in Germany
- Average cost depends on the complexity:
  - Simple app: 7,754 EUR
  - Medium complexity ("Where-is-my-car-app"): 13,397 EUR
  - High complexity: 48,804 EUR
- A major cost driver: front end/back end development
- Additional costs for second platform: 58%
- Costs for iOS / Android now aligned
- Symbian apps cost 45% more - Windows Phone currently the most expensive

First indications of the expected costs for an app development can be derived from online calculators.

Example: Otreva App Cost Calculator
(Source: http://www.otreva.com/calculator/#)
Development Approach

It is important that the app development follows an user-centered approach, i.e. is taking the earliest possible involvement of end-users.

Past: Waterfall Model (i.e. Royce 1970)

Today: User-Centered Design (i.e. ISO 9241, SAP)

User Centered Design Approach

The design & development approach within UCD relies on prototypes to gather user feedback and stepwise improve the app concept.
Idea generation has to be conducted before the development process can begin – features and functions can be defined using creativity techniques.
Competitive User Experience Analysis

Based on these ideas a competitive analysis from the user's perspective should follow ("Competitive User Experience").

Advantages of a “Competitive User Experience” Analysis

- Identification of best practices and user expectations (established functions and design elements)
- Avoid mistakes of others (problem areas of existing solutions)
- Better adaptation to user needs (Identification of opportunities and "niches")
- Inspiration/identification of emotional elements ("Emotional Design")

Source: Susanne Ginsburg, Designing the iPhone User Experience
Up-front User Research

In further steps customer requirements are to collect by up-front user research – this is not to be confused with a usability testing.

**Up-front user research:** Informs product requirements and design

“What should we design?”

**Usability testing:** After requirements defined and initial design established

“Did we design it right?”

Source: Ginsburg 2010
Designing the iPhone User Experience: A User-Centered Approach to Sketching and Prototyping iPhone Apps
by Suzanne Ginsburg

Paperback: 336 pages
Publisher: Addison-Wesley Professional
1 Edition (August 22, 2010)
Language: English
ISBN-10: 0321699432
Methods for Up-front User Research

A variety of tools are available to conduct up-front user research and to document the findings of this process.

**User Research Methods:**
Shadowing (Context Analysis), Field Interviews, Diary Studies

**User Research Analysis & Documentation:**
Personas, Szenarios, Use Cases, User Journeys

The concept can then be tested based on prototypes to determine its suitability with users and to be further improved.
Prototyping Types

Based on the development phase low- and high fidelity prototypes are used.

Low-fidelity/Paper Prototypes
(e.g. Forms, Stencils)

High-fidelity/Click-Prototypes
(e.g. Axure)

Low-fidelity Prototypes/Wireframes
(e.g. Balsamiq)

Video Prototypes

Mobile app concepts can be presented very clearly to users and decision makers in demo videos – or so called “video prototypes”.

Link to video example: [http://www.csc.com/de/offerings/64514/70102-mobile_loesungen_im_oeffentlichen_personenverkehr](http://www.csc.com/de/offerings/64514/70102-mobile_loesungen_im_oeffentlichen_personenverkehr)
1. Introduction
2. Designing & Developing Mobile Apps
3. Mobile App Prototyping
4. Mobile App Launch
Methods for Up-front User Research

- **Low-fidelity Prototyping:**
  1. High level of abstraction from screen design
  2. No colors, pictures, fonts, etc.
  3. Use of wireframes, placeholders, etc.
  4. Paper based, software based, hybrid

- **High-fidelity Prototyping:**
  1. Design is very close to the end product
  2. Usage of colors, pictures, fonts, etc.
  3. Picture- (e.g., InVision) or code-based (e.g., Codiqa)
  4. Software based

Quelle: Ginsburg (2010)
Prototyping Tools (Low-Fidelity, POP)

https://popapp.in/
Prototyping Tools (Low-Fidelity, Balsamiq)

http://webdemo.balsamiq.com/
Prototyping Tools (High-Fidelity, Codiqa)

https://codiqa.com/demo
Prototyping Tools (High-Fidelity, Fluid)

Design brilliant apps
Then share them online for feedback or preview them on your mobile.

Try it free

https://www.fluidui.com/
Groups, Layers and Multi-item edit

Speed up and organize your work beautifully, in nested groups.

https://proto.io
Prototyping Tools (Low-Fidelity, InVision)

http://www.invisionapp.com/
1. Introduction
2. Designing & Developing Mobile Apps
3. Mobile App Prototyping
4. Mobile App Launch
Business Model

If a commercialization of the app is intended, the business model must be specified prior to its distribution.

<table>
<thead>
<tr>
<th>Business Model</th>
<th>Description and Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paid App</td>
<td>Download the app for a purchase price</td>
</tr>
<tr>
<td>InApp-Purchase</td>
<td>Payment for additional features or content</td>
</tr>
<tr>
<td>Freemium</td>
<td>Free basic version and paid extensions</td>
</tr>
<tr>
<td>Virtuelle Goods</td>
<td>Paid &quot;consumer goods&quot; (e.g. currency for a mobile game)</td>
</tr>
<tr>
<td>Subscriptions</td>
<td>Time-recurring payments for use</td>
</tr>
<tr>
<td>Advertising</td>
<td>Integration of paid advertising</td>
</tr>
</tbody>
</table>

Mroz (2013): App-Marketing
Upload in the Store: Review Process

In order to be able to publish the app in the App Store of the platform the relevant requirements and design guidelines have to be considered carefully.


Upload in the Store: Required Items and Content

For the distribution in the App Store different information needs to be provided depending on the platform.

Important Information for App Store Upload

- App name
- Choice of category
- Keywords for the app-description
- App Description
- Icon, Logo, Graphic Feature
- Screenshots
- Demo Video (optional)
- pricing model
- Administrative information
- App software (such as APK file on Android)
- ...

For the distribution in the App Store different information needs to be provided depending on the platform.
Elements of a Mobile App Distribution Strategy

In addition to publication in the App Store a comprehensive distribution strategy need to be defined – even a good app does sell "automatic".

Important elements of a Mobile App Distribution/Marketing Strategy

<table>
<thead>
<tr>
<th>Element</th>
<th>Description &amp; Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing Strategy</td>
<td>Scheduling of launch and updates</td>
</tr>
<tr>
<td>Pricing Policy</td>
<td>Price levels and price changes</td>
</tr>
<tr>
<td>Customer Relations</td>
<td>App website and dealing with reviews/feedback</td>
</tr>
<tr>
<td>Public Relations</td>
<td>Communication on public relations and social media</td>
</tr>
<tr>
<td>Cross Promotion</td>
<td>Advertisement on website, flyers, products, etc.</td>
</tr>
</tbody>
</table>

Mroz (2013): App-Marketing
Performance Measurement

Also important is a continuous performance measurement and monitoring of user feedback / reviews.

http://www.distimo.com

Apple iTunes Connect

https://www.apptweak.com