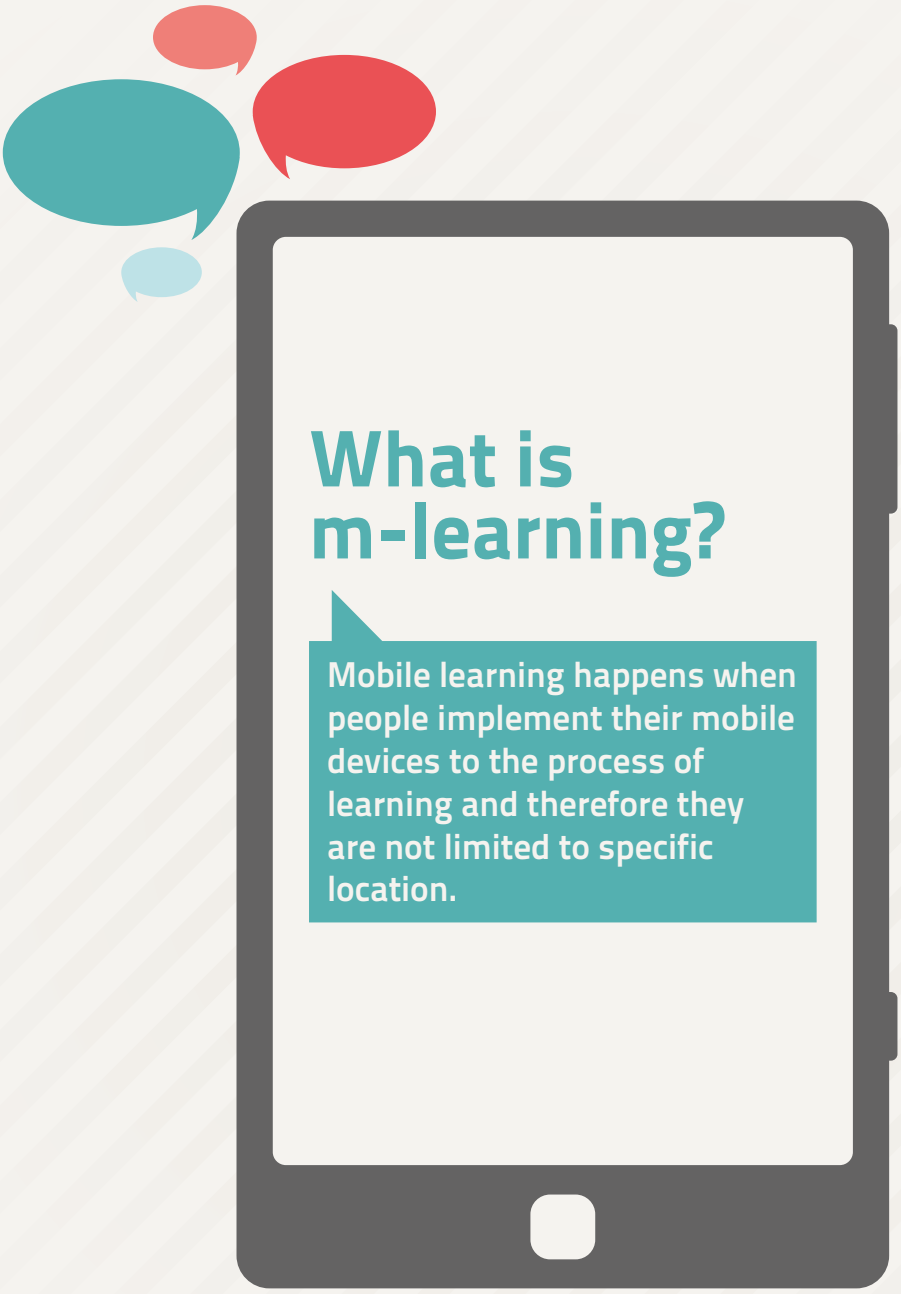
So you want to...

go mobile?



What is m-learning?

Mobile learning happens when people implement their mobile devices to the process of learning and therefore they are not limited to specific location.

Lifelong Learning Programme

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This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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We are living at the beginning of new Era of "Knowledge Society" in which tremendous changes are undergoing in education. Ways of acquiring knowledge have been strongly influenced by the ICT, by which we are surrounded every day in almost every aspect of our life. The rapid growth of mobile devices has dramatically changed the way we communicate, and the way we obtain information. Without a doubt it has become important driver of innovation in learning. Mobile computing is one of the fastest growing areas within the technology industry worldwide. It makes possible to envisage an audience for mobile learning content which is media rich, collaborative and always available to the user. Nowadays the learning process can be characterized by a preference for receiving information quickly, the ability to process it rapidly, heavy reliance on ICTs for information access and communication and a preference for active involvement in learning process over passive learning in lectures. Moreover, the traditional educational systems of VET should go in the direction of training closely related to the job. Therefore, new methodological approaches are needed in order to make the best use of the potential of mobile devices.

This manual was prepared in the frames of E-business Mobile Training project, co-financed by the European Commission's Leonardo da Vinci programme. The partnership of project consists of 4 organizations representing 3 countries (Bulgaria, Spain, Poland). The project Manual is a combination of general textbook and a guidebook for trainers and coaches, designed as a summary of practical aspects of Mobile Training Methodology for E-business. It presents data and knowledge in graphic form, making it easy to search, understand and memorize. If a reader wants to know more about a subject, he or she can consult the methodology for a more profound analysis, use cases and investigations, as well as a detailed bibliography.

Mobile phones

(also known as cellular phones, cell phones and a hand phones) are used to make and receive phone calls and SMS text messages by connecting through radio signals to base stations that are linked in a cellular network. Most of today's mobile phones have a number of additional features like MP3 player, short-range wireless communications (Bluetooth, infrared), e-mail and internet access, or camera. They are sometimes called **feature phones** and lie halfway between low-end, simple mobile phones and smartphones.

Smartphones

While there is no standard official definition of the term "smartphone" (and it's sometines hard to distinguish it from feature phone), we assume that a smartphone is a device that combines the functionalities of mobile phone, personal digital assistant and computer. It is based on an advanced operating system that allows to install and run various applications and offers access to the internet via mobile browser.

eBook readers

Devices designed primarily for the purpose of reading digital e-books and periodicals. They use electronic paper technology for better readability of their screens especially in bright sunlight. The disadvantages of electronic paper are that currently it can display content only in black and white and has no ability of displaying video content. Thus, its application for mobile learning is limited to mainly textual information.

Notebook and netbook computers

Not everybody consider laptop/notebook and netbook computers a part of the mobile ecosystem. But as they become smaller, thinner and easier to carry around they can be used as mobile learning devices that are generally more powerful than smartphones and equipped with full features of PC computers. On the other hand, they allow full-feature, "traditional" e-learning without design restrictions typical for mobile content.

Tablet devices and computers

Half-way between smartphone and laptop computer, they take advantage of both kinds of devices. Having screen big enough for browsing "traditional" e-learning content, they present some limitations (for example, many of them don't support Flash or other formats popular for Web) but also some advantages (like GPS or gyroscope) over regular computers. Their market share is still limited, but their popularity is growing very quickly and they are likely to substitute in some extent e-book readers and netbooks.

Portable media players

(such as iPods and MP3 players): are used for storing and playing digital media such as audio, images, video, documents, etc. Their clear advantage is the small size and light weight, but they have to compete in the market with mobile phones and smartphones, as well as other more specialized devices such as portable DVD players.

Moment of Learning Need	Delivery Method	Applications in m-learning
When learning for the first time	▪ Instructor-led training ▪ Web-based training ▪ Performance support ▪ Electronic performance support system	Not recommended
When learning more	▪ Instructor-led training ▪ Web-based training ▪ Performance support ▪ Electronic performance support system	Mobile technology can be used as supportive tool for learning. They allow quick access to additional information (like corporative data bases, documents and procedures) in the exact moment and place where it is needed.
When remembering and/or applying what's been learned	▪ Performance support ▪ Electronic performance support system	It can provide knowledge refreshers, job aids or performance support any moment it is needed, especially in the need of applying previously gained knowledge and skills in real context, during performance of given action.
When things go wrong	▪ Performance support ▪ Electronic performance support system	Very helpful in situations of crisis, when quick access to critical information is needed. Therefore it allows react instantly and effectively to overcome difficulties or correct errors.
When things change	▪ Performance support ▪ Electronic performance support system	Mobile learning can help employees in finding relevant data delivered just in time and always up-to-date.

Before you take the decision about implementing mobile learning in your company, you should know your employees' learning need. Bob Mosher and Conrad Gottfredson's Five Moments of Need© is a framework that posits that there are five primary moments of need employees face in the learning and performance life cycle. The five moments occur:

1. When learning for the first time
2. When wanting to learn more
3. When trying to remember and/or apply
4. When things change
5. When something goes wrong

The authors identified the best training delivery methods to meet each of the Moments of Need. The first and second moment are related to acquisition of knowledge and more traditional models of teaching. The other three deal with application of knowledge and are directly aligned with performance support.

Let's see how mobile learning can help in each of the Moment of Need.

[Bob Mosher and Conrad Gottfredson (2011) Innovative Performance Support: Strategies and Practices for Learning in the Workflow, McGraw-Hill, New York]

PHONE CALL

Another simple solution that works for everyone and on every phone.

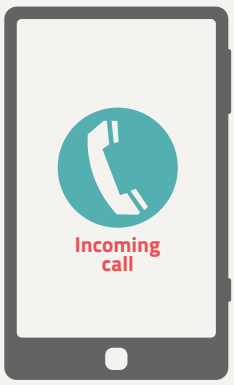
Cost low

Effort simple

Works on any mobile phone

Sample solutions

- communication between learners and teachers. Asking questions or providing feedback and motivation
- performance support. Establishing a support hotline



EXISTING TOOLS

There is a variety off-the-shelf of apps that you can use for learning, many of them are free or available in freemium model. It is more than likely that your employees already use some of them – like note-taking or productivity apps, office applications, or file sharing.

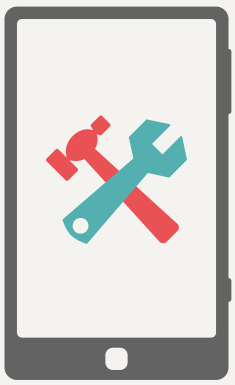
Cost low/medium

Effort medium

Works on mostly smartphones and tablets

Sample solutions

- quizzes and assessments (Quizlet, Easy Assessment)
- office applications (Google Docs, iWork)
- flashcards (StudyBlue, Mental Case, Quizlet)
- location-aware applications (Foursquare, DoubleDutch, Google Latitude)
- presentations (Keynote, Prezi, Slideshare, present.me)
- file sharing (DropBox, Box.com, iCloud)
- note taking and sharing (Evernote, Springpad)
- dictionaries (dictionary.com, Cambridge Business Dictionary)



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SMS

Short text messages are the simplest and cheapest way to deliver learning content. It is also easy – most people know how to send and receive text messages. It works on every type of mobile phone.

Cost low

Effort simple

Works on any mobile phone

Sample solutions

- small pieces of text-based information. For example, daily pieces of advice or language lessons
- alerts and reminders. You can integrate a simple mobile solution to your existing LMS/e-learning course and have learners receive updates, deadlines or grading info right to their mobile phones
- assessment. Assess your learner's progress asking them questions via SMS
- fast communication channel between learners and teachers
- performance support. Send series of SMS guiding a worker through a procedure

EXISTING CONTENT

You can have your existing learning content delivered via mobile devices. Depending on content type and target devices, you can use it "as it is" or adapt it for mobile browsing.

Cost low/medium

Effort medium

Works on

Some may require more advanced devices like smartphones; some (like audio recordings) may be used on wider range of devices; note that visual content requires bigger screen. Some mobile devices (like iPods or e-book readers) are developed for specific content types.

Sample solutions

- existing e-learning modules
- formal learning content – presentations etc.
- supplemental content or review material as part of blended learning programs
- podcasts and video
- searchable references (like Wikipedia, or your company's database)
- job aids, checklists, and reference
- e-books or audio books

SOCIAL MEDIA

Use social media for communication, knowledge construction and sharing. Most of your employees are already using them for private purposes. Instead of banning social media in work, you should integrate them in your workers' activities. Be careful with sharing sensitive information with "outside world"! Establish a clear policy on privacy and information sharing.

Cost low

Effort medium

Works on smartphones and tablets

Sample solutions

- set up a Facebook group as a community of practice
- create a wiki for Frequently Asked Questions or collaborative knowledge base
- use Twitter for a fast performance support

APPS

Creating a dedicated app allows you to best meet your learners' needs.

Cost medium (web app) to high (native app)

Effort medium to high

Works on

target smartphones and tablets (native app), all smartphones and tablets (web app)

Sample solutions

- **a native app.**
- **a web app.** The difference between a mobile-friendly web and a web app is that the second has a touch-friendly, interactive interface that looks like a native app and in can be launched form a shortcut icon installed on the phone's screen.
- **a hybrid app.** The hybrid apps are developed with HTML5 wrapped in a native container. They look like native apps, but the content can be updated and modified easily.

06

08

05

07

DEVICES' AFFORDANCES

Use your device's affordances to enhance learning. You can have your learners take pictures of their work (or document problem they encounter and share them with others asking for help), record voice notes for assignment, scan QR codes with information or instructions, or use built-in sensors for data collection.

Cost low

Effort medium

Works on smartphones and tablets

Sample solutions

- still and/or video camera
- internal microphone
- voice control
- data probes

MOBILE WEBSITE OR LMS

Setting up mobile version of your website is an easy way to deliver existing content to mobile phones. Even simple phones have a web browser.

Cost medium

Effort medium/high

Works on smartphones and tablets

Feature	Native app	Hybrid app	Web app
Development language	Native only	Native and web or web only	Web only
Access device specific features	High	Medium	Low
Speed	Very fast	Very fast	Fast
Development cost	High	Medium	Medium
Installation	App Store	App Store	Mobile browser
Approval process	Mandatory	Low overhead	None
Advenced graphics	High	Medium	Medium
Upgrade flexibility	Low	Medium	High

There are two main approaches for porting an educational environment to mobile devices: adapting a web version to the constraints of mobile devices, and building a native implementation in each supported mobile phone. Each approach has its advantages and disadvantages.

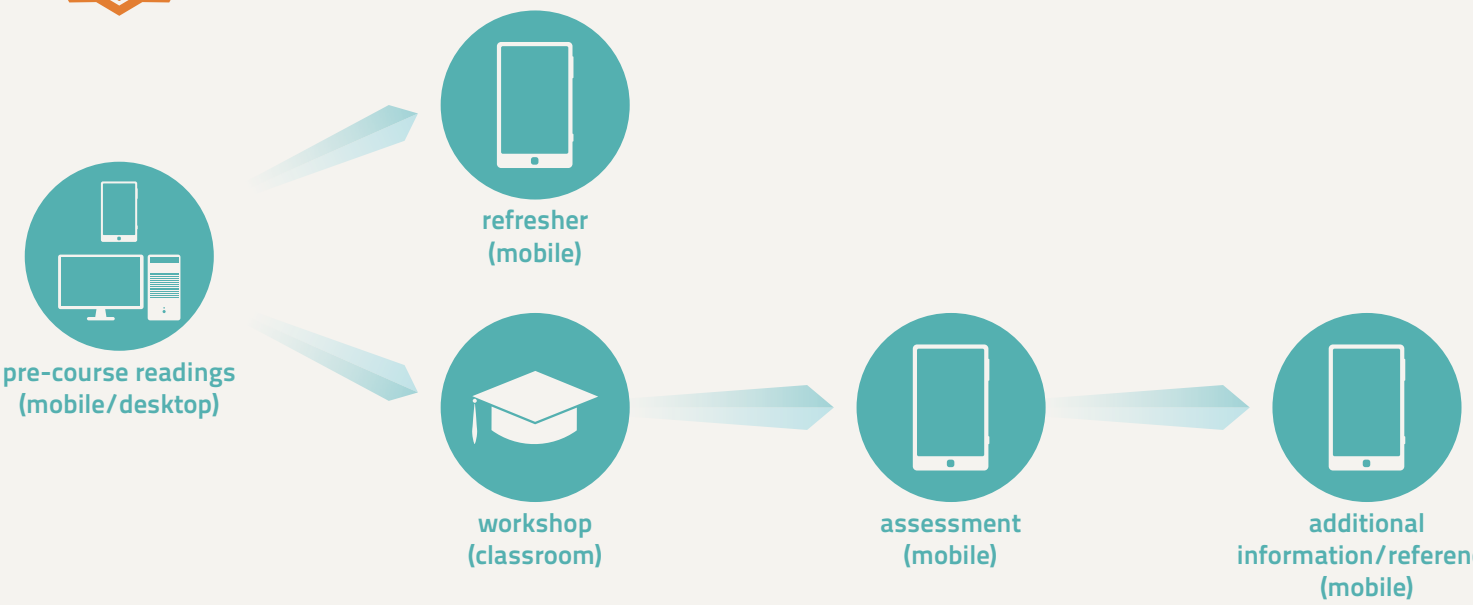
There is also a third option that lets developers take advantage of both web and native characteristics. The hybrid apps are developed with HTML5 wrapped in a native container. The container allows them to be sold in app markets also gives them access to native capabilities like the camera, microphone, contact list, or notification system. For the end user, they look and behave like native apps. But the main content is written in HTML so it can be updated and modified easily and it's development is considerably cheaper than creating and updating a native app, especially if we need to develop for multiple operating systems.

Blended learning:

There is an unlimited number of learning scenarios using mobile devices. Let's take a look at some examples.

scenario 1

scenario 2



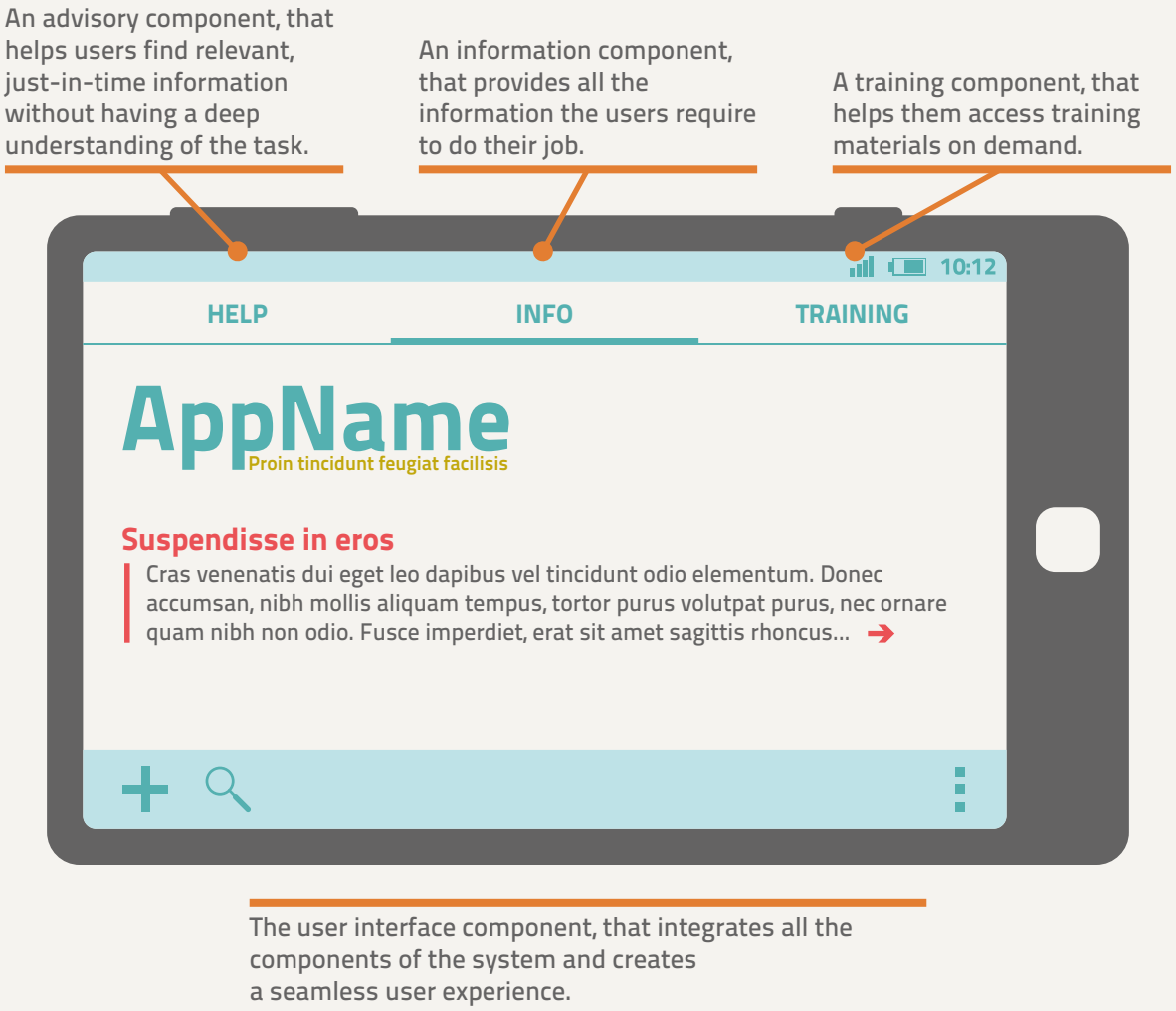
Pure mobile learning:

scenario 3 Performance support

scenario 4 Workflow support

Formal course: you can have your e-learning content delivered on mobile devices. More and more authoring tools let you create content that can be deployed on desktop computers as well as on mobile devices. But due to the screen size differences, it is almost impossible design course that is equally attractive and accessible on a computer and on a phone. If you need to deliver the same content as e-learning and m-learning, consider tablets.
Blended learning: m-learning works perfectly as part of a blend. You can mix it with e-learning, classroom training, webinars, and the like.
Pure mobile learning: works best as "just-in-time" performance or workflow support.

A performance support system (PSS) is a promising approach in business and industry training to empower workers to perform tasks with a minimum amount of external intervention or training. A PSS is a computer-based system that improves worker productivity by providing on-the-job access to integrated information, advice, and learning experiences by providing computer support just-in-time, just-enough and just-at-the-point-of need for an effective and efficient job performance.
A typical performance support is structured to provide immediate, individualized on-line access to the full range of information, software, guidance, advice and assistance, data, images, tools, and assessment and monitoring systems to permit job performance with minimal support and intervention by others. Most PSSs consists of four components:

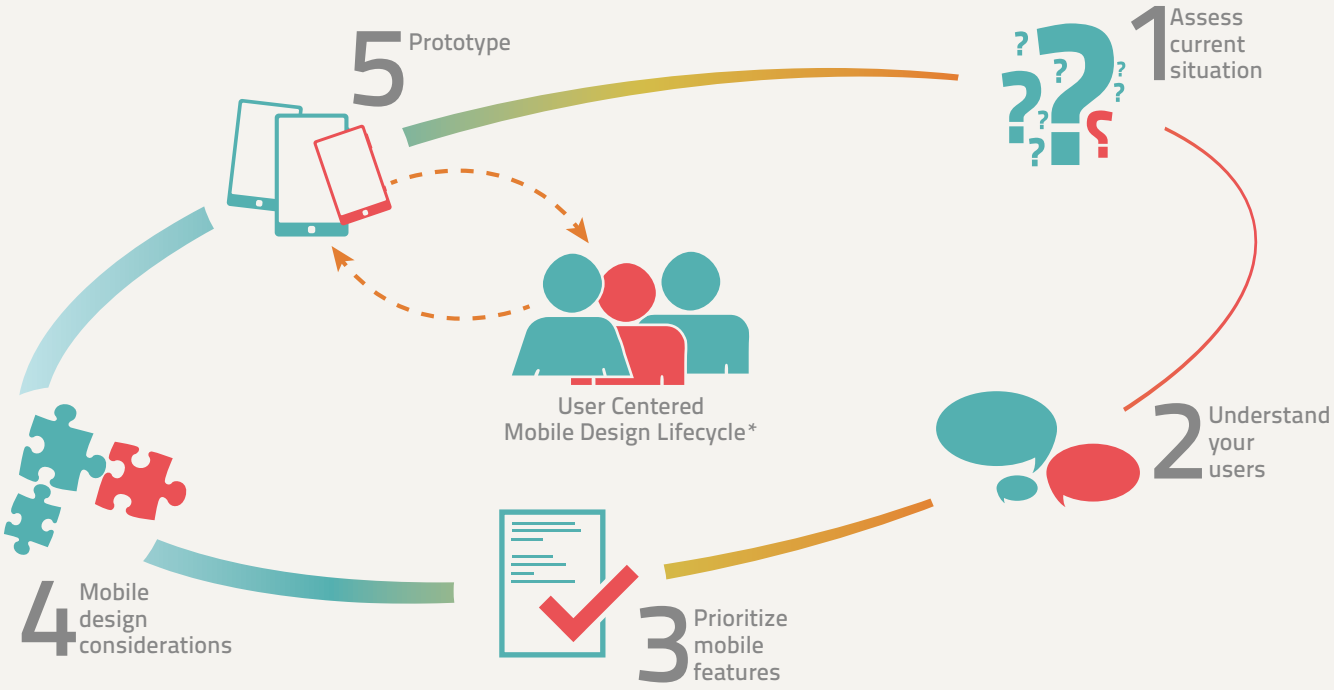


How do you implement a performance-centered design in training? The performance-centered approach focuses on practical tasks rather than knowledge transfer. The training modules are composed of a set of activities or tasks. Each task is accompanied by information and instructions, but the learner is free to decide if he or she will consult them (and in which sequence) or use his/her own knowledge and skills to perform the task.
A typical structure of the course is:

Module 1

- Task 1
  - Task description
  - Task-specific training
  - Reference information
  - Instructions how to perform
  - Expert advice
- Task 2...
- Task 3...

Module 2...



Mobile devices are the most personal of all the tools we use for learning, working and communicating. That's why any mobile interface and content needs to be designed with end user in mind.

1: Assess current situation

- Look for a learning or performance problem and analyze carefully if mobile learning is the best solution.
- Are your users really "mobile" enough to warrant a mobile learning approach? What are they already doing with mobile? Will mobile access help achieve their learning goals?
- Ask yourself what form of mobile learning suits your needs. Do you need content push or pull? Will you be using collaborative tools? Assessment tools? Performance support?
- What actions or activities do you want to track?
- Do you already have learning materials that could be converted into a mobile format? Is your content appropriate for mobile use?
- What tools, applications and mobile device affordances (GPS, multi-touch, voice, cameras, video recording...) can you use to enhance learning?
- Is mobile the best option for your budget? How does it fit into your corporate strategies? Ask yourself what kind of mobile learning can you afford with your resources (staff, IT infrastructure, etc.)?

2: Understand your users

- Who are they (employees, partners, customers…)?
- What mobile devices do they use? How do they spend most time with their mobile devices (gaming, texting, creating and sharing content, socializing, surfing the web…)?
- What features, apps or tools do they use most?

3: Prioritize mobile features

Devices are equipped with various features that could be used to enhance learning. Think what tools and devices (audio playback, video playback, clock, calendar, contact list, GPS, maps, navigation, bluettoth, e-mail, web browser, text messaging, phone call, audio recorder, camera, text editor, spreadsheet, social networking, augmented reality, data probes) may be more accommodating for the type of learning activity you need to deliver.

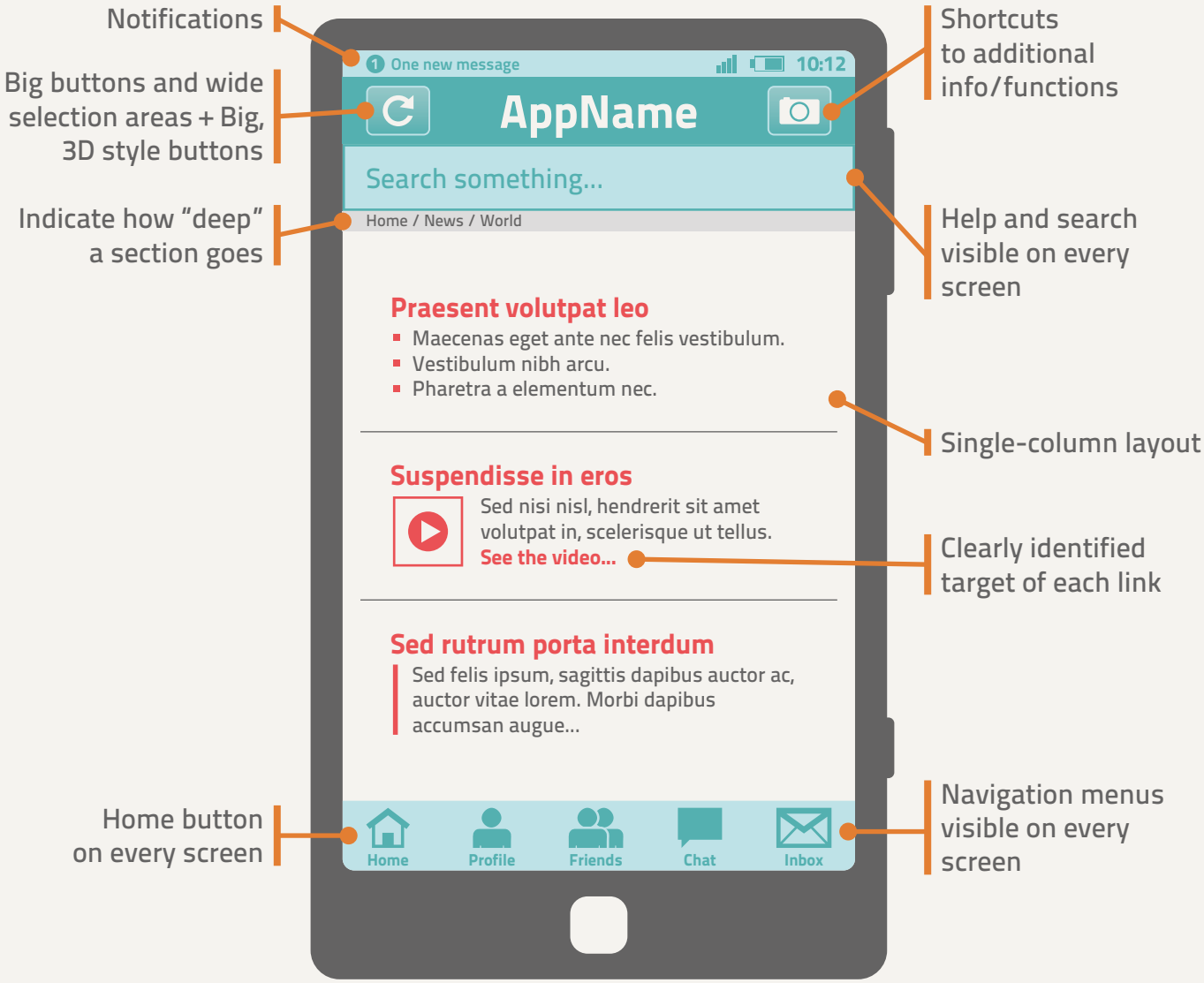
4: Mobile design considerations

- Design for smaller screen sizes
- Simplify layout and navigation
- Minimize user's input
- Design for intermittent connectivity

5: Prototype

- Even if designing a native app, consider prototyping with web app first. This will allow you to simulate and refine the user experience and modify your course more easily.

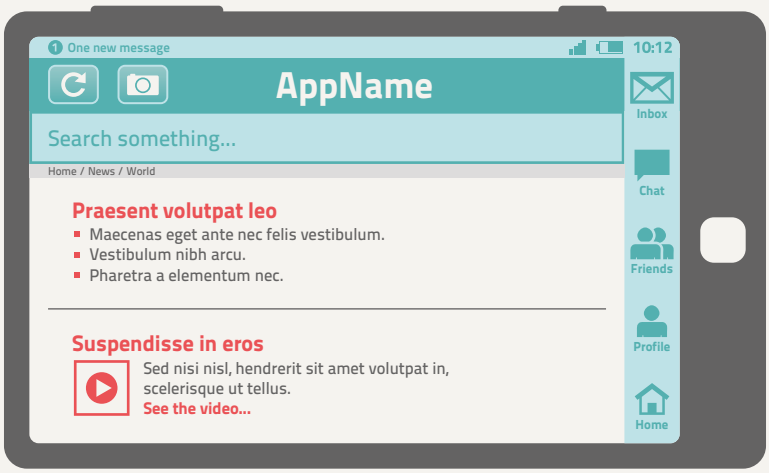
[*Based on: Lyndon Cerejo (2011). A User-Centered Approach To Web Design For Mobile Devices.
Available at: http://mobile.smashingmagazine.com/2011/05/02/a-user-centered-approach-to-mobile-design]



Simple interface layout

High contrast

Avoid scrolling



Fluid layout fits the screen to the orientation of the phone

Flexible display adjusts to different screen sizes

CORE GESTURES

Basic gestures for most touch commands*

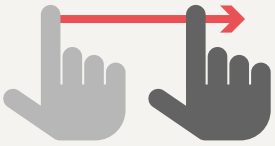
Tap

Briefly touch surface with fingertip

Double tap

Rapidly touch surface twice with fingertip

Drag

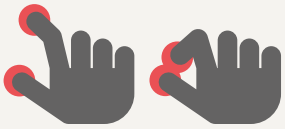


Move fingertip over surface without losing ontact

Flick

Quickly brush surface with fingertip

Pinch



Touch surface with two fingers and bring them closer togehter

Spread

Touch surface with two fingers and move them apart

Press

Touch surface for extended period of time

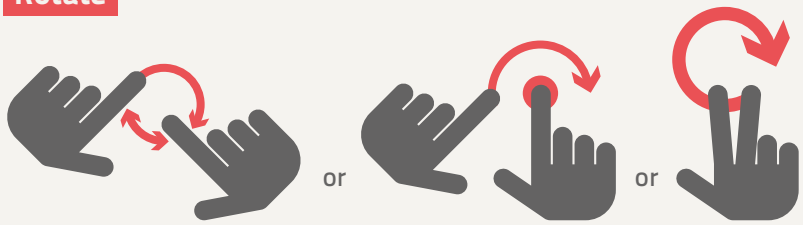
Press and tap

Press surface with one finger and briefly touch surface with second finger

Press and drag

Press surface with one finger and move second finger over surface without losing contact

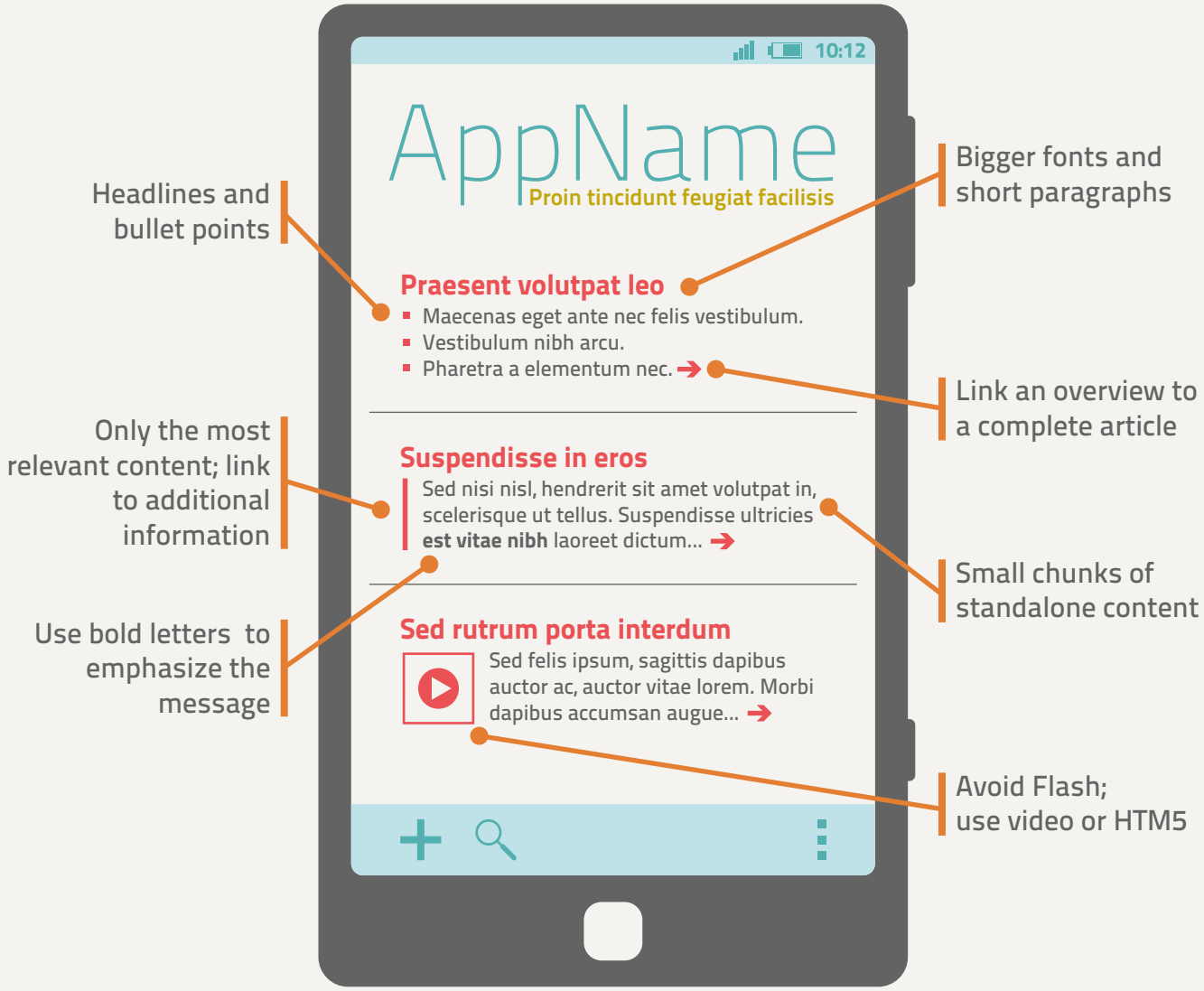
Rotate



Touch surface with two fingers and move them in a clockwise or counterclockwise direction

Today's mobile devices are mostly touch-based. Although the gestures supported depend on phone's model and operating system, there is a basic repertoire of touch commands that's becoming a standard for interacting with touch screen. To know more on how popular software platforms support core touch gestures see "Touch Gesture Reference Guide" by Luke Wroblewski, available at http://www.lukew.com/ff/entry.asp?1071

[*Based on: Wroblewski, L. (2011). Mobile First. A Book Apart.]



To address the specific characteristics of each device(s) you're targeting, see the official user interface (UI) and user experience (UX) guidelines from the manufacturers. Below you can find guidelines for most popular mobile operating systems:

- **iOS** Human Interface Guidelines (http://goo.gl/1LSo6)
- **Android** User Interface Guidelines (http://goo.gl/FM6aw)
- **Blackberry** Smartphones UI Guidelines (http://goo.gl/mR6E4)
- UI Guidelines for **Windows Mobile** (http://goo.gl/he3gx)
- **Nokia** Developer Design Portal (http://goo.gl/8So8b)

High-bandwidth medium	Lower-bandwidth version	Alternative media
Video	▪ Shorten clips. ▪ Reduce width and height. ▪ Compress more highly.	▪ Stills and audio. ▪ Still photograph and a transcript. ▪ Just a transcript if the visual component is not essential.
Video chat or conferencing	▪ Smaller window. ▪ Only the current speaker visible.	▪ Audio chat or phone conference. ▪ Text chat.
Photographs	▪ Crop the image to just the essential part. ▪ Reduce the width and height. ▪ Compress the graphic more highly.	Include a thumbnail image linked to the full-sized graphic.
Audio	▪ Shortensegments. ▪ Convert stereo to mono. ▪ Compress more highly. ▪ Choose a file format like .mp3 that is designed for small size.	▪ Text transcript or description of sounds. ▪ Text summary of a discussion.
Slide presentation as video	Slides at smaller size and audio more compressed.	Still pictures and transcript.

Make available lower-bandwidth versions and alternative media for crucial content. William Horton (Horton, 2012) provides a list of tips for addressing the low bandwidth issues:

Native applications development

Most mobile devices provide development frameworks on top of which third-party developers can build applications. Applications available for mobile operating systems are usually native applications developed in their own Software Development Kit (SDK), which is only supported by each operating system.

Cross-platform development

You can also find a number of cross-platform development tools that allows you to create native, hybrid or web apps what can be deployed on various devices.

Motorola Solutions' RhoMobile Suite is the HTML5 application development platform that works with any device type, operating system and screen size, including Windows® Embedded Handheld, Windows® CE, Windows® Phone 7, Apple® iOS, Android® and BlackBerry®.

Appcelerator's Titanium Development Platform allows for the development of native iOS, Android, hybrid, and mobile web apps as well as desktop applications from a single code base.

Open source and free HTML5-based tool, PhoneGap leverages web such as HTML and JavaScript.

The MoSync Mobile SDK is a complete, rich, cross-platform mobile application development SDK. It allows to build and compile apps for up to nine different platforms at once, using C/C++ or HTML5/JavaScript, or a combination of both to create hybrid apps.

Sencha Touch is a high-performance, mobile HTML5 application framework. It lets you create sophisticated web apps apps that work on iOS, Android, BlackBerry, Kindle Fire, and more.

Web application development

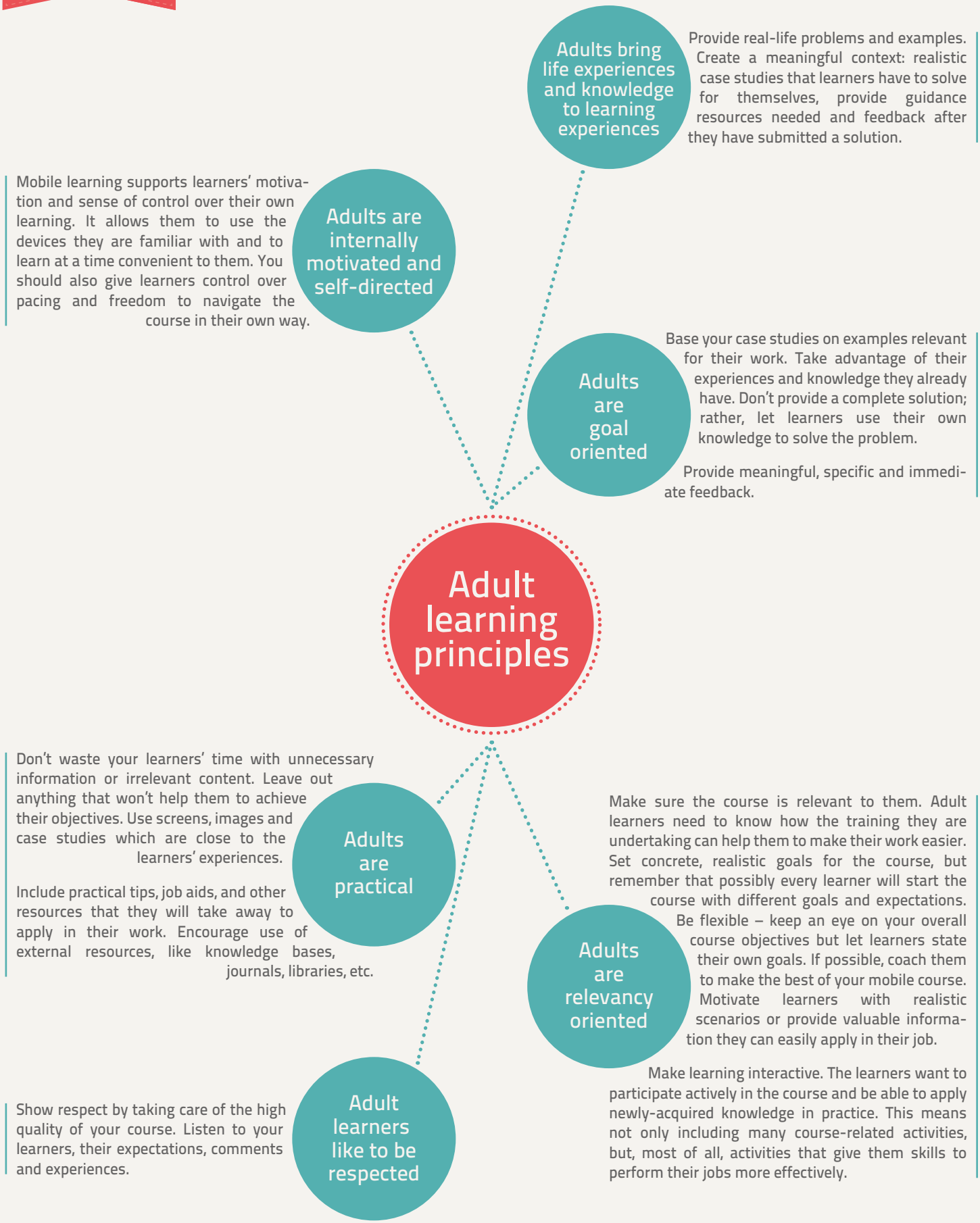
iUI is a framework consisting of a JavaScript library, CSS, and images for developing advanced mobile webapps for iPhone and comparable/compatible devices.

iWebKit is a free framework designed for the creation of iPhone and iPod touch compatible websites or webapps.

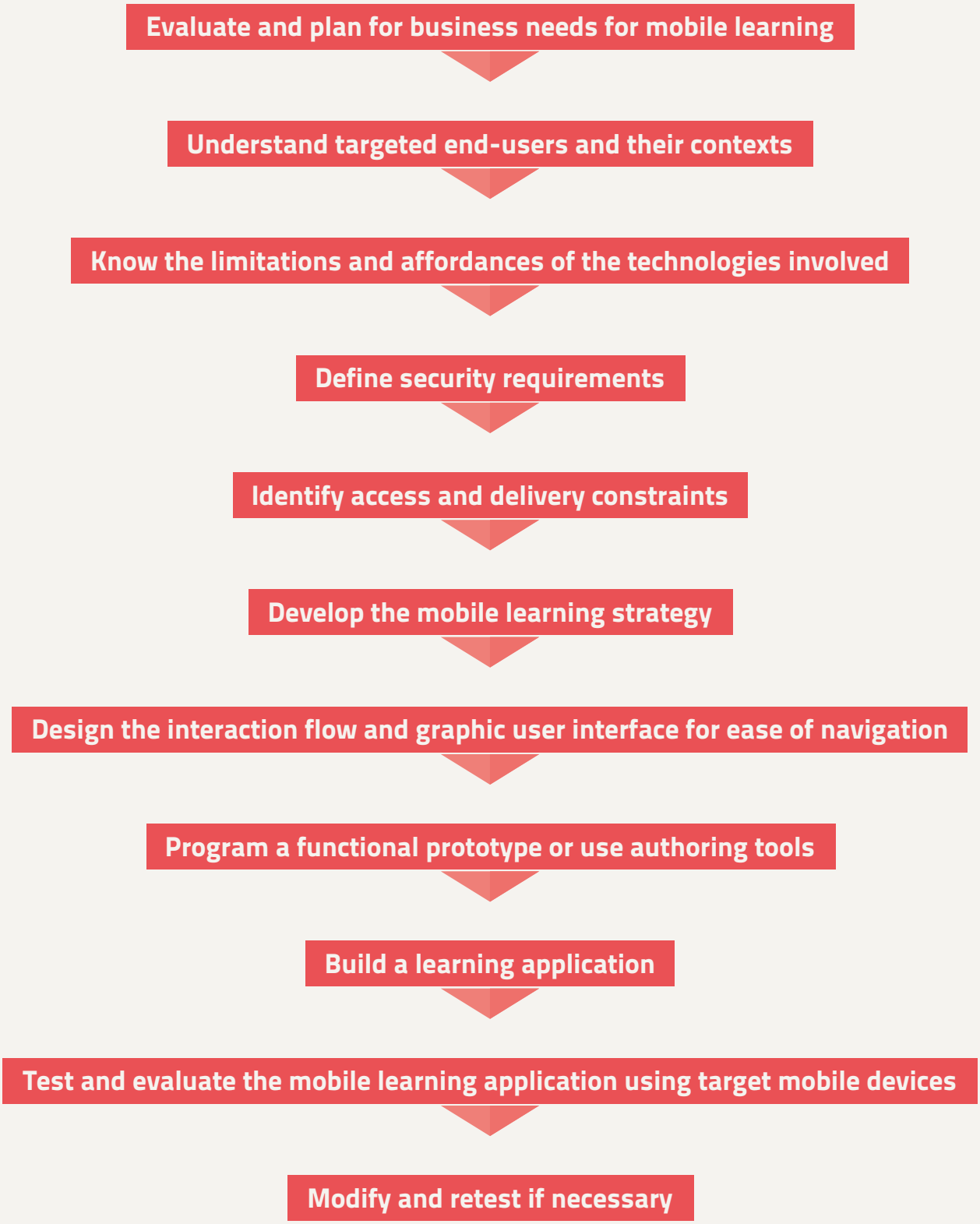
jQuery Mobile is a HTML5-based user interface system for all popular mobile device platforms, built on jQuery library.

Rapid authoring tools and LMS

There is a growing market of tools and platforms that allow the creation of mobile courses from scratch or converting existing learning material (like PowerPoint presentations) into a mobile format. There are also mobile versions of some of the popular Learning Management Systems (LMS) that facilitate access to learning content and administration.



Andragogy is a theory of adult learning proposed by Malcolm Knowles. His theory can be stated with the following six principles of how adults learn.



[Based on: Woodill, G. (2011). The Mobile Learning Edge. McGraw-Hill, New York.]

Let's summarize the main points of this manual and see their place in the process of implementing m-learning in a company. Gary Woodill in The Mobile Learning Edge (2011) proposes the following stages of mobile learning project:

Evaluate and plan for business needs for mobile learning:
See pages 3 and 13. Any mobile learning project has to connect to your company's business needs. Consider alternatives to mobile learning—is this the best solution? How does your project fit in your company's general strategy?

Understand targeted end-users and their contexts:
See page 13. Know the special characteristics of your users and the environment in which learning activities will take place. Consider present mobile device ownership and usage patterns among targeted users.

Know the limitations and affordances of the technologies involved:
See pages 13. Select the right technology mix for your project.

Define security requirements:
Privacy and security remain top concerns and barriers to mobile adoption for many organizations. Mobile devices can be easily lost or stolen. There are also dangers of losing data or rogue applications and malware gaining illicit access to company information.

Identify access and delivery constraints:
See page 18. Slow internet connection and high prices for bandwidth can be an issue. Some problem with the Internet could occur even in developed countries in Europe, especially in rural areas.

Develop the mobile learning strategy:
See pages 5, 6, 7 and 8. Identify the type of content to be delivered, learning methods and tools to be used. Will your strategy rely mostly on ready-to-use learning content? Do you want your users to create, share and communicate? Do you need to deliver training, facilitate social learning or enable performance support?

Design the interaction flow and graphic user interface for ease of navigation:
See pages 14, 15, 16, and 17. Learn about mobile usability and user interface design guidelines. Identify main characteristics and issues of targeted devices.

Program a functional prototype or use authoring tools to build learning application:
See page 19. Create a prototype or demo version of your application.

Test and evaluate your mobile learning application on target mobile devices:
Use devices and configurations you want your end-users to use. Perform user tests with targeted users, in real-life conditions that reflect the environment in which the learning will take place.

Modify and retest if necessary.

We are mobility evangelists!

We are who decide how we will take advantage of the innovations that appear in the mobile market every year:

2012
Global smartphone market reaches 1 bilion, and mobile subscriptions outnumber the world's population.

2007
The first mobile phone with multitouch display and touch keyboard. Traditional (physical) keyboard lands on the scrap heap.

2003
The first business phone released. It allows for mobile internet browsing, faxing and fast writing thanks to a full physical keyboard.

1999
The first phone with a WAP browser capable of Internet connectivity.

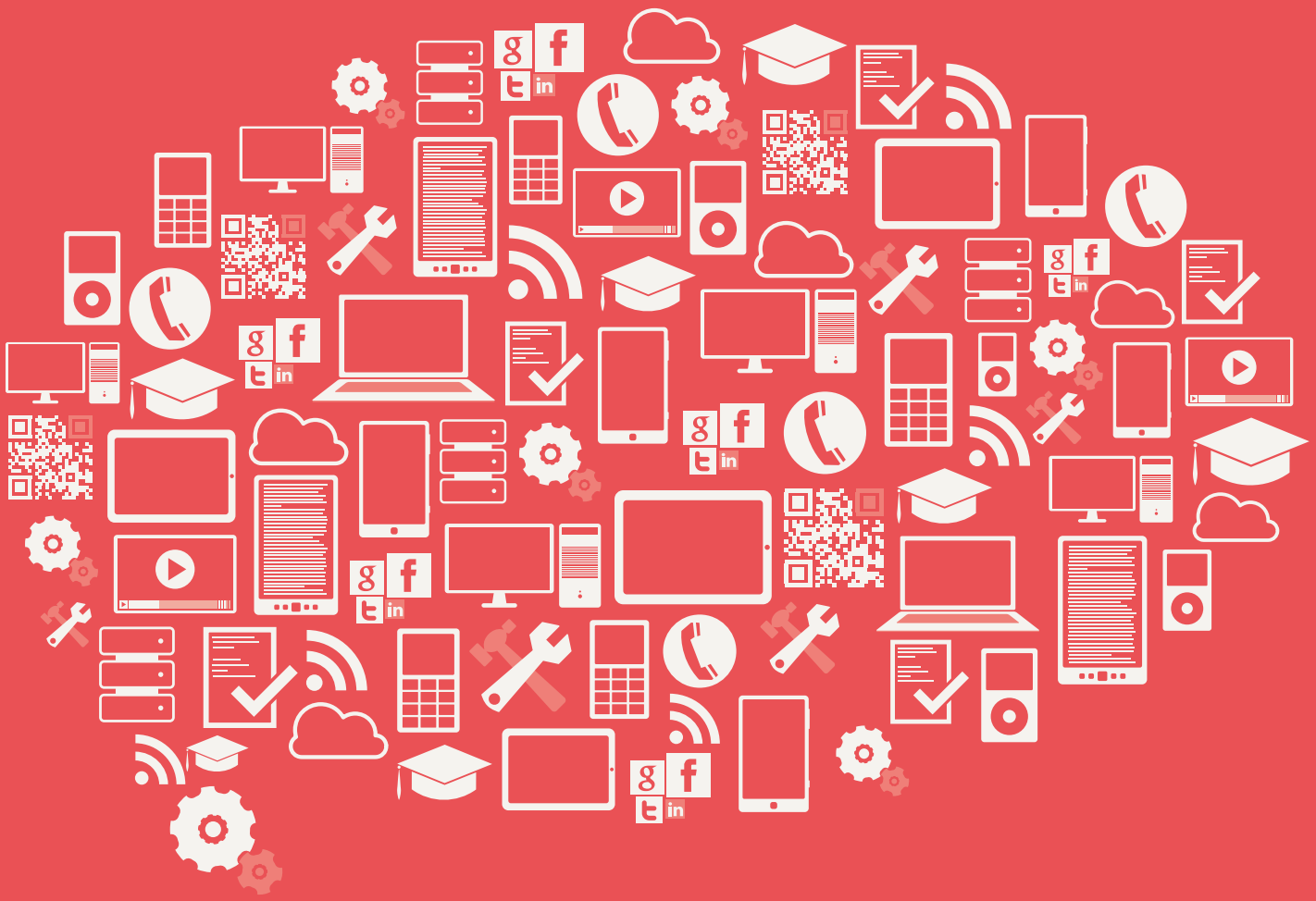
1992
The first SMS message is sent, offering an alternative to voice calls and opening gates to services other than voice.

2010
The first tablet achieves commercial success, starting a new era of mobile technology.

2005
The first GPS-enabled mobile phone. Navigation systems and geolocation are getting popular with cell phone users.

2000
The world's first camera cell phone enters the market. After ten years they reach resolution and image quality of standard digital cameras.

1997
The first mobile phone with color display is announced. The color screen allows for rich content and more detail. Soon playing video games and watching video will become standard.



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