Jakob Nielsen
Raluca Budiu

Mobile Usability

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Jakob Nielsen and Raluca Budiu

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Berkeley, CA 94710

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New Riders is an imprint of Peachpit, a division of Pearson Education.

Senior Editor: Susan Rimerman
Copy Editor: Anne Marie Walker
Proofer: Emily K. Wolman
Indexer: James Minkin
Production Editor: Tracey Croom
Composition: Danielle Foster
Cover Design: Peachpit Press

ISBN-13: 978-0-321-88448-0
ISBN-10: 0-321-88448-5

9 8 7 6 5 4 3 2 1

Printed and bound in the United States of America

For Hannah.

—Jakob

For Matei and Mihai, with love.

—Raluca

Acknowledgments

We have drawn from several Nielsen Norman Group projects in writing this book. Janelle Estes ran studies of how users read from mobile devices, and Marieke McCloskey ran studies on how people read from tablets and e-readers, and also helped with some of the logistics for our Dutch study. Hoa Loranger, Kara McCain, Amy Schade, and Kathryn Whitenton helped with several of our usability studies, and Kara McCain also redesigned several screens that are shown in this book as examples of improved usability. Luice Hwang set up facilities for a large number of studies in other states and countries. Susan Pernice managed participant recruiting for studies in Australia and Netherlands. And the rest of the Nielsen Norman Group, including Jen Cardello, Susan Farrell, Garrett Godlfield, Don Norman, Kara Pernice, and Bruce Tognazzini, shared with us their personal stories and insights about mobile apps and websites.

The visioneering concepts shown in Chapter 6 were created by a team that included Bruce Tognazzini, Amy Gallaher, and Shuli Gilutz. Marc Ramsay ran our WAP phones studies in 2000. Scott Butler and the Ovo Studios generously provided us with a mobile device camera that we used for some of our studies. Hannah Kain, Aaron Katske, and Brandon Marugg helped with facilities for many of our research studies in California. Cristian Lupsa and the magazine *Decât o revistă* let us use their location and amenities during our study in Romania, and Eric Chow recruited participants for our Hong Kong study. Mihai Budiu lent us his phone for our Windows Phone 7 studies, kindly offered technical support and advice, and contributed additional insights. And finally, a special thanks to our editors Susan Rimerman, Anne Marie Walker, and Tracey Croom for all their hard work with the manuscript.

About the Authors

Jakob Nielsen

Jakob Nielsen, Ph.D., is a principal of Nielsen Norman Group. He is the founder of the "discount usability engineering" movement, which emphasizes fast and efficient methods for improving the quality of user interfaces. Nielsen, noted as "the world's leading expert on Web usability" by *U.S. News and World Report* and "the next best thing to a true time machine" by *USA Today*, is the author of the best-selling book *Designing Web Usability: The Practice of Simplicity* (New Riders Publishing, 2000), which has sold more than a quarter of a million copies in 22 languages.

His other books include *Usability Engineering* (Morgan Kaufmann, 1993); with Robert L. Mack, *Usability Inspection Methods* (Wiley, 1994); *Multimedia and Hypertext: The Internet and Beyond* (Morgan Kaufmann, 1995); *International User Interfaces* (Wiley, 1996); with Marie Tahir, *Homepage Usability: 50 Websites Deconstructed* (New Riders Publishing, 2001); with Hoa Loranger, *Prioritizing Web Usability* (New Riders Publishing, 2006); and with Kara Pernice, *Eyetracking Web Usability* (New Riders Publishing, 2010). Nielsen's Alertbox column on Web usability at www.useit.com has been published on the Internet since 1995 and has approximately 200,000 readers.

From 1994 to 1998, Nielsen was a Sun Microsystems Distinguished Engineer. His previous affiliations include Bell Communications Research, the Technical University of Denmark, and the IBM User Interface Institute. He has been awarded 80 United States patents, mainly on ways of making the Internet easier to use. Nielsen holds a Ph.D. in human-computer interaction from the Technical University of Denmark.

Raluca Budiu

Raluca Budiu, Ph.D., is a user-experience specialist with Nielsen Norman Group. There she conducts usability research; consults with large companies from a variety of industries; and presents tutorials on mobile usability, usability of touch devices, cognitive psychology for designers, and principles of human-computer interaction. She co-authored research reports on mobile usability, iPad usability, and the usability of websites for children.

From 2004 to 2007, Budiu worked at Xerox PARC doing research in human-computer interaction. She also explored new ways of measuring information scent, and conducted research on interfaces for social bookmarking systems and on the cognitive benefits of tagging. Budiu was also a user researcher at Microsoft Corporation, where she explored future directions and made strategic recommendations for incorporating user-generated content and social-Web features into MSN.

Before PARC, Budiu carried out research in psycholinguistics and cognitive science, building computational models of how people understand language.

Budiu has authored more than 20 articles and conference presentations on human-computer interaction, psychology, and cognitive science. She holds a Ph.D. from Carnegie Mellon University.

Contents

Preface

The topic of this book is simple: how to design the best websites and apps for mobile devices and tablets. How is it different from the many other books on this topic? It is based on empirical evidence on how regular users actually use such user interfaces.

A key lesson from the past decades of usability is that you cannot trust your own instincts regarding what will be easy for normal people. The fact that you're reading this book proves that you are very different from the average mobile user. Repeat after us: *"I am not the target audience"* (unless you're designing an app for designers).

Most other books on mobile design describe the authors' personal preferences: what they think is good. This can certainly be interesting information, but it's safer to rely on actual usability research with more representative users.

Chapter 1 describes how we conducted this research. You can skip it if you simply want to know what we discovered but not how we ran the studies. However, the chapter is short, so we recommend that you read it anyway. Who knows, maybe you will be inspired to conduct your own user testing when you see how easy it is to get real data.

Chapter 2 is about the question that should be addressed before doing any mobile design: Should you even have a mobile site or app?

Chapters 3 and 4 are the meat of the book: how to design for mobile devices and how to develop content for the small screen. Chapter 5 applies these concepts further to the larger tablet screens.

Chapter 6 presents a broader perspective beyond the current flat touch screens, and the appendix takes a look back at the pre-iPhone phones.

Why Mobile Is Different

In 2012 the analytics company Monetate released a study of 100 million site visits across its e-commerce clients. Conversion rates differed dramatically, depending on which device was used to access a site, as shown in the following table:

Device	Conversion Rate
Desktop computer	3.5%
Mobile phone	1.4%
Tablet	3.2%

The definition of "conversion rate" is simple. It's the percentage of visiting users who end up taking a desired action. On e-commerce sites—such as those analyzed in the table—it's even easier to understand conversion, because the "desired action" is to buy something. Thus a conversion rate of 3 percent means that of every 100 people who arrive at the site, 3 turn into paying customers and 97 leave without buying anything.

It's clear that mobile users bought much less than people sitting at their PC. It's also interesting that the conversion rates of the tablet users were much closer to the desktop users than to the phone users. As you'll see in Chapter 5, this matches our usability findings, because we have also seen that browsing websites on tablets (like the iPad) is much easier than it is to use websites on mobile phones.

What should we make of the huge difference in conversion rates between desktop computers and mobile phones? There are at least two different possible conclusions:

- The mobile user experience must be horrible. (This is in fact what we find in user testing.) Therefore there are fortunes to be made if companies would only design mobile-optimized sites that are easier to use for mobile users. After all, mobile sales could be 2.5 times greater if mobile sites were as easy to use as desktop sites.
- It's not worth investing in mobile design, because mobile users don't account for very much business. Mobile phones are fine for frivolous tasks like checking sports scores and posting Facebook updates but not for higher-value tasks.

Both conclusions are reasonable. As we discuss in Chapter 2, some companies shouldn't bother designing for mobile. But many companies should improve their mobile design to better match mobile usability guidelines, even if they don't currently get a lot of business from mobile users. It's quite likely that the small amount of business is caused by a low conversion rate, which again is caused by a design that doesn't match the special mobile needs.

So what are those special mobile usability issues? To some extent, many are not that different from the regular usability issues we have discussed in our many previous books about Web usability. The main difference is that each guideline is *even more crucial* for mobile.

For example, when we discuss writing for the Web, we've always said to be brief and to get straight to the point at the top of the page. Many users will never see the bottom of a Web page if the top of the page doesn't immediately communicate its relevance for the user's current problem. This guideline is equally true for desktop design and for mobile design. But it's stricter for mobile. On the small screen, text shouldn't just be short—it should be ultra-short. And the "top of the page" means a much smaller area on mobile.

There are two ways to consider whether mobile and desktop user experience issues are different. First, we can *empirically* say for certain that there is a measurable difference between the two classes of

devices, as shown by the conversion data in the preceding table and by the user testing data we present in this book.

Second, it just makes good *common sense* to design differently for highly different devices. In the early days of the Web, we had to explain why designing Web pages was not the same as designing printed magazines or brochures. By now most people have probably come to realize that print and online are distinct media forms and require separate design approaches. Similarly, there are many differences between mobile and desktop use, such as small versus big screen, on the move versus stationary, touch versus mouse, wireless (and sometimes spotty) connectivity versus faster wired Internet, and so on.

Screen Shots Are Examples Only

We can tell you right now what the customer reviews in various online bookstores will say about this book two years from now. Many reviewers will complain that the screen shots are very old. Others will say that it's not fair to criticize companies for the way their mobile sites looked before they were redesigned (as most will hopefully be by then).

In fact, even if you bought this book the day it was published, you might feel the same: It's not fair to criticize a design that has been improved while the book was being edited and printed. The mobile field moves fast enough that many of the sites and apps shown here will surely be out in new releases by the time you lay your eager hands on a freshly printed book.

But let's make one thing clear: We don't show a screen shot to criticize the owners or designers of that site. This is not a consumer review of best mobile sites or advice for what apps to install on your phone to have a good time. We don't even care whether a specific site is good or bad, because we have no vested interest either way. We're always happy to see sites improve, because that shows uptake of our usability findings, but if a design stays the same—or gets worse—it's no skin off our nose.

We include screen shots in this book to serve as examples of our usability findings. If we expended our entire page count on elaborate discussions of abstract principles, we would have no readers. Snooze.

It's a well known, human-factors principle from instructional design that specifics communicate better than abstractions. We're simply

following our own guidelines when we try to *show* you what we mean instead of purely *telling* you.

A given screen shot remains just as good of an example of a usability principle even if the company behind that site came to its senses and improved the design after we grabbed the image.

As a meta-example (an example of an example), let's say that we included a picture of Apple Computer's rainbow-striped logo from 1976 as an example of how you might employ many different colors in a logo. Well, Apple changed to a monochrome logo in 1998, but that doesn't mean that all pictures of its 1976 should be removed from discussions of how color works in logos.

In fact, sometimes older examples are better examples than newer ones if they more clearly show the underlying principle. Some usability mistakes, fortunately, are becoming so rare that they're found mainly on obscure sites that make many other design errors in the same screen, making for more confused examples. But we still must warn against usability problems that have become rare because there's always somebody who's ready to introduce a bad design that revives the mistake.

Case in point: We had *almost* eradicated splash screens from the Web after a decade-long campaign against this user-hostile design idea. No big corporation or best-selling e-commerce site will put a Flash intro in front of its homepage these days. But we've tested several mobile apps that reintroduced this user experience sin. Sure enough, our test users complained just as bitterly about these new designs as the last generation of users did about Flash intros back in 2000.

To misquote a famous saying, the price of good user experience is eternal vigilance. Old mistakes will come back to bite you (and your customers) if you don't know about them.

If you designed any of the screen shots we use in this book, rest assured that we don't mean you any harm. We're not complaining about you. We know that commercial design projects are nothing but one compromise after the next, and that design decisions are often made by old-school managers who don't understand interaction design.

The examples have no deeper meaning other than this: They make our usability findings concrete so that you can see some specific user interface designs that average people will have an easy or a difficult time using.

—Jakob Nielsen and Raluca Budiu

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1 Our Research: How We Ran the Usability Studies

This book is different from almost all other books about mobile user interface design in one way: Our findings and recommendations are based on empirical research. We don't rely on our own opinions. We don't ask you to design the type of mobile sites and apps that we personally like and would prefer to use.

Instead, we report how a broad spectrum of average users around the world actually uses websites and apps. What do people like and dislike? What designs are easy for them to use, and what causes them trouble? We know, because we've seen it happen.

You, dear reader, are probably not an average user. Chances are that you are particularly interested in mobile devices and in user interface design. Otherwise, why did you buy this book when you could have purchased several perfectly good crime novels instead for the same price?

We (Jakob and Raluca) both have doctorates and decades of experience in the high-tech business and with user-experience research. We even live in Silicon Valley. What we personally like is completely irrelevant because we are so different from the majority of users around the globe. Don't design for us. But equally as much, don't design for yourself.

Design for your customers.

We strongly recommend that you run your own usability studies with your own customers as they attempt to use your design. You always learn something valuable every time you do this. In this chapter you'll learn more about the proper methodology for studying mobile usability.

But why not start out benefiting from the studies we've already run? The findings in this book are distilled from hundreds of hours spent observing real user behavior across many different research studies. This chapter summarizes these studies. You can skip the rest of Chapter 1 and go directly to the findings in Chapter 2 if you don't care how we know what we know.

Client Research

We conduct two types of user research: client studies and studies funded by our own company, Nielsen Norman Group. The first law of consulting is that all client information must remain confidential. Therefore, we can't tell you anything about our consulting clients or the findings from the work we've done for them. This is why we supplement our client work with a large amount of independent research. Because we pay for these studies ourselves, we're free to tell you everything that happened. The information in this book is based on this self-funded research.

Even though we can't report on the work our clients paid for, we obviously know everything that happened in those studies. Therefore, the secret client findings inform the publicly disclosed guidelines. If something previously unknown happens in a client study, we know to invest in a public study to find out more about that type of user behavior. And if a new client study confirms the findings from a public study done the year before, we know that those old findings continue to hold and we don't bother investing more in researching that issue again.

Diary Studies

Early in our mobile project, we conducted two separate diary studies to understand the range of activities that people perform on their phones. The first study involved 14 people from six different countries (Australia, Netherlands, Romania, Singapore, UK, and USA) who owned different types of phones—feature phones and smartphones, including touch-screen phones. For the second diary study, we collected data from 13 iPhone owners in the United States.

For the first diary study, we were less interested in specific usability problems; therefore, we recruited participants with relatively advanced technical skills and did not impose any of the typical occupational restrictions that are used when recruiting for traditional usability testing (for example, no IT-related occupations). For the second study, we recruited more average users who did not work in marketing or any IT-related fields.

The snippet technique was introduced by J. Brandt, N. Weiss, and S. Klemmer in txt 4 l8r: Lowering the burden for diary studies under mobile conditions *(CHI, 2007).*

Both diary studies used a variant of the snippet technique to make mobile logging as quick and nonintrusive as possible. Using Twitter, participants recorded every activity that they did on their mobile phone (except for talking or text messaging) for one to two weeks. Each time they used their mobile device, users tweeted a short message intended to remind them of the activity. At the end of the day, users went back to their tweets and elaborated on each of them by filling in a questionnaire that detailed the context of the corresponding mobile activity.

Twitter is a microblogging service that allows each user to post short messages; the messages are further broadcasted to all other Twitter users who opted to receive updates from that particular user (that is, to "follow" that user).

At the end of their participation in the diary study, we conducted a short phone interview with our users. In the second study, instead of the phone interview, participants came to the lab for a regular usability-testing session.

Usability Testing

Over the years, we carried out many mobile usability studies in the United States, but also in other countries (Australia, Hong Kong, Netherlands, Romania, and UK). All of these were traditional usability studies using the think-aloud methodology. Studies were conducted as one-on-one sessions with one test user at a time. (These were not focus groups.)

The purpose of these studies was to understand the typical usability issues that people encounter when using apps or the Web on a

Our first iPad study took place one month after the first-generation iPad came out, and our first Kindle Fire study took place two weeks after the Kindle Fire came out. There simply weren't enough users owning these devices at the time of those studies, so we had to resort to people who were users of the respective platforms (iOS and Android) but did not have a tablet device of their own.

variety of mobile phones—including feature phones and smartphones with and without touch screens.

For most of our usability-testing sessions, users brought their own phone or tablet to our lab for individual sessions that lasted between 60 and 90 minutes. (Exception: A few of the participants in our tablet studies used a tablet that we provided.) Each session involved the participant, a facilitator, and in some cases, one or two observers. The participants started by telling us how they normally used their device and showing us some of the apps that they had installed on their device. Next, we gave each participant tasks to complete; these tasks involved either the Web or mobile apps. Users commented on:

- What they were looking for or reading
- What they liked or did not like about the site
- What made it easy or difficult for them to accomplish the task

Some of the tasks were directed to specific websites or apps (for example, Use espn.go.com to find out if there are any NBA basketball games that you could watch tonight on the ESPN TV channel); others were open-ended (such as, Find where the word "dollar" comes from), requiring users to first choose one or more appropriate websites or apps before solving the problem with those sites or apps. For the directed tasks, users had to find and install the app on their phone, or in the case of websites, had to find a way to get to the site on their phone.

Table 1.1 provides examples of the tasks that users performed. The open-ended tasks let users decide what app or website they would use to complete the task. The directed tasks indicate the app or website that the users had to use.

Overall, 124 users participated in our phone usability testing sessions and another 35 users in our tablet sessions for a total of 159 users. All of them used their phone several times per week for activities other than texting or talking. We screened out for technical experts and people who worked in usability or marketing, because they were not the target users for the sites we tested and tend to exhibit atypical behaviors due to their expertise.

In most of our studies, the participants' interaction with the phone was recorded using a document camera. For a few studies we used a mobile device camera mounted on the phone. The document camera and the mobile device camera allowed the participants to hold the phone in their hands.

Table 1.1 Examples of Tasks Used in Our Usability Testing

Open-ended Tasks	Directed Tasks
Find the symptoms of swine flu and what you should do to avoid getting sick.	Use yelp.com to find reviews of the San Francisco restaurant Absinthe.
Check the local weather forecast for tonight.	You have $50 to spend on a piece of clothing for yourself. Use the JC Penney app to find something that you might like.
You want to get some dessert and a drink late after a movie. Find a place that serves good desserts and that is open after 10 p.m.	You want to buy some pasta, diced tomatoes, and ice cream. Use the Coles app to create a list that contains all those items.
Your friend wants to watch a movie on TV tonight after 8 p.m. Find a listing of tonight's TV program and identify a movie that she may want to watch.	Using the app AA Stocks, find the current stock value of China Mobile. How did the stock change during the past month?
Find a *Tom and Jerry* video cartoon.	Use the app Flipboard for the iPad to check the latest news. Set up the app to show the news topics that interest you.
It's 6 p.m. and you need to get from West Kensington to Tufnell Park. You decide to take the underground. Find out the best way to get there, changing as few lines as possible.	You want to take a photograph of the Golden Gate Bridge from the vista point. Use the app LightTrac to find the direction of the sun's rays tomorrow at noon.

Qualitative User Research

If you're an old-school marketing person, you probably won't find it very impressive that we tested 159 users in our mobile usability studies. (We tested additional users in our original research on WAP [Wireless Application Protocol] phones and in various other studies of primitive pre-iPhone mobile designs that we mainly won't discuss here.)

We're not trying to predict whether iPhone or Android will sell more units among the "Millennial" demographic next quarter. Equally, we're not trying to measure unaided recall of a particular brand name or even customer attitudes toward a brand.

We study behavior, not opinions. We study specific user interface designs and if users have a difficult time or an easy time accomplishing tasks with each design option. This type of research is best done in a qualitative manner, not by collecting statistics from large numbers of users.

As an analogy, consider the design of carpeting for a hospital corridor. If you observe a few elderly patients with walkers who trip over a bump in the carpet, you could reasonably conclude that *carpet bumps cause a usability problem for elderly patients* and recommend that the hospital installs smooth carpeting.

History Lesson: The Blue-green Book

In 1999, Jakob Nielsen wrote the first book about website usability: *Designing Web Usability: The Practice of Experience* (Peachpit Press). Because the cover was strikingly blue and green, many people remember this as the "blue-green book."

Designing Web Usability was based on about the same amount of usability testing as we have conducted for the present book: fewer than 200 users. This was more than enough to identify all the big issues in Web usability—people's reluctance to wait for slow downloads, their distaste for splash screens, their quick and somewhat superficial scanning of most of the content, and so forth.

Initially, some proponents of cool design were skeptical of the message in *Designing Web Usability*. But today it's safe to say that any company that tries to actually conduct business on the Internet has bought into most of the recommendations from this early book.

Even though one data point can't prove anything conclusively, it is reasonable to expect *Mobile Usability* (this book) to have the same fate as *Designing Web Usability* (the 1999 book). Initially, some designers may be hostile to findings that contradict their personal preferences, but in a few years the usability research will be accepted as common wisdom. By reading the book now, you have the option of being ahead of this curve and can start acting on the recommendations before everybody else does so, as a matter of course.

(*Designing Web Usability* was a great book for its time—if we do say so ourselves. But it was written in 1999, when the Internet was a more primitive beast. If you want to know the current recommendations on Web usability, we now prefer that you read our newer books *Prioritizing Web Usability* [Peachpit Press, 2006] and *Eyetracking Web Usability* [Peachpit Press, 2009], which are based on research with several thousand test users.)

You don't need to observe 1000 old folks meandering down the hallways and count how many of them trip. You also shouldn't wait until the hospital is sued because a poor old lady fell and broke her hip.

Statistics showing that, say, 13.2 percent of patients trip over the bump might look impressive on a slide show to convince management to invest in better carpets. And the malpractice suit would certainly concentrate the executive mind-set. But the recommendation to install safer carpeting could be made after an afternoon's observational research.

Once you've seen a problem in real life, you know it's there. You don't need to measure it.

In addition, we can estimate the magnitude of a problem with a much smaller number of users than what's needed to measure it precisely. Does it really matter whether 63 or 65 percent of users have difficulty with a certain design element? If a simpler study finds that "most" users have difficulty, that's enough to avoid that design.

As another example, let's say that a website is about to publish an article about the H5N1 influenza using the headline "Burd Flu Outbreak in Hong Kong." The copy editor will hopefully flag "Burd" as a typo and suggest "Bird" as the correct spelling. Even if you had only one person review the draft copy, that's enough to identify the error and the fix. You don't need to poll 1000 editors to see how many of them agree that "bird" is spelled with an "i" instead of a "u."

Admittedly, some usability problems are so subtle that it's not enough to see them once. But observing 159 people across four continents is more than enough to understand any big issues. In this book we have only enough page count to discuss issues that are so important that our amount of qualitative research is more than sufficient to nail down what constitutes good or bad design.

We are not researching minor design issues that might make a one percent difference to the business value of a mobile site or app. We hunt big game, so we pack our elephant gun.

Obviously, for large companies, one percent can mean hundreds of thousands of dollars, so they should invest in more detailed research to resolve the small usability issues in their design. However, even the largest company is well advised to start its mobile usability research with smaller, qualitative studies, which will no doubt quickly find several major usability problems that should be addressed before moving on to any fine-tuning of the user interface.

Two final points for anybody who still questions qualitative user research:

- Empirical evidence from countless projects over the last 23 years shows that testing with a handful of users is sufficient to identify the majority of important usability problems in a design. Not everything will be represented, but the big findings will be there. For the purposes of this book, we don't need to know every last usability issue for any of the individual sites and apps we tested. It's more important to learn the big picture from comparing the main findings across designs to identify the general usability guidelines that everybody should know.
- Ask yourself how our 159 study participants compare with the number of actual customers you have personally observed performing test tasks in one-on-one settings. In most companies, our number will be bigger than your number. Thus, the lessons from our research will magnify the amount of empirical insights available to most design teams.

2 Mobile Strategy

Running our first mobile usability studies with modern phones in 2009 was a cringe-worthy experience for users and researchers. In terms of the user experience (UX) quality we observed, it was like stepping into a time machine for a quick trip back to 1998. The similarities between the mobile user experience in 2009 and regular desktop use of the Web in 1998 were numerous: