# Touch gestures in mobile web browsers

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**Abstract**

The Web evolves very fast, day by day. With current technologies, it is possible to create web applications which look and feel comes close to those of native apps. The same applies to the implementation of touch gestures in mobile web browsers, even if that possibility is not as often used as in native smartphone applications. This paper deals with the use of such gestures in the web browser of smartphones.

A focus group discussion was conducted to find the basic attitude of users toward touch gestures. Afterwards study-participant-tests were carried out on the basis of those findings, which verify the use of gestures in different scenarios. For those study-participant-tests a prototypal web application has been developed in which users can solve different tasks, both with and without gestures. The tests show that users learned various gestures from native apps, but are not automatically applying them in the browser. However if the existence of concrete gestures are pointed out to users, they do apply them.

## 1 Introduction

Thanks to the rapid evolution of web technologies in the field of mobile devices, it is now possible to create mobile-optimized web applications with a look & feel that is very close to those of native apps. Among other things, it is also possible to implement touch gestures in web applications. However, that possibility has been used rarely. This paper examines how common touch gestures of smartphone apps are recognized and used by users in their mobile web browsers. A “multi touch gesture” is defined in (Ingram et al., 2012) as follows: "the physical motion of the users' hands and fingers as they interact with the multi touch surface."

Well known gestures are for example pinch-to-zoom (zoom on a map with two fingers), the swipe through a photo gallery, or the interaction with list items through gestures as it is known from various native smartphone apps. These gestures are also recommended in the human interaction guidelines for Android (Android, n.d.) and iOS (Apple, n.d). There is a considerable amount of research about such gestures.

Bragdon et al. (Bragdon et al., 2011) deal with the influence of environmental actions (situational impairments) on the operation of smartphones with touch gestures. Their work shows that gestures on mobile devices offer an increased accuracy compared to normal click-based interaction.

The work of Warr & Chi (Warr & Chi, 2013) investigates the touch gestures “swipe” and “scroll” to switch between different web sites in mobile browsers. Their results suggest to use vertical scrolling to switch between pages. While those gestures happen in the browser, they are actually native behaviour, so they do not fall into the same category as the gestures this paper covers.

Azis et al. (Azis et al., 2013) conducted studies with children at different ages. Their goal was to analyse the use of gestures on smartphones and tablets with this target group. They show that children in the age of 2 years are already able to use gestures such as drag and slide.

Fong-Gong Wu & Kuo (Wu & Kuo, 2013) researched basic usage patterns of touch gestures on mobile phones but not in a browser setting.

Benjamin Poppinga et al. (Poppinga et al., 2014) and Miguel A. Nacenta et al. (Nacenta et al., 2013) explore the memorability of self-defined touch gestures to launch apps on a smartphone. However, such a scenario is nearly impossible to implement with current technology especially in mobile web browsers.

The focus of this paper is on the exploration of those gestures in the context of web browsers on smartphones in contrast to the (more common) usage in native smartphone applications: a topic for which there has been little research.

The goal of this paper is to find out whether users already know such gestures in the context of mobile web browsers and if they would apply them correctly. The established hypothesis is:

*"Users use touch gestures in mobile web browsers only if they are advised on their existence."*

## 2 Method

Two methods were used: focus group discussions and tests with study participants.

### 2.1 Focus group discussions

To empirically investigate the hypothesis, two focus groups with three people of the target group were conducted in the familiar environment of the users to determine general trends in this area. The target group for those focus groups were people between 14 and 50 years who own a smartphone and also regularly use it. As a result, the fundamental validity of the hypothesis should be verified. The term “touch gestures” as well as the concrete usage have been discussed with the participants. Finally we observed the interactions of the participants using already established native apps like Facebook or Gmail.

### 2.2 Study-participant-tests

The testing of study participants was conducted after the focus group. For this test, a functional prototype was created, which offered easy opportunities for interaction through gestures. The prototype consists of three sections:

- A todo list, in which entries can be deleted or marked as completed (see figure 1). Usable gestures: Swipe right on list elements to delete them, swipe left on list elements to show additional options
- A map, in which zooming and panning is possible. Usable gestures: pinch to zoom, panning
- A gallery, in which switching from image to image is possible. Usable gestures: swiping between images

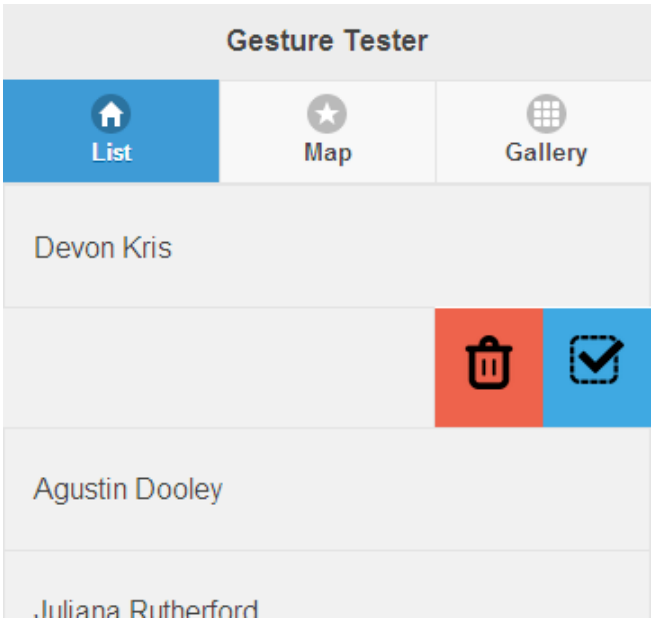


*Figure 1: Screenshot of the prototype, list view*

For these tests, participants were selected who have not participated in the previous focus group discussions. Three scenarios were built and tested with five people. The scenarios were:

1. Participants receive no indication of touch gestures.
2. It is pointed out to participants that gestures are available.
3. Participants were handed a picture with all gestures supported by the prototype.

Each participant joined only one scenario. The same four tasks were assigned in each scenario:

4. Delete the second list item
5. Mark the first four list items as done and refresh the list
6. Go to the gallery and search for the cat image
7. Go to the map and find the name of the marked city

Thus, the performance between the various scenarios could be compared. The tasks were designed in a way that it was always possible to solve them without touch gestures. The target group for those tests was the same as for the focus groups: regular smartphone users with an age between 14 and 50 years. A total of 15 participants aged between 14 and 48 years were tested.

Results from task 3 and 4 serve mostly as comparative values: expectations were that most users know those touch gestures as they are already well established. In contrast the gestures to interact with the list items are more specific and can provide better insight into user behavior.

# 3 Results

## 3.3 Focus group discussion

Each of the participants has at least the second smartphone and about 4 years experience with the operation of such touch based phones.

In the focus group, mainly the following activities and apps are in use: phone calls, sending SMS, surfing the internet, retrieving emails (GMail), watching movies, photographing, Dropbox, EverNote, YouTube, Facebook, and WhatsApp.

Five of the six participants (p1, p2, p3, p4, p5 - see table 1 for details) know touch gestures in general. However they did not mention any gestures in the mobile web browser but only the general device-specific touch gestures outside of apps like “right swipe” to switch between the individual screens on the smartphone.

The gesture that provides the user with phone settings and notifications when swiping down the status bar has also been mentioned - all of the focus group participants had Android-based smartphones, were this is a very common gesture.

| | Gender | Age | Occupation | Smartphone | Smartphone experience since |
|---|---|---|---|---|---|
| p1 | f | 15 | student | HTC Desire 500 | 3 years |
| p2 | m | 17 | apprentice | HTC One SV | 4 years |
| p3 | f | 24 | kindergartener | Samsung Galaxy S3 | 4 years |
| p4 | m | 30 | electrical engineer | Nexus 5 | 3,5 years |
| p5 | m | 30 | electrical engineering technician | Nexus 5 | 3 years |
| p6 | m | 50 | qualified male nurse | Wiko Darknight | 3 years |

*Table 1: focus group participants*

Those five participants used touch gestures in apps like Gmail, Facebook, YouTube or ES-Data Explorer. However, most of the time that happens unconsciously (as of p1). Just one of the participants (p2) was aware that they had been using gestures in apps.

Most of the participants that used touch gestures encountered the functions by trial and error or out of experience. Only one person (p2) has already read info-screens and thereby learned how to use the app. Participant 2 also mentioned that some apps don’t have an info-screen but that they learn new gestures through past experiences.

All six people could imagine to use gestures on the Web, because they find it convenient. However they could not name any concrete gestures.

The findings of the focus group discussion were consistent with our expectations. The users seem familiar with gestures in general, but apply them rather instinctively and only where they seem to expect them. Thus our initial hypothesis was fundamentally confirmed.

## 3.4 Study-participant-tests

The study-participant-test revealed that users use gestures only when it is explicitly pointed out which gestures exist and how they can apply them. Thus the hypothesis has been falsified because the mere hint to their existence was insufficient to significantly increase the use of gestures.

Although there were differences between the scenarios but not in the presumed scale. The following tables 2, 3 and 4 show that there were hardly any differences between scenario 1 and scenario 2.

In scenario 2 all of the participants confirmed that the advice to touch gestures has been noticed. However no participant asked what they could do with the gestures, although observation has shown gestures weren't entirely clear to them.

Participants have generally rather understood the term touch gestures as "wiping" or "sliding". They also referred to basic touching and the long tap as gestures.

Open-ended questions show it was clear to all participants that they could use touch gestures, although most of them used only a single one.

There are two explanations:

- Participants refer differently to the term "touch gesture" or don't even know what it means.
- There was always an alternative way to complete a task without the use of gestures (for example by tapping on the detail view).

However in scenario 3, where a visual tutorial was shown at the beginning, participants used a lot more touch gestures. Although they did not perform the correct gesture on the first try, they took a lot more time to experiment and find more gestures than in scenario 1 or 2.

The participants concentrated much more on touch gestures and interactions in this scenario, yet sometimes wrong gestures were used. They also stated that they find all the interaction concepts positive and convenient, if they know how they work. Thus it is not only important to demonstrate the existing possibilities to the users, but also to consider which moment is right to learn the correct gesture.

With a large amount of interaction possibilities not everything should appear at once. The right concepts should be provided at the right time so users are not overwhelmed.

Tables 2, 3 and 4 show detailed results of the study.

## 3.5 Comparison of the scenarios

| Gender | Smartphone | Age | Occupation | A1 | A2 | A3 | A4 |
|---|---|---|---|---|---|---|---|
| m | iPhone 4S | 31 | fotographer | - | - | - | - |
| m | Sony Xperia Z | 23 | student | - | - | - | Pinch to Zoom |
| m | Nexus 5 | 20 | student | - | help required: Pull-to-Refresh | - | Pinch to Zoom |
| f | Samsung | 22 | student | - | - | - | Pinch to Zoom |
| m | Samsung Galaxy SII | 20 | student | - | - | - | Pinch to Zoom |

*Table 2: overview scenario 1*

| Gender | Smartphone | Age | Occupation | A1 | A2 | A3 | A4 |
|---|---|---|---|---|---|---|---|
| f | Moto G | 24 | trainer | Swipe to delete | - | Click & Swipe | - |
| m | Samsung Galaxy SII | 47 | entrepreneurial | - | - | - | Pinch to Zoom |
| f | Samsung Galaxy SIII | 22 | office administra-tor | - | Pull-to-Refresh | - | - |
| m | iPhone 5s | 27 | sales representative | - | Pull-to-Refresh | Swipe | Pinch to Zoom |
| f | LG | 48 | sales woman | - | - | - | Pinch to Zoom |

*Table 3: overview scenario 2*

| Gender | Smartphone | Age | Occupation | A1 | A2 | A3 | A4 |
|---|---|---|---|---|---|---|---|
| m | iPhone 5s | 21 | student | Swipe Left for Details | Swipe Left for Details, Pull-to-Refresh | - | Pinch to Zoom |
| m | iPhone 5 | 17 | student | Swipe Left for Details | Pull-to-Refresh | - | Pinch to Zoom |
| f | Samsung SIII mini | 20 | student | Swipe Right to Delete | Pull-to-Refresh | - help re-quired: Swipe | Pinch to Zoom |
| f | Samsung SIII mini | 14 | student | Swipe Left for Details, danach Swipe Right to Delete | Pull-to-Refresh | - | Pinch to Zoom |
| w | Samsung SIII mini | 14 | student | Swipe Right to Delete | after trying all swipe directions: Pull-to-Refresh | Swipe | Pinch to Zoom |

*Table 4: overview scenario 3*

### 3.6 Demonstration of the interaction concepts

After completing all tasks, all possible interactions of the three scenarios have been shown to the participants (if not already performed). Sometimes small clues were sufficient for them to perform the correct gesture, which also surprised them as they did not expect them to really work. Especially younger participants had less problems in trying out gestures. The users explained later on if and where they have already learned of the interaction concepts and were always positively surprised that certain gestures really work. Applications that were mentioned most were: Facebook, Gmail, Google Maps and the iOS mail app. There were no significant differences between all three scenarios.

## 4 Discussion

While there are gestures like pinch-to-zoom that can be referred to as "commoditized", this is not true for all of them. Figure 2 shows which gestures were used instantly and which were known to the users after further questioning.

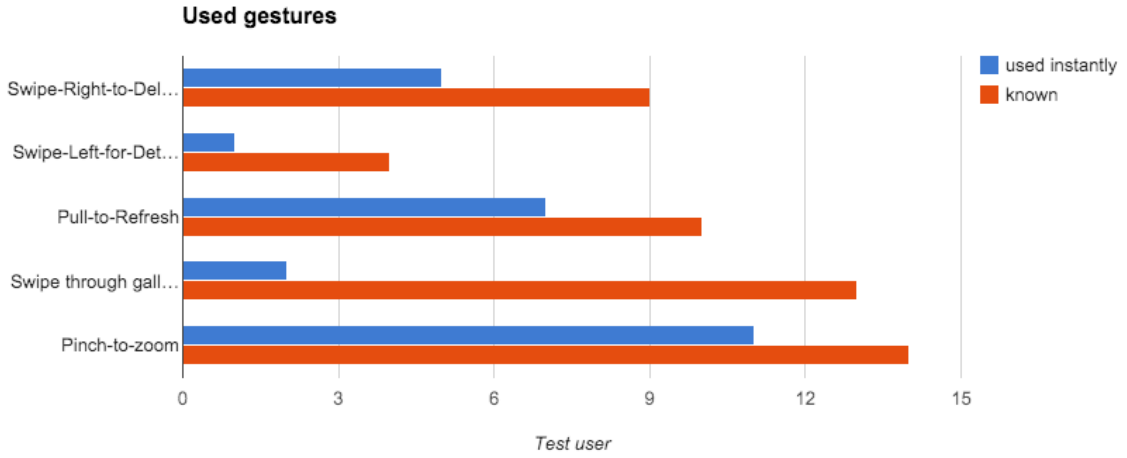


*Figure 2: Used gestures in the participation study-participation-tests*

Gestures that are not yet well established should be explained to users very thoroughly. Thus the final result of this paper's thesis is:

*"Users only apply touch gestures in mobile web browsers, if their existence is sufficiently pointed out to them."*

In general, our open discussions showed that users have a basic acceptance for touch gestures in web apps. Therefore, their use in today's web apps can already be recommended - but only if fallback solutions are present, because at the moment it cannot be safely assumed that all users will know how to use them.

What techniques are required to sufficiently and effectively explain touch gestures has to be researched in a future survey. However there are already various approaches like introducing users to gestures by showing a tutorial at app launch or by showing tooltips like in the examples in figure 3.

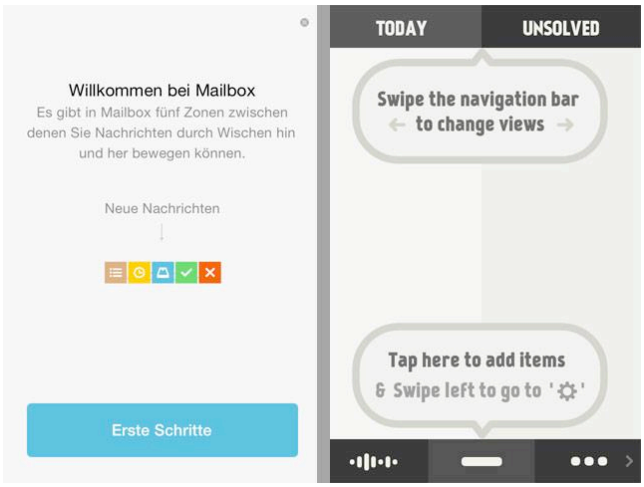


*Figure 3: Existing native implementations for tutorials (left, Mailbox) and tooltips (right, Dooo)*

The result of our study-participant-test suggests that there are major differences in usage between differently aged users or users with distinct smartphone operating systems (iOS / Android / Windows Phone). To explore these differences in more detail, a further study with a larger participant basis and a more distributed smartphone operating system usage should be conducted.

Such factors offer a large scope for further research.

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