

Adrianna Baran

Handheld? Handhelp!

Reaching the tops of our screens is becoming more difficult. What can we do?



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Since the release of the original 3.5 inch display iPhone in 2007, Apple iPhone screens have become increasingly larger. There are newer models that are almost double that of the original, such as the iPhone 13 pro max with a 6.7 inch screen (see figure 2, 3 & 4). Larger screens, however, aren't necessarily convenient for every user, and as devices continue to grow and our hands do not, these so called "handheld" mobile devices are becoming increasingly difficult to hold and interact with, especially when trying to navigate or type with one hand. So, how is Apple accommodating to different types of users, and how can individuals decide which phone dimensions best suit their needs?

Mobile phones' role has evolved from simply making phone calls to performing other activities, such as internet browsing, social networking, gaming, navigating, listening to music, and watching movies (Saaksjarvi et al., 2014). Kim et al. (2011, as cited in Raptis et al., 2013) suggests

that a device with a screen larger than 4.3in. will increase efficiency for those who mainly perform information seeking tasks on their device, such as Internet browsing. Screens of this size will also lead to higher enjoyment for users that want to mainly use their device to play games or watch media. Increase in screen-size may result in better fidelity of moving images, viewing quality, and comfort, but it also implies lesser mobility, especially during single handed use (Kim et al., 2011). Karlson et al. (2006) confirmed that one-handed operation was preferred over two-handed operation. If larger screen sizes remove their mobility convenience, can they still be considered "mobile" phones?

People have a 'natural' zone, 'reach' zone and 'unreachable' zone that is predetermined by the length of their thumb (Woollaston, 2015) (see figure 1). Larger devices have more areas that are out of reach and this reachability degrades with increasing device size

(Karlson et al., 2006). Consequently, performance is impacted by increases in input time and touch error (see figure 5 & 6).

What can customers do?

Different sizes are better suited to different people and to different use cases. To ensure maximum comfort, handling, efficiency and overall user satisfaction, customers should stop purchasing what is trending and start considering their aims of use and what their thumbs can reach. "When we buy gloves, we usually try them on to see if they'll fit our hands, but this basic step seems to be missing from the process of choosing a smartphone, where we tend to focus on the 'wow factor,' " says Ira Janowitz, an ergonomics consultant (n.d., as cited in Fowler, G., 2014).

Apple's role in this

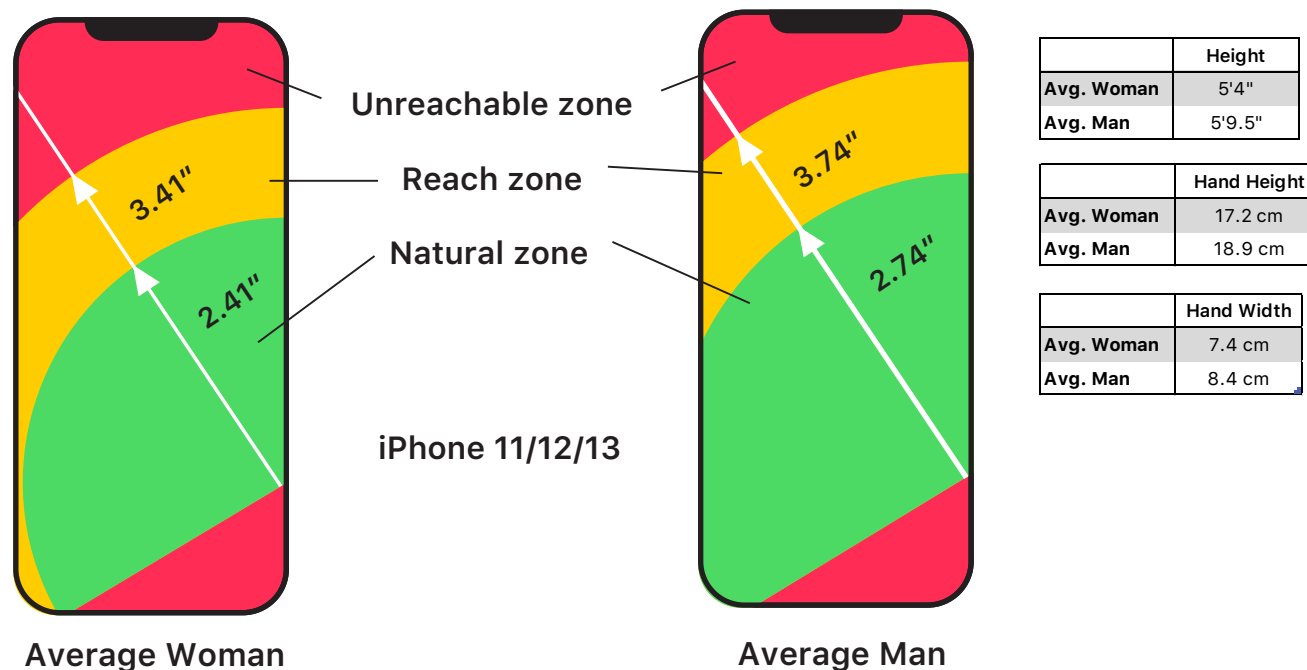
Apple's developments have and will continue to directly influence the way

in which we use our phones daily. They have the responsibility to design with a user first approach. It's promising to see that they have launched various size options as part of the iPhone 12 and iPhone 13 ranges. This includes a larger 'max' version and smaller 'mini' version

alongside the classic sized model (see figure 2, 3 & 4). They should continue this path to accommodate to different types of users, giving them control over the desired use of their device. Apple has also put focus into support for single handed use by focusing touch targets away from

the far corners and towards the middle and along the right side of the phones where touch error is lowest (Larsen et al., 2019). New increases in screen size are often fortunately followed by new features that assist with usability (For examples, see figure 7).

Fig. 1 Reachable Areas on our Phones



	Height
Avg. Woman	5'4"
Avg. Man	5'9.5"

	Hand Height
Avg. Woman	17.2 cm
Avg. Man	18.9 cm

	Hand Width
Avg. Woman	7.4 cm
Avg. Man	8.4 cm

Since hand size and thumb length will differ by individual, designs should strive to support a range of users (Karlson, A et al., 2006) and users should evaluate their options whilst keeping hand and smartphone anthropometric measurements in mind. If the physical design of a smartphone doesn't complement the characteristics of the hand and users' aims, this can significantly reduce user satisfaction and operating performance.

References:

Karlson, AK., Bederson, BB., & Contreras-Vidal, J. (2006, January). Understanding single-handed mobile device interaction. <https://www.cs.umd.edu/hcil/trs/2006-02/2006-02.pdf>
 Larsen, JN., Jacobsen, TH., Boring, S., Bergstrom-Lehtovirta, J., & Pohl, H. (2019, October). The influence of hand size on touch accuracy. Proceedings of the 21st international conference on human-computer interaction with mobile devices and services (pp. 1-11). <https://doi.org/10.1145/3338286.3340115>

Woollaston, V. (2015, January 9). Which smartphone best fits your hand? Graphic reveals which device matches your 'thumb zone'. Daily Mail Australia. <https://www.dailymail.co.uk/sciencetech/article-2903179/Which-smartphone-best-fits-hand-Graphic-reveals-device-matches-thumbzone.html>

iPhone Screen Size Increase

Fig. 2 Comparison of iPhone Screen Sizes

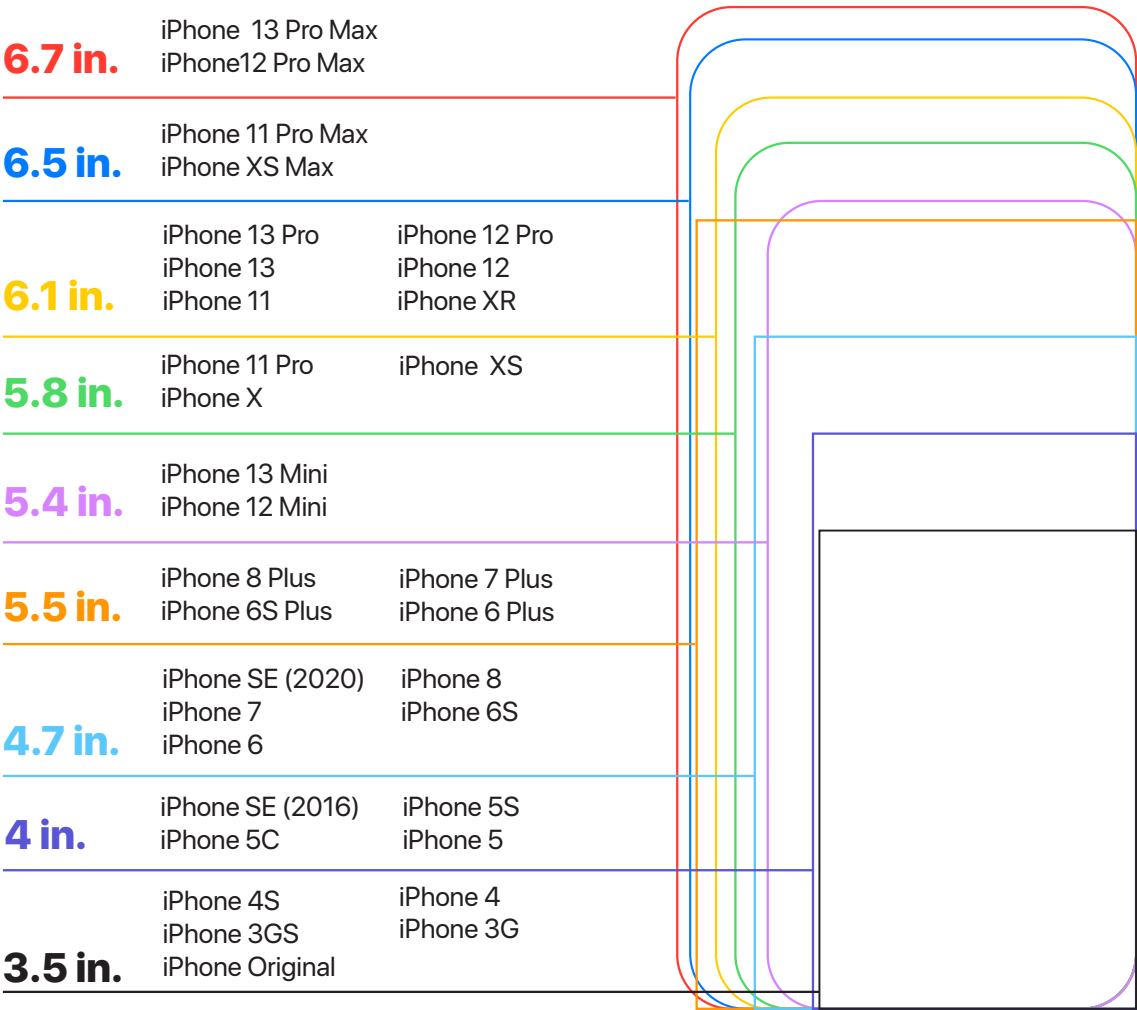


Fig. 3 iPhone Screen Sizes (2007 - 2021)

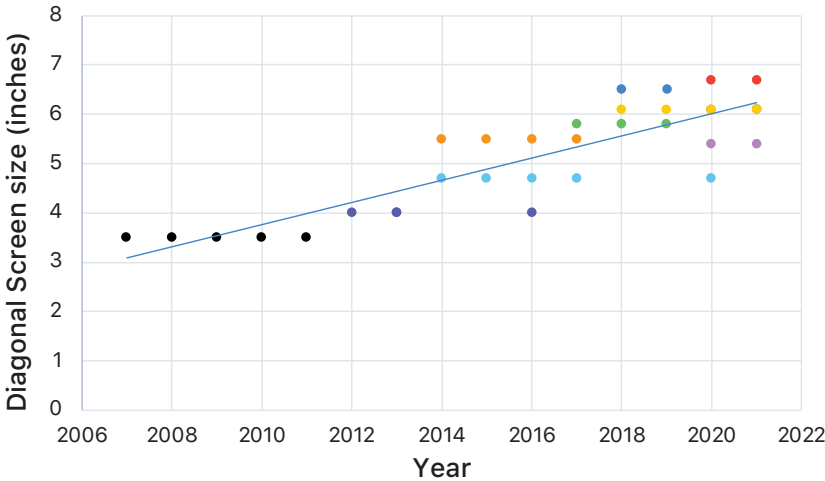


Fig. 4 Screen Size Conversions and Dimensions

Diagonal (in.)	6.7	6.5	6.1	5.8	5.4
Width (cm)	7.1	6.9	6.5	6.2	5.7
Height (cm)	15.5	15	14.1	13.4	12.5

Diagonal (in.)	5.5	4.7	4	3.5
Width (cm)	6.8	5.9	5	4.9
Height (cm)	12.2	10.4	8.9	7.4

Operation Time and Touch Error

Fig. 5 Operation Time by Screen Size and Handlength

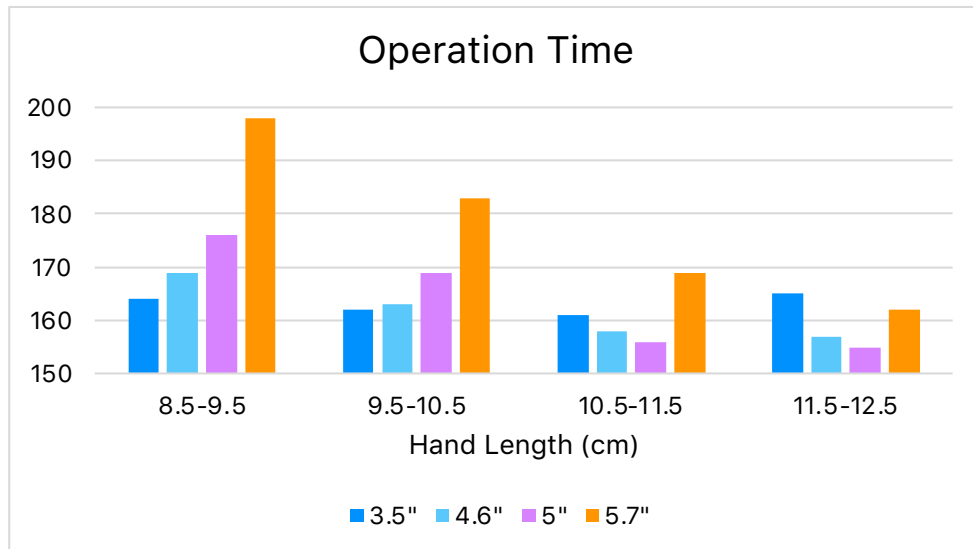
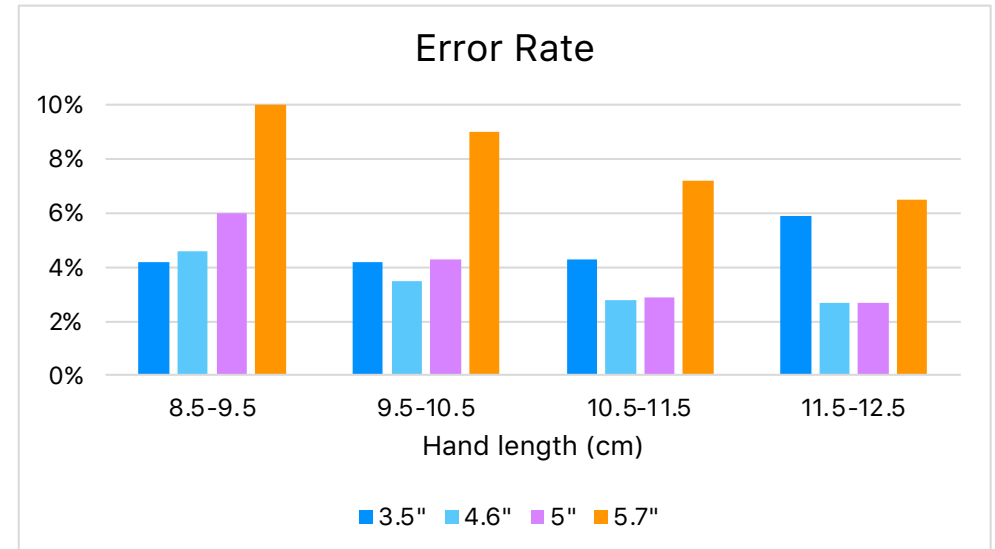
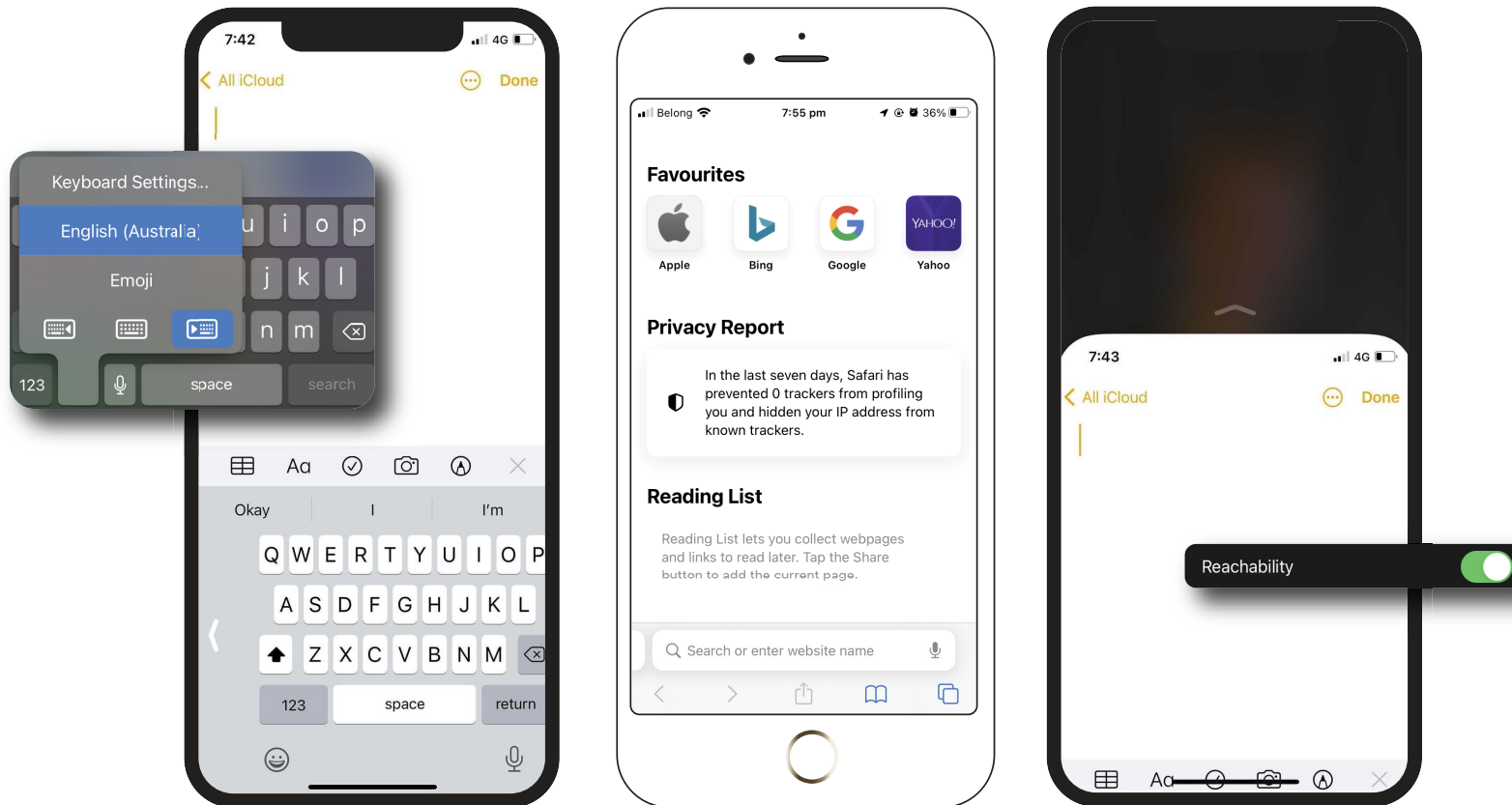


Fig. 6 Error Rate by Screen Size and Handlength



Features and Settings to Assist with Usability

Fig. 7 Features to Assist with Usability



Holding down the emoji icon on the keyboard shifts the keys to either the left or right for a one-handed keyboard.

Other

Swiping motions that allow for different actions to be made when specific targets are hard to reach e.g. pull-to-dismiss, swipe to go back, pull to search from home screen

The search bar in Safari has moved to the bottom of the screen.

Reachability setting brings the top half of the screen nearer to the bottom.

Settings > Accessibility > Touch, then turn on Reachability.

Swipe down on the bottom edge of the screen. Or swipe up and down quickly from the bottom edge of the screen.

(Older models) Double tap the touch ID scanner.