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User Experience Research & Design

Smartphone Text Entry Methods Compared: Which is Best?

White Paper

March 30, 2011

Abstract

The mobile device and application market has grown rapidly over the last few years, allowing users to stay in touch and work with data more effectively on the go. Text entry methods vary significantly across devices, raising an important question: Which input methods actually work well for entering text? Is a physical keyboard still necessary for professional text entry, or are touchscreen interfaces just as accurate and efficient? Little research on these questions is publicly available, leaving developers of mobile technology to make user interface decisions based on guesswork and opinion.

This white paper discusses an exploratory study that Blink Interactive conducted to address these questions and stimulate thinking about and perhaps even innovation in entering text on mobile devices.

Problem

Smartphones are becoming must-have tools for information workers who need to communicate and stay informed on the go. Nielsen reports[1] that by the end of 2011, smartphones will take the place of feature phones in most Americans' pockets due to decreasing hardware costs and increasing feature offerings. Mobile device usage is also expected to expand rapidly beyond voice communication, with more information workers managing increasingly complex communication, calendaring and data-entry tasks on their smartphones.

Dozens of new smartphone models are introduced in the market each year, and each generation of the devices gets ever closer to providing a rich computing experience. The iPhone® mobile digital device and BlackBerry® smartphones have maintained a substantial market share for the last few years, while the Android™ mobile operating system is taking shape as a strong competitor. The leading smartphones featuring these operating systems offer full QWERTY keyboards through a touchscreen, physical keyboard or both. Understanding consumer needs and personal preferences enables mobile technology developers to optimize text entry methods for their devices and operating system platform and guide future investments.

Despite the booming popularity of touchscreen and physical QWERTY keyboards, there are few published studies or established best practices to help mobile technology developers decide which methods to pursue. Instead, the industry has relied primarily on internal market and device research and consumer purchasing trends to guide their decisions. This is problematic because of the strong divide in opinions among smartphone users. For example, some believe that only a physical keyboard provides the visual and haptic feedback necessary to type accurately and quickly, while others believe a well-designed touchscreen works just as well and is less physically bulky than a physical keyboard.

In this study, Blink explored the usability of text entry methods for several popular devices. We were curious to find out whether one method enabled users to type faster and more accurately, regardless of their stated preferences or experience level. We also wanted to identify specific design elements of mobile text input interfaces that supported or hindered text entry tasks.

Our study focused on exploring:

- Which text entry method provides the fastest and most accurate text entry?
- Which text entry method receives the highest satisfaction and ease of use ratings?
- How do first-time experiences compare across text entry methods?
- What aspects of text entry user interfaces do smartphone users particularly like or dislike?
- What can be done to make text entry more accurate and less aggravating?

[1] Smartphones to Overtake Feature Phones in US by 2011: http://blog.nielsen.com/nielsenwire/consumer/smartphones-to-overtake-feature-phones-in-u-s-by-2011/

Approach

To better understand user performance and satisfaction with different mobile text entry methods, we conducted interviews with 18 iPhone and BlackBerry users in the Seattle area. All participants were information workers who used their smartphones on a daily basis for typing tasks such as writing email and text messages, taking notes, or editing documents. All participants owned their current smartphones for at least six months and were very comfortable using them.

During the interviews, participants were asked to use four mobile text entry interfaces to type messages - the iPhone touchscreen keyboard, HTC EVO™ touchscreen keyboard with an Android operating system, and as shown in Figure 1, the BlackBerry® Bold™ physical keyboard and the ShapeWriter™ touchscreen keyboard for the iPhone. We selected the iPhone, BlackBerry and HTC EVO as our test devices because they were among the top-selling smartphones at the time of the study. We also included ShapeWriter due to its unique text entry method using a single stroke to connect letters into a word, which we wanted to compare against the more traditional text entry methods of the iPhone, BlackBerry and Android operating systems.

Figure 1. The BlackBerry Bold physical keyboard (left) and the ShapeWriter touchscreen keyboard (right).

We compared participants' performance and ratings across all methods to determine if one method resulted in faster text entry, fewer errors or higher subjective ratings than the others. We also looked at performance and ratings collected on text entry methods unfamiliar to participants (for example, how iPhone users did with the BlackBerry, HTC EVO and ShapeWriter methods) to see if one fared better than the others with first use. Finally, we considered the trends and themes in the verbal feedback given about each method.

The focus of the interviews was to capture participants' performance and satisfaction across each interface that we tested. For each of the four text entry methods, participants were given three different text samples of the same length with the same number of punctuation marks, numbers, and special characters to enter while holding the device in the portrait orientation. In our evaluation, we considered performance and satisfaction in a few key ways:

- **During text entry tasks.** We timed how long it took participants to type each message and counted the number of typing errors that occurred using each entry method.
- **After using each text entry method.** We asked participants to rate the overall ease of use and their satisfaction with the method using a four-point Likert scale. Participants also discussed what they liked and disliked about the method.
- **At the end of the interview.** Participants ranked each method from most to least favorite.

Insights

Participants generally were fastest, had the highest levels of accuracy and gave the highest ratings to the method with which they were most familiar. Even when participants did not perform as well on their most familiar method, they still consistently rated satisfaction higher for this method than for other methods.

None of the text entry methods stood out as the most accurate, fastest, or most satisfying to use when participants did not have prior experience with them. We found that were equally well (or equally poorly) across all novel methods and gave similar satisfaction ratings to the novel methods. In other words, none of the methods offered user interface advantages that seemed to make them easier or more satisfying with first use.

Speed of Text Entry

Participants completed the text entry exercises fastest when using the entry method with which they were most familiar, as shown in Figure 2. This may be due, in part, to motor learning, a form of procedural memory created over time by practiced, repetitive actions. In other words, participants already knew where to find a majority of the letters, numbers and punctuation they needed when using a familiar interface, allowing for faster typing. When typing on less-familiar interfaces, however, they spent more time looking for the keys they needed. Caps lock, punctuation and symbols were especially time-consuming to find because they were located in different places of each entry method.

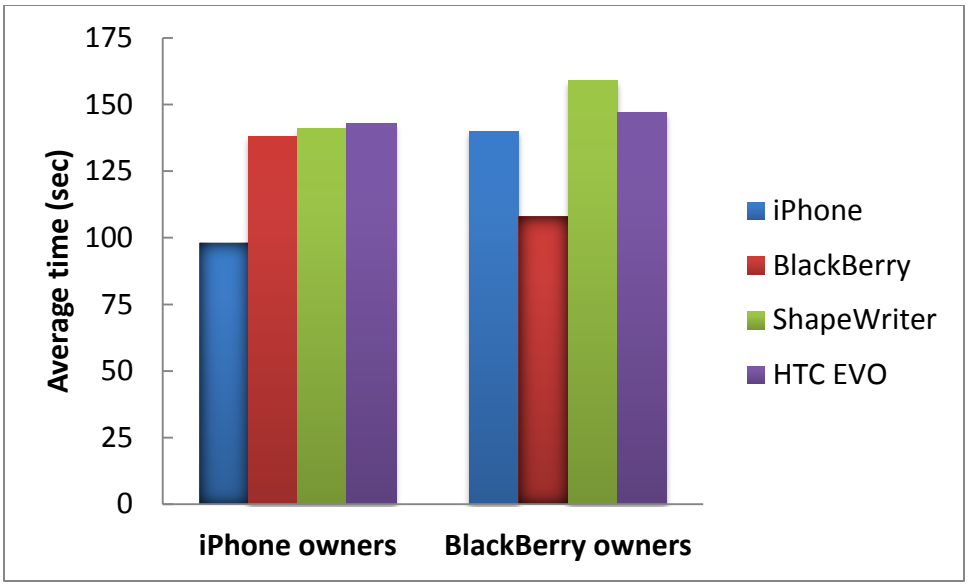

Figure 2. Average text entry time for each method for iPhone and BlackBerry owners. Text entry time for owners on their native device is highlighted.

For the three less-familiar methods, text entry speed was roughly the same for both iPhone and BlackBerry users. Specifically, iPhone touchscreen users typed at a similar speed when using the BlackBerry, ShapeWriter and HTC EVO interfaces for the first time. Similarly, BlackBerry physical keyboard users typed at a similar speed across the iPhone, ShapeWriter and HTC EVO interfaces.

Accuracy of Text Entry

Participants were most accurate (that is, they typed with the least number of errors) when using the iPhone and BlackBerry text entry methods, regardless of their prior experience with either method. This finding suggests that neither physical keyboard nor touchscreen use is necessarily linked with more accurate typing.

Interestingly, we also found that iPhone users, on average, made more errors when using the HTC EVO touchscreen keyboard whereas BlackBerry users made more errors using the ShapeWriter (see Figure 3). While we do not know exactly why this occurred, one possibility is that a very similar touch interface (HTC EVO) that differs subtly from a familiar device can lead to more errors, a least for iPhone users. On the other hand, the larger differences between *tapping* and *swiping* letters (ShapeWriter) may be sufficiently large for BlackBerry physical keyboard users to introduce errors when using ShapeWriter.

These findings suggest that small differences may impact performance just as large ones do, but that there is a broad range of text entry methods that users are able to embrace without substantially sacrificing performance.

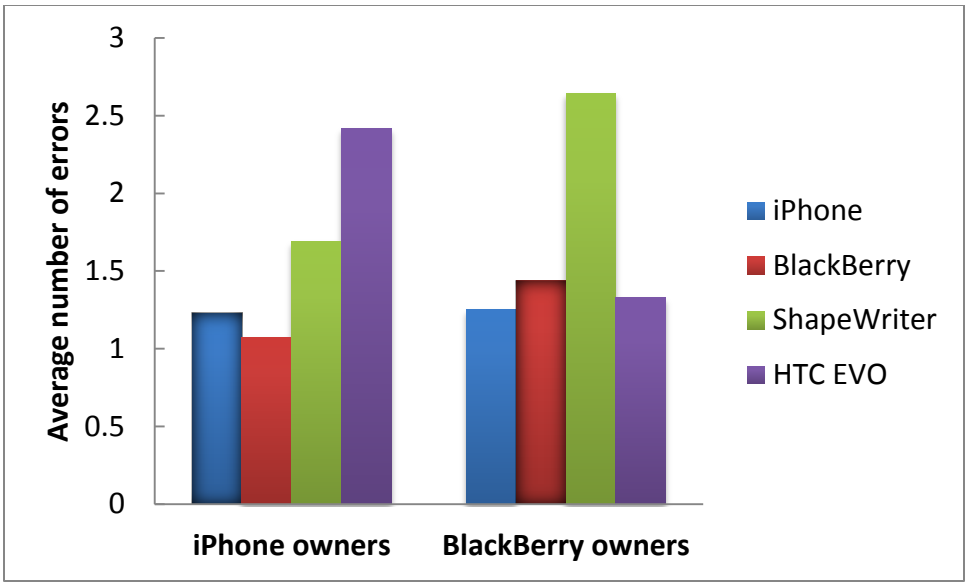

Figure 3. Average number text entry errors for each method for iPhone and BlackBerry owners. Text entry errors for owners on their native device are highlighted.

Ease of Use and Satisfaction Ratings

Perhaps not surprisingly, study participants gave the highest ease of use (see Figure 4) and satisfaction (see Figure 5) ratings to the method with which they were most familiar. Individual participants' ease of use and satisfaction ratings for any single device tended to be the same or very similar, indicating a possible relationship or correlation between these two measures.

Participants also gave similar ratings to all non-familiar methods. These ratings suggest that all novel methods were slightly difficult to use initially and that participants were somewhat dissatisfied with their first experiences with them.

It is likely that participants gave higher ratings to familiar methods because the familiarity of the method made them feel more comfortable and in control. In contrast, less familiar methods were deemed more difficult and dissatisfying because participants did not always know how to use them. For example, one of the most common complaints about the novel methods was that participants did not know where to find necessary keys (such as caps lock or symbols) due to differences in keyboard design across methods.

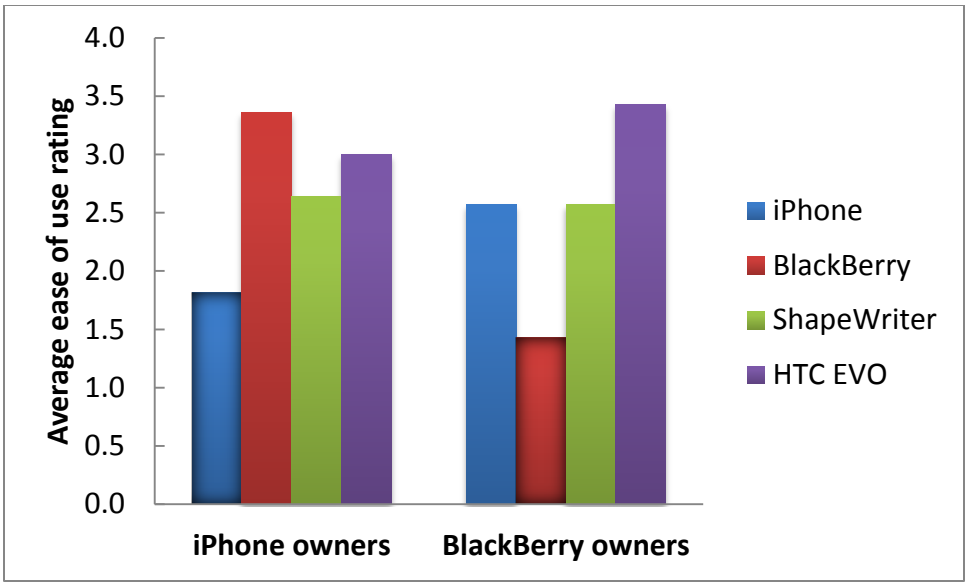

Figure 4. Average ease of use ratings (1 = very easy and 4 = very difficult) for each text entry method for iPhone and BlackBerry owners. Ease of use rating for owners on their native device is highlighted.

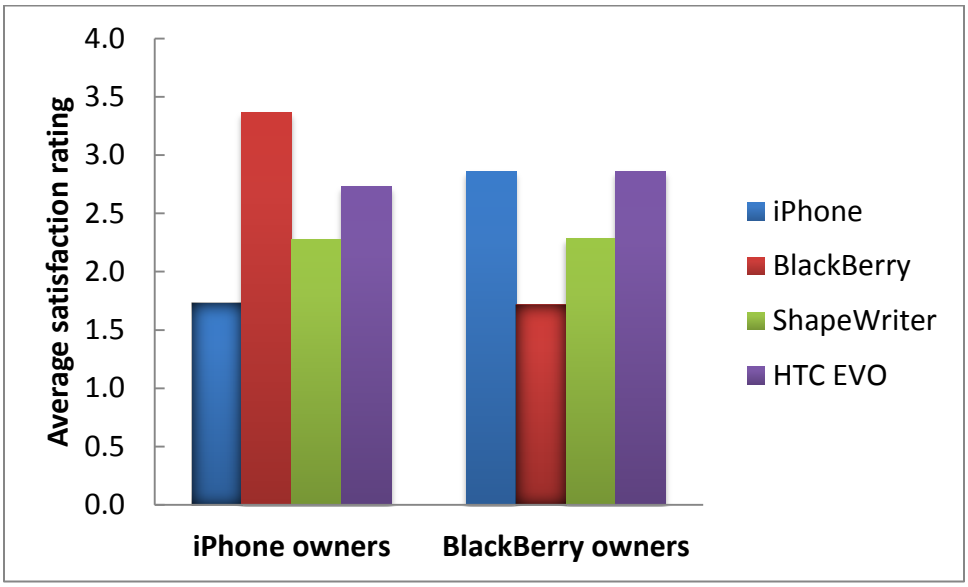

Figure 5. Average satisfaction ratings (1 = very satisfied and 4 = very dissatisfied) for each text entry method for iPhone and BlackBerry owners. Satisfaction rating for owners on their native device is highlighted.

Preference Ratings

As shown in Figure 6, when asked to state their favorite text entry method, participants tended to choose the one with which they were most familiar. ShapeWriter was the second favorite, especially for BlackBerry users. When asked about this choice, participants said they were interested in using it more because it seemed "fun" even though it was slower to use and led to a higher typing error rate. Participants who rated this method favorably thought they could become more proficient (as indicated by speed and accuracy) over time if they continued practicing using it.

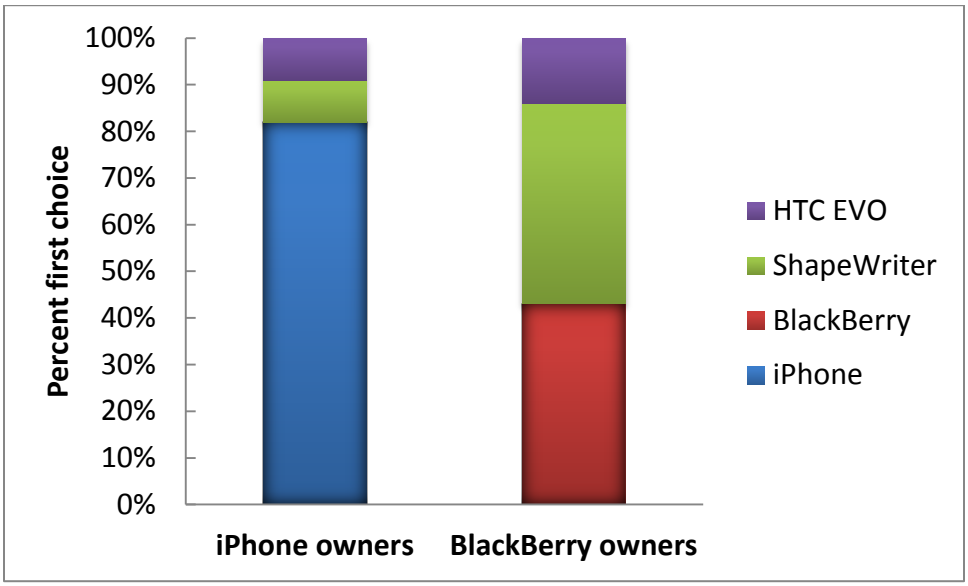

Figure 6: Percentage first choice text entry method for iPhone and BlackBerry owners. First choice for owners on their native device is highlighted.

Subjective Feedback and Impressions

Analysis of participants' subjective feedback of the text entry methods showed that participants were frustrated with the differences between each method. Specifically, they found it difficult to locate certain keys (caps lock, punctuation and symbols) because they were placed in different locations across each method. Some participants did not like the haptic feedback (via vibration) given when typing using the HTC EVO touchscreen interface and were unsure how to turn it off. Finally, differences in key size across methods made it difficult for participants to know where to place their fingers.

Key Take-aways

These study findings suggest that for the text entry methods tested, little advantage exists for one method over another during first-time use. For example, we observed no differences in performance when using a physical keyboard versus a touchscreen keyboard. Furthermore, the larger touchscreen keyboard size of the HTC EVO did not seem to provide a significantly improved experience over the smaller touchscreen keyboard of the iPhone for first-time users.

The only aspect that made a clear impact was participants' familiarity with each method. We saw that each method differed slightly in its presence of caps lock, punctuation and symbols. Participants knew where to find these keys on the method with which they were most familiar due to months or years of practice. In contrast, the non-familiar methods required extra effort and concentration, which added frustration and impacted performance.

This sends an important message to mobile technology developers: Users perform better and respond more positively when using a familiar text entry method. We can take advantage of the power of familiarity when designing new text input methods by ensuring they offer a similar placement and design of keys. For example, if you are trying to develop a new mobile device that will appeal to the iPhone market, there may be benefits to ensuring the keyboard provides access to symbols in the same place as the native iPhone keyboard.

Conclusions

As mobile technology developers release new, exciting and innovative user interfaces to the market, it is common for them to make claims that their product offers a superior user experience over the competition. Our exploratory study suggests that there may be no single text input method that is inherently "the best" across the board for smartphone users. Instead, what matters most in the text entry user experience is the level of familiarity that users develop over time by practicing with a given method. Knowing the lay of the land—how the keyboard buttons feel and respond to being pressed, where to turn on caps lock or how to find an exclamation point – goes a long way in helping users feel comfortable and type efficiently.

That said, mobile technology developers should not be afraid to introduce new input methods that go beyond users' familiar methods. Participants in our study were optimistic about new input methods such as ShapeWriter, despite the initial learning curve they faced with it. This is because they wanted to find an even better input method than what they were already using, suggesting a latent need for improvements in text entry methods on mobile devices. The finger-tracing method used in ShapeWriter made it novel and fun compared to the usual hunting and pecking that these participants normally employed on an iPhone or BlackBerry or HTC EVO keyboard.

While this study was strictly exploratory, it does provide a basis on which to design more rigorous, targeted research to address specific user experience questions to guide development of text entry methods for smartphones and new devices.

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