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# Tablet Text Entry Using a Combination of Physical Keyboard and On-screen Suggestions Bar

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Biography: The position paper authors work in the “DesignLAB” at Logitech. The team works on the design and development of a range of new Logitech products. Denis and Jan are from an interaction and industrial design background. Aidan and Asif are from a software development and HCI background.

**Abstract**

On-screen keyboards for tablets have evolved rapidly since the release of the initial iPad. However, there are also advantages to using a physical keyboard. This position paper reports on a pilot study that uses a combination of a physical keyboard with an on-screen word suggestion bar. The use of physical keyboard plus touch interaction is a common user configuration for text entry/edit, but has little associated published research.

**Author Keywords**

Text entry, tablet, touch

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation

**Introduction**

This position paper discusses text entry on tablets while using an external Bluetooth keyboard on Android and iOS platforms. This combination of a relatively small key pitch physical keyboard (less than 17 mm) plus touch interaction is a common configuration for users. The intention of this position paper is to bring this hybrid of physical keyboard plus touch input to the

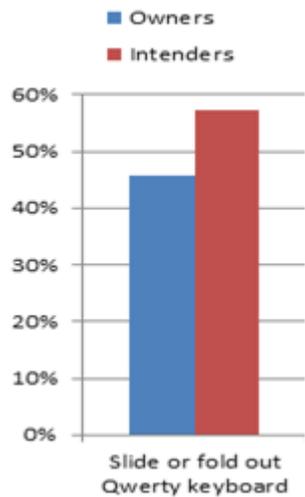
attention of the text entry research community, hopefully resulting in more research around this topic.

At the initial launch of the iPad in 2010 many of the apps were focused on consuming content, together with keeping up to date and in contact when on the move. However, over the past 18 months an increasing range of productivity and content creation apps have been released for tablets. This includes the Apple, Google and Microsoft productivity suites which are leveraging cloud infrastructure for interoperability across a range of platforms including smartphones, tablets and PCs. There is an increasing need for improved text entry and editing for tablet users.

### Using Bluetooth Keyboards with Tablets

Tablet operating systems come with increasingly powerful on-screen keyboards (OSK). However, OSKs take up a significant portion of the display real estate and the lack of tactile feedback can be problematic, especially for smaller size tablets. Several studies (including our own studies which have not been published externally) show a decline in typing efficiency and a poorer subjective user experience, relative to a traditional physical keyboard [1, 4].

Both Android and iOS have support for external Bluetooth keyboards that can be used as a replacement for, or in conjunction with, an OSK. There is a wide range of Bluetooth tablet keyboards on the market today. As shown in Figure 1 a significant number of tablet users own, or plan to purchase, a Bluetooth keyboard to be used in conjunction with their tablet [7]. It is a very common real world use case.



**Figure 1.** Owners, and intended purchasers, of external Bluetooth keyboards for tablets

These users get the benefits of more screen space and keyboard tactile feedback, but they can also lose out on the advantages of increasingly powerful OSK features such as error correction, word completion, suggestions and adaptive IME (input method editor) processing. However, as shown in Figure 2, the SwiftKey OSK also allows the word suggestion bar to be used with a physical keyboard [6]. This configuration results in an interesting hybrid of physical keyboard and touchscreen interaction.



**Figure 2.** SwiftKey Suggestion Bar with Physical Keyboard

### Pilot Study

There are a number of papers that evaluate text entry performance on a tablet using external keyboards [2]. This pilot study differs in that it used an external physical keyboard in conjunction with an on-screen word suggestion bar. Eight participants used an Android tablet (Samsung Galaxy Tab S 10.5, Android 4.4) in conjunction with an external Bluetooth keyboard (Logitech Ultrathin Folio) and SwiftKey OSK (Version 5). There were two conditions (and a within subjects design); one in which the participants just used the physical keyboard with the tablet, and the second in which they used the physical keyboard in combination with the onscreen prediction bar. The participants were all iPad owners (using iOS 7 at the time), and had not previously used word suggestion bars on Android

platforms; this was a new experience for the participants.

At the beginning of the study the participants browsed the web and performed a number of searches to get comfortable using the physical keyboard. They then proceeded to enter 50 randomized phrases from the MacKenzie phrase set [5]. This established their baseline performance with the physical keyboard.

In the second part of the study, the participants again browsed the web and performed a number of searches to better understand and get comfortable with the hybrid keyboard plus suggestion bar interaction. Following that familiarization period, they proceeded to enter 50 randomized phrases [5].

The (fairly open!) guidance for the task for participants was to enter the text as quickly and as accurately as possible, and to use the word prediction bar to help them. Between each participant session, the system was restored to the starting baseline condition for SwiftKey predictions (otherwise SwiftKey predictions would automatically suggest most words in the phrase set based on prior learning). After each text entry session, the participants completed a subjective rating questionnaire including NASA-TLX [3].

### Results

Figure 3 shows the average WPM for use of the two configurations. The introduction of the suggestion bar in the interaction resulted in a drop in the average text entry rate of over 24%. This is a worst case scenario in which the interaction is new for the user, and the SwiftKey prediction engine has limited opportunity to learn and adapt.

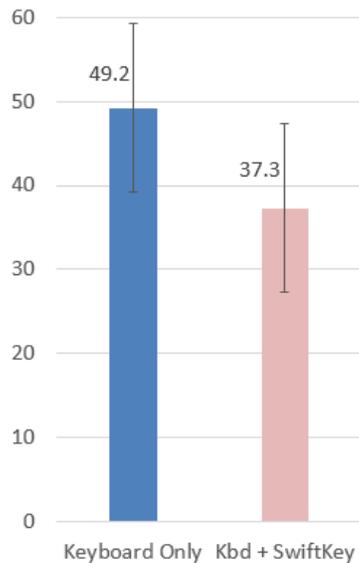


Figure 3. Average WPM

Figure 4 shows the average ratings for some individual TLX questions for both test configurations. Based on participant comments, some of the relatively low ratings for the physical keyboard were due to the small key pitch (17 mm) and compact layout of the physical keyboard relative to their regular keyboard.

The average TLX ratings for the mental demand and effort questions were much higher for the keyboard plus suggestion bar configuration. Scanning the word suggestions takes time, and adds cognitive load. For traditional text entry the user's visual attention is split between the display of content being entered and occasional glances to the keyboard. However, as shown in Figure 5, the addition of the prediction bar adds a third area of visual scanning to the interaction.

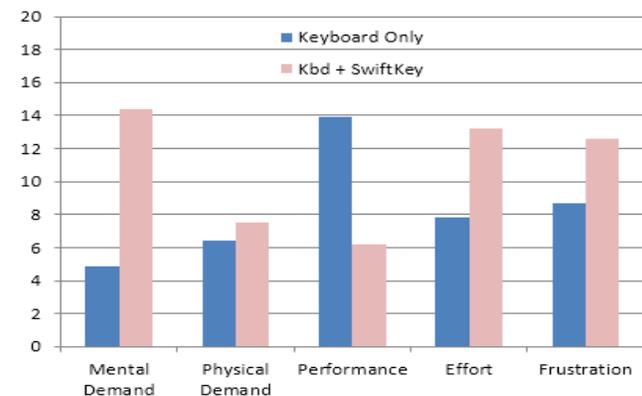
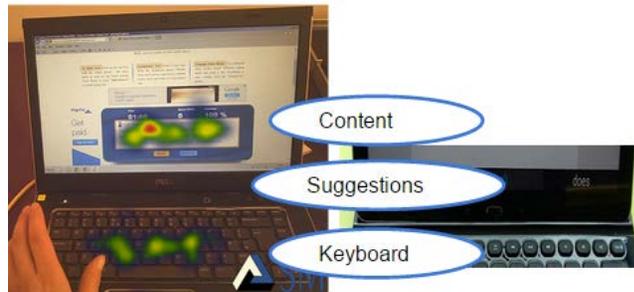


Figure 4. Average TLX for Participants

Some of the participants reported making an additional effort (because they were participating in the study) to try use the word predictions, when it would have been

easier and more natural for them to type the word on the keyboard, i.e., they could continue to use their typing skills to quickly and easily enter words that they were very familiar with. During the study, two of the participants stopped using the prediction bar after a few sentences, and continued to just use the physical keyboard.



**Figure 5.** User visual attention is split between the content, the keyboard and the word suggestions bar

In this very short exploration of initial use, there were no negative comments relating to ergonomics or comfort while interacting with the suggestions bar. The prediction bar was located at the lower part of the screen and within very easy reach, and users were occasionally touching the screen for other non-text entry interactions, i.e., switching between keyboard and screen is already a frequent behavior for tablet users.

### Summary

The choice to purchase or use an external keyboard for a tablet depends on many more factors than purely text entry. A keyboard folio results in additional weight and

bulk for the owner; but can compensate by providing protection, style and advantages of a familiar physical keyboard configuration.

The results of this pilot study demonstrated that the initial introduction of an on-screen suggestion bar resulted in a decrease in WPM and additional mental effort for the participants. However, based on the findings in the study, and some subsequent follow on work, we believe there are opportunities to refine and optimize this hybrid keyboard and touch interaction to improve the text entry experience for tablet users.

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