



# Immersion®

## TouchSense® Solutions

*Tactile feedback for a wide range of touchscreen-based products, applications, and environments.*

Touchscreens have many benefits, including ease of use, software flexibility, and space and cost savings—but they lack the confirming tactile feel that mechanical switches and buttons provide. With Immersion's TouchSense® tactile feedback, your product's touchscreen interface can reach its full potential—and give graphical buttons the intuitive, confirming feel like users expect from mechanical controls. With tactile feedback, onscreen buttons seem to press and release, turning traditionally passive touch interfaces into active displays that “come alive” to provide a greater connection with the user.

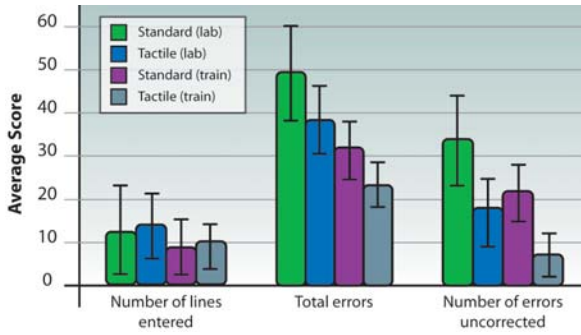
The TouchSense tactile feedback system can be added to most touchscreens to promote:

- A more familiar, engaging, satisfying experience
- Unmistakable confirmation for fast and accurate data entry
- Intuitive, natural, multisensory interactions that reflect a quality brand

“Immersion's TouchSense system is the most exciting opportunity to improve the usability of touchscreens that I have ever experienced. It has to be felt to be believed.”

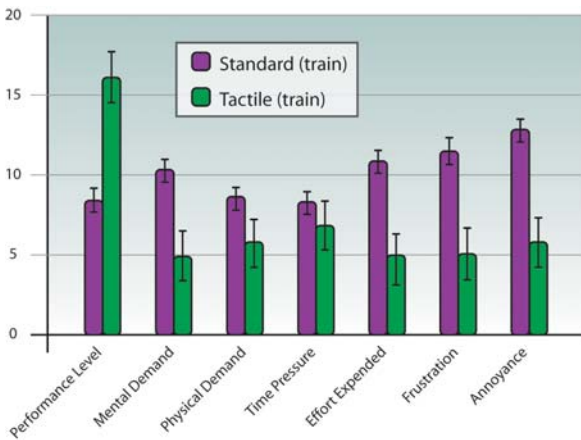
— *Scott Weiss, author of **Handheld Usability** and President of Usable Products Company*





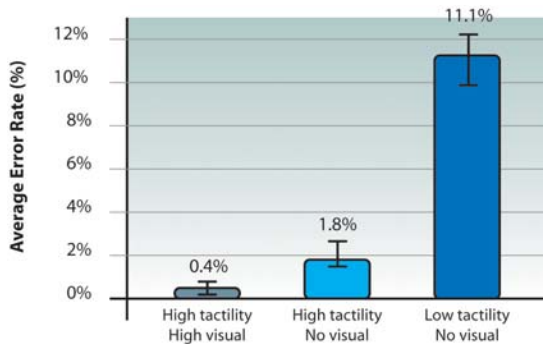
Adapted from Brewster, Chohan, and Brown 2007

**Figure 1:** Tactile feedback was shown to improve typing speed, reduce errors, and contribute to higher error correction.(1)



Adapted from Brewster, Chohan, and Brown 2007

**Figure 2:** With tactile feedback, performance level increases. In addition, users said that, with tactile feedback, touchscreen operation is less mentally and physically demanding as well as less frustrating and annoying.(1)



**Force Feedback**

Adapted from Silfverberg 2003

**Figure 3:** Without visual feedback, rough, not smooth, buttons reduced errors significantly.(2)

## Competitive Advantage

Product features are important, but you also need a streamlined, intuitive user interface to gain a significant competitive advantage. That’s why touch interfaces have become so popular—and why tactile feedback is such a strong differentiator. In combination with sight and sound, the TouchSense system can provide confirming response for a satisfying, harmonious, multimodal experience. Independent research shows that when users can also rely on their sense of touch, they perform tasks faster and more precisely (Figure 1) and with greater confidence (Figure 2). Tactile cues reduce dependence on sight for some applications (Figure 3). In addition, they can help improve operation in environments where sound is ineffective or inappropriate (3).

## User Satisfaction and Performance

Independent research shows that tactile feedback can be used to expand the touch interface, allowing it to convey both simple and complex information, improve performance, reduce cognitive load, and increase user satisfaction.\*

Studies also show that users prefer programmable tactile feedback because they perceive it supplies a better user experience.

## Product Design Enhancements

Some product designers avoid using touch-activated controls because of the lack of tactile feedback. By supplying a better user experience, including more intuitive interactions, the TouchSense system can help justify touchscreen adoption for these products—which can support a cleaner, more modern design and software flexibility. For products that already use touch-activated controls, the greater usability, speed, productivity, and user satisfaction supplied by the TouchSense system can be powerful differentiators.

The programmable TouchSense system outputs a consistent feel that can help establish or reinforce your brand. The experience of using a touch control that “touches back” can make users feel more in control, a usability enhancement that can also increase the perceived quality of your products.

\* For a description of recent independent research on tactile feedback in the human-machine interface, refer to Immersion white papers, The Value of Haptics at [www.immersion.com/valueofhaptics.php](http://www.immersion.com/valueofhaptics.php) and Haptics: Improving the Mobile User Experience through Touch at [www.immersion.com/improving-mobileUE.php](http://www.immersion.com/improving-mobileUE.php)



## Proven Technology

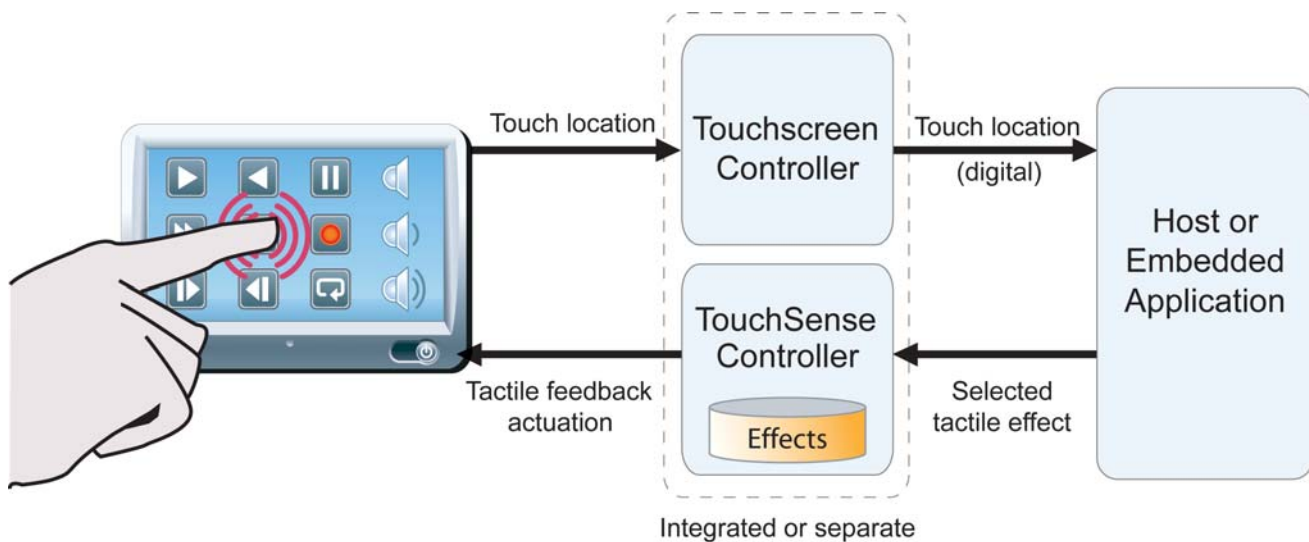
The TouchSense system is established and proven technology. Since 2005, over 25 product designs and millions of devices have been sold throughout Asia, Europe, and North America.

The system is controlled by your product's application software, so that touching different onscreen objects can produce a particular, programmed, context-sensitive feel. The TouchSense system includes actuators, controllers, and application programming interfaces (APIs) that let designers focus on creating an intuitive interface rather than on the mechanics of programming. When a user touches the screen, a signal is sent to the touchscreen controller, which supplies information on the precise screen location where contact was made. This location information is sent to the product's software application, which commands Immersion's tactile feedback controller to play a specific vibrotactile effect corresponding to the user's selection.



The Samsung Ultra Smart F700 is typical of the new design for mobile phones where a large touchscreen replaces a smaller display and mechanical keypad. Using haptics, interactions are immediately confirmed solving one of the central usability challenges of touchscreens.

A key feature of TouchSense technology is that its tactile effects can vary in frequency, waveform, magnitude, and duration. The result is that all types of on-screen buttons, switches, and other controls can supply distinct sensations to allow greater discrimination for users and more extensive applicability for OEMs and integrators.



The touch location is sent to the touchscreen controller, which sends the location to the host application. The application then commands the TouchSense controller to play the appropriate tactile effect.



**PND:** Touch feedback can also provide usability and safety enhancements that are particularly helpful in distracting environments.



**Multimedia control:** With TouchSense technology, the Select button can feel very different from Fast-forward, Rewind, or Play, letting the user know immediately whether they've made the right selection.



**Personal media player:** Tactile feedback can not only improve touchscreen usability, it provides a unique user experience, which can be a distinct advantage, especially in competitive markets.



**Desktop phone:** With fluid and reconfigurable touchscreen displays, you can make advanced features easy to access. With TouchSense components, you can now also retain the intuitive and confirming responses people like about mechanical buttons.

## Easy Path to Deployment

The TouchSense system works with touchscreen sizes up to 36 inches. With a choice of actuators, the system gives you a great deal of mechanical design flexibility, making it possible to integrate it into a wide range of products for most any application. A library of tactile effects is included, and customized effects are also available.

We work with you through a well established process to complete an optimal TouchSense implementation:

### 1) Review and recommend.

Given your unique application and functional requirements, we'll recommend a suitable TouchSense architecture.

### 2) Prototype and test.

We provide the components and integration guidelines you can use to prototype the haptic system within your product. We can also assist with prototype development.

### 3) Design for production.

We can work with you to fine tune the TouchSense integration and haptic waveforms to achieve optimal touch feedback richness and fidelity.



**Contact Immersion today**  
*Find out how easy it can be  
to integrate tactile feedback into your  
touchscreen-controlled products.*



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<sup>1</sup> Brewster, Stephen, Faraz Chohan, and Lorna Brown. 2007. Tactile Feedback for Mobile Interactions. Proceedings of CHI 2007.

<sup>2</sup> Silfverberg, Miika. 2003. Using Mobile Keypads with Limited Visual Feedback: Implications to Handheld and Wearable Devices. Mobile HCI 2003, ed. L. Chittaro, LNCS 2795: 76–90.

<sup>3</sup> Burke, Jennifer L., Matthew S. Prewett, and Linda R. Elliot. 2006. Comparing the Effects of Visual-Audio and Visual-Tactile Feedback on User Performance: A Meta-analysis. International Conference on Multimodal Interfaces. Proceedings of the 8th International Conference on Multimodal Interfaces, 108–117.