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[Business Day](#) | Novelties

Tackling the Limits of Touch Screens

By ANNE EISENBERG MAY 17, 2014

Touch screens are ubiquitous on tablets and smartphones, but their flat glass surfaces can hinder close reading and accurate typing. People flipping through electronic pages often retain less of what they read than on printed ones, studies suggest. And typing on a flat surface with no physical keys to guide the fingers requires heightened visual attention to avoid typos, draining concentration from the thoughts being expressed.

Companies are trying to address these problems with new tools adapted from the analog world of three-dimensional typewriter keys, tactile paper pages, and pop quizzes on the blackboard.

[Tactus Technology](#)¹ of Fremont, Calif., is developing a keyboard with shape-shifting keys that pop up from the screen's surface when needed, then recede so that the screen is flat and featureless again, said Craig Ciesla, co-founder. Fluid in tiny microchannels raises the keys up and later recedes, making it appear that the keys have melted away.

The technology will be offered later this year as an accessory to the iPad Mini, for \$80 to \$100, Mr. Ciesla said. Next year it will be included in many touch screens produced for tablets and smartphones. Wistron, a [company](#)² in Taiwan that is an investor in Tactus, will make the panel with the disappearing keyboard. (Tactus says it has raised \$21 million in capital.)



Photo caption: A touch-screen keyboard from Tactus Technology has keys that rise up in three dimensions for typing. *Credit Tactus Technology*

¹ <http://www.tactustechnology.com/>

² www.wistron.com/

Such tactile features can help build muscle memory and improve accuracy — skills lost in the rush to touch screens, said [Scott MacKenzie](#)³, a professor of electrical engineering and computer science at York University in Toronto who specializes in human-computer interaction. Many people who type on flat glass screens must keep their eyes focused on the surface to hit the correct key, he said. “It’s not just that visual attention is needed,” he added, “but a lot of visual attention.”

That means less focus on the act of composition, said [Erik Wästlund](#)⁴, a senior lecturer in psychology at Karstad University in Sweden who specializes in the readability of electronic text. Keys that rise and fall, but don’t use up valuable screen real estate when no longer needed, are a good solution, he said. “The more senses you can use, the better,” he said. “The senses can work in parallel.”

Accurate typing isn’t the only problem with touch screens and their fleeting electronic pages. Many studies suggest that people’s memory and comprehension are often better when they read long passages on paper than on screen, said [Mariette DiChristina](#)⁵, editor in chief of Scientific American, which in August held a conference on learning in the digital age.

But electronic textbooks are incorporating ways to compensate for this, Ms. DiChristina said, “so that you are spacing what you are learning over time with feedback — right or wrong — to immediately help you understand what you know and what you don’t know.”



Photo caption: A prototype interface developed at a South Korean research center helps students flip through e-books as they would through paper books. *Credit Sangtae Kim*

³ www.yorku.ca/mack/

⁴ scholar.google.com/citations?user=Ytim9v4AAAAJ&hl=en

⁵ http://www.nature.com/press_releases/dichristina.html

Old-fashioned pop quizzes can be inserted effectively into e-pages, said Susan Winslow, vice president for marketing at [Macmillan Higher Education](#)⁶, the publisher. For example, one of its e-textbooks for college biology majors, “[Biology: How Life Works](#)”⁷, offers the ability to take notes and highlight text on screen, as well as frequent short quizzes, embedded in the text, to aid in retention. Students get their scores instantly. “We give them feedback,” Ms. Winslow said, and students can find out if they are right or wrong on each question before moving on.

Slowing down students as they read electronic textbooks can be important, said [Maryanne Wolf](#)⁸, a developmental psychologist and cognitive neuroscientist at Tufts University and author of “[Proust and the Squid: The Story and Science of the Reading Brain](#)”⁹ (Harper Perennial).

Even digerati who may have never lifted a 1,200-page printed textbook may need some help as they speed along on their e-books. Dr. Wolf cited a recent study from Israel in which engineering students perceived their performance to be better when they read on a screen rather than on paper. “But the reality was that they were better on paper,” she said.

Another problem with touch screens’ transitory images is that they don’t help students create a mental map of what they’ve read and what’s to come — an overview that is known to be useful in memory. “You might remember that something you read yesterday in the paper was in the middle of the page, or in the right corner,” Dr. Wästlund said. “Even though you haven’t tried to memorize position, you have built this internal model” — like the page layout of a newspaper. That kind of cognitive map or physical landscape into which readers fit new knowledge is much harder to build with fleeting e-pages.

To help with this problem, [Sangtae Kim, Jaejeung Kim and Soobin Lee](#)¹⁰ of the Institute for Information Technology Convergence at Kaist, a South Korean university, have built a prototype for a touch-screen interface that lets students flip through e-book pages as they would through a paper book. On the left side, students can see all the pages they’ve read; on the right are the pages that remain. Students can hold a page in view while scanning the contents and cross-referencing distant pages.

All of these devices may play valuable roles for the many people who may need to tap the brakes a bit while working on touch screens. “Skimming, browsing, multitasking — all of that is done better on screen,” said Dr. Wolf at Tufts, adding that it shouldn’t come at the cost of what she called “deep reading — the contemplative, focused aspect of the reading life.”

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⁶ <http://www.macmillanhighered.com/catalog/page/whoweare>

⁷ <http://www.macmillanhighered.com/Catalog/product/biologyhowlifeworks-firstedition-morris>

⁸ <http://ase.tufts.edu/crlr/team/wolf.htm>

⁹ <http://www.harpercollins.com/9780060933845/proust-and-the-squid>

¹⁰ <http://www.kaist.ac.kr/html/kr/index.html>