

A paperless era?

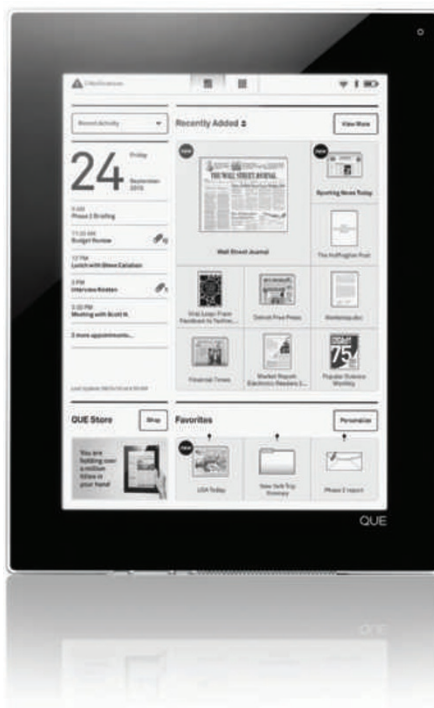
The recent explosion of e-readers onto the market, along with the news that Amazon is now selling more e-books than physical copies, suggests that our reading habits are finally changing.

A multitude of new large-screen e-readers — devices that download and display digital text and images — were announced in January at the International Consumer Electronics Show (CES) in Las Vegas, US, suggesting that an increasing number of consumers will be using mobile products to read digital information in 2010. This may mark a turning point in the convenience and usability of portable technology, because for the first time it may be truly practical to read a long newspaper article, scientific paper or book on a portable device that has the size and weight of a modest magazine.

Until recently, those wishing to download and read digital information (including scientific papers) without resorting to bulky and heavy laptop computers have relied on small handheld devices such as the iPhone, BlackBerry or advanced mobile phones. Such pocket-sized devices boast unparalleled portability, but their tiny screens greatly impede readability and cause frustration as long articles require seemingly endless scrolling. Although some publishers have formatted their content and websites to suit the tiny screens of such mobile devices, it is undoubtedly a far more pleasant experience to read content on a device with a larger screen. We are now seeing the arrival of a new breed of large-screen products that fill the gap between laptop computers and mobile phones or PDA-sized devices.

New e-readers announced at the CES include offerings from Plastic Logic (QUE proReader), Amazon (Kindle DX), iriver (Story), Spring Design (Alex), Samsung (E-6 and E-10), DMC (Ocean), Interead (COOL-ER 3G), Skiff, Bridgestone and others. Many of the e-readers being announced have large screens based on either LCD technology or E-ink's electrophoretic pigment technology.

Amazon's new 9.7-inch-screen Kindle DX e-reader is now retailing for around \$500, featuring 3.3 GB of memory and wireless access. Interestingly, Amazon claims that the original Kindle is the most gifted (most purchased as a gift) item in Amazon's history, and that Christmas Day 2009 saw sales of electronic books for the Kindle exceed those of physical books for the first time. This is an interesting statistic indeed,



PLASTIC LOGIC

and perhaps shows what the future may hold for e-readers.

At the CES, Plastic Logic also showed off its long-awaited QUE proReader, featuring a 10.7-inch all-plastic display and both 3G and wireless connections. Orders are now being taken, and the QUE is expected to ship from mid-April with a retail price of \$649 for the 4 GB version, which has only wireless access, or \$799 for the 8 GB version, which has both wireless and 3G access.

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Both Amazon's Kindle DX and Plastic Logic's QUE proReader feature black and white displays based on E-ink's electrophoretic technology, which relies on oppositely charged black and white pigment particles packaged in microcapsules holding a transparent fluid. Electrodes are used to control the density of the particles and thus form a black and white image.

The common theme to most of the new e-readers being announced at the

CES is the use of a large ~10-inch screens, wireless and 3G data connections and sophisticated touchscreen interfaces. Indeed, it is probably the emergence of all these technologies at sufficient levels of performance and cost-effectiveness that is now likely to be the recipe for success for e-readers.

Some devices such as the dual-screen e-reader from MSI take the interface a stage further by boasting two large screens that can fold together — one of which is a touch-sensitive keyboard. A similar concept is being pioneered by the laptop manufacturer Asus, who exhibited a prototype at the CeBIT IT show in 2009. Entourage Systems, a start-up firm from the US, is also gearing up to release a dual-screen e-reader based on E-ink technology later this year.

Although all of the e-readers described above are thin (typically less than half an inch thick) and relatively lightweight (usually less than 500 g), they are all rigid and are thus often too large to carry in a pocket. Many believe that the future lies with flexible roll-up displays that would allow e-readers to be shrunk in size when not in use. Although this is still some time away, it should not prove impossible given that E-ink's display technology is inherently flexible. Indeed, giving some cause for optimism, Bridgestone of Japan has introduced a flexible colour e-reader that is just 5.8 mm thick and has a 13.1-inch e-paper display. Based on the firm's Quick Response Liquid Powder technology, the display offers 4,096 colours, a refresh rate of 0.8 s, and is touch-sensitive and completely flexible.

Perhaps the most excitement of all surrounds Apple's mysterious new tablet product. No official details are available as *Nature Photonics* goes to press, but rumours suggest that the device will be officially unveiled before the end of January. The product is expected to boast a screen of approximately 10 inches in size, offer the same functionality as the iPhone, and use 3G phone networks and wireless networks to download information. Given the popularity that Apple has enjoyed with the iPhone, this may be the one product that gives e-reader devices the popularity they really need to achieve mass-adoption. □