

they be in Africa, China, or anywhere else, wait and watch for us to take responsible steps with technology so that its impact on their lives reaches only far enough to solve their real problems.



Verso

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We find Liu Wenping in a far corner of western Beijing one summer evening, in the Ba Bao Shan cemetery. She is sitting propped against the headstone of former Communist diplomat Bao Yongfa. It is evening, 2008, and Liu is reading the ancient writings of Mo Ti on the Microsoft-Warner Rocket 881ct. It is a fresh one she picked up this afternoon at the store, since her last one finally died last night. The cause was natural battery failure — the only normal and predictable cause of death, except of course for obsolescence — and it went out with the trash early this morning.

Simultaneously, we see a little hut in a village not far from Mogadishu, on the east coast of Africa. A young boy, Yeshaq, is studying his English homework on the same model of machine, except that it is solar powered. His family owns only one of these devices, so Yeshaq is careful not to damage it. Even though they cost less than one day's salary and are reasonably sturdy, his mother does not want to take any chances. Since the satellite hookup is at school, Yeshaq must carry the Rocket back and forth with him in his backpack, so his father sewed him a special leather case for it, generously padded on the inside with wool. His ingenuity is contagious: several other parents have made their own imitations.

An estimated one billion Rocket 881ct's are now in circulation. Their average life span is 117 days. As a worldwide average, they cost about six hours' salary. Eighteen percent of the world's population owns or uses one of the two major brands of e-book every day in businesses, schools, or in the home.

Originally presented at TextOneZero conference, Brooklyn, New York, May 2001.

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bution problems; a need for increasing immediacy; a great need for portability; an immense paper waste stream; a colossal market; and a terribly short life span for the majority of the material. It would seem that these two media could not be more ideal candidates to fit into those little machines. Still, most people seem to want to take a square peg and push it into a round hole. The fact is, of the three reading media of our day, the first one that comes to people's minds happens to be the one with the least need and the least potential.

Print on demand is an incremental step which helps to solve several of the problems we are encountering with the book industry. But most e-book entrants, in their zeal to purvey electrons instead of atoms, have considered print on demand as a halfhearted afterthought, something which they might get to at some point as a sort of legacy support option for those who don't care for their wonderful e-books. But our plans, which certainly may include e-reading, have focused more on print on demand as a reasonable, realistic, and economical use of today's technology.

Print on demand's aim has been to bring electronic publishing technology only as far as it needs to go in order to deliver books safely and economically to the public. It is not a hammer looking for a nail, as are many e-book concepts. Print on demand serves a practical immediate need and is low-tech enough that the smallest communities can support it today with a very modest investment in technology. In many parts of the world, home flashlights and batteries are a rarity; let alone electrical outlets in the home to recharge them. But if a community can pool its resources and support a single laser printer, or merely a post office, then it can benefit from print on demand. The difference between content prepared for e-books and that prepared for print on

very far or engage in very much commerce to secure the remaining materials and tools needed to publish their beautiful volumes.

How to make a book out of high-tech stuff

Silicon is second only to oxygen in abundance on Earth. In fact, silicon makes up about one-fourth of the Earth's chemistry. It is the all-important product in semiconductor manufacture, and it is most easily mined from the powdery shores of distant beaches. But silicon is only one of a thousand ingredients that make up an e-book or any computer. The silicon must be doped with other elements, mined elsewhere in the world, to make integrated circuits.

The petroleum for your e-book's case may have been pumped into ships from deep beneath Kuwait, then brought to cracking towers in Pakistan where it was distilled. It may have been Thailand where the distilled material was polymerized. The raw, uncolored plastic was finally shipped to Singapore, where designs for the plastic casts had been sent from California. After numerous casting tests and revisions shipped back and forth between Asia and America, the final production run was done. It took approximately 10 quarts of oil to make your e-book's housing.

Gold and copper may be taken from the Andes Cordillera, to be used for wiring and connectors. Lead for solder may have come from Australia. Nickel from Canada may be sent with cadmium (made as a byproduct of zinc manufacturing in New Jersey) to South Carolina to be made into batteries.

The original book, which may have come from a dusty shelf somewhere in the Library of Congress, was scanned on site. The bitmaps traveled on CD-ROM to the Philip-

pines, where they were analyzed by optical character recognition software and then proofread and marked up. The finished markup traveled back to a document processing facility in Wisconsin, where it was paginated in Quark for PDF, and separately styled for OEB and other formats. Quark was developed in Colorado, and the PDF format in Silicon Valley. The book is moved from Wisconsin to a Web server somewhere in Austin, Texas, which was developed by a New York advertising agency with help from a Florida application company and a host of Web development tools.

To engineer an electronic book reader requires hundreds of specialties in engineering and manufacturing. There was a specialist who designed that clever plastic tab which holds the battery compartment door in place, and he may never find himself in the same city nor so much as speak the same language as the person who cast the plastic, let alone the specialist who engineered the battery construction, let alone the one who ran the machine which printed the circuit boards, let alone the hundreds or thousands of others who had some tiny part in developing the hardware and software of the thing you hold in your hands.

There is the hardware to manufacture, with all of its materials and engineering specialization. There is the embedded software, encompassing several dozen modules, linked by a score of protocols and interlocks, teetering atop a set of abstractions easily ten layers deep.

Finally, there is the publishing network, whose complexity makes the hardware and embedded software problems seem like baby's blocks in comparison. The tiniest flaw in a data line a few atoms thick or a misplaced character in software, deep within the machine or somewhere on the other side of the world, may affect only one or a small number of readers, but it could leave all of them out of luck and without the ability to read.

one steel has struggled in vain against the attacks of a new chisel or drill bit made of a slightly tougher alloy. Failing that, you could always try getting in through the side window.

In 1976, computer crackers worldwide numbered in the dozens or hundreds. We sat at Teletypes, ignored by the world around us, and chipped away at college mainframes. Not long after, more came along and could access and exploit telephone switches and credit card accounts over the growing number of automated systems attached to modems. Today, computer criminals number in the millions, because they include our young nieces and nephews with their Napster and headphones. Tomorrow they may number in the billions.

We are fast becoming a generation of digital kleptomaniacs: the rising curve which marks our ability to protect content is never far enough ahead of the curve of the methods, motives, and opportunities to circumvent security. The only hope may be that, with the new empowerment, the third related curve — that which makes us all into publishers — will render the audience for virtually any product insignificant enough in size that any collective or personal motivation to steal it is effectively neutralized.

The proper technology for the job

So far, there have been few truly compelling arguments which help e-books make sense as a megabusiness opportunity. However, both the newspaper and magazine industries are in a much deeper soup, in many ways, yet they are paying less attention to the portable electronic reader. Newspapers and magazines are almost perfectly suited for electronic reading and for portable devices: relatively short texts; a bulky format coupled with distri-

they are the civilized world's biggest readers and, not coincidentally, its most impatient spenders. This population taken alone, probably numbering well under a hundred million worldwide, is not the world, but only a very small portion of it. Appeals to a Benetton-like multicultural soup of youthful choice and publishing opportunity are pure mythology; they have nothing to do with our Chinese and African friends. They and most of the rest of the world are already served quite well by the boring businesses of offset printing, small bookstores, public libraries. Of the estimated worldwide book market of US\$70 billion, the fraction which may capture all of the problems listed above amount to a lot of money, but it is only one niche of the book market. To assume that the new technologies will catch on like wildfire is fantasy; to attempt to force them through marketing could cause damage to access channels which already work and always have.

Liu Wenping sees her screen flash. Was it lightning from overhead, or did something start to go wrong inside?

The security question

Technology is and always will be a double-edged sword: the same tools which can be used for good intentions can be used for equally malevolent ones. As the Internet provides each of us with the same power to access legitimate content quickly and effortlessly, it offers every unskilled user the potential to disseminate, receive, and employ tools which can crack a file open with the same technical skill required to heat a cup of soup in a microwave oven — and potentially the same impulsive motivation.

This is not an opinion, but a time-tested law of the nature of technology. Throughout our metallurgical age,

If we are looking at the full life cycle of an e-book, we must not ignore the environmental impact of the product at the end of its lifetime. Electronic devices are an environmental nightmare because they are almost impossible to recycle. This does not justify the paper waste in printing today; still, at the very least, paper is eminently recyclable. E-books, big and small, are simply not recyclable, at least in the sense we normally assume.

Even today's most primitive e-book readers contain more technology and processing power than was housed in all of the Massachusetts Institute of Technology 40 years ago. If all of the circuitry in an e-book were made of regular household wiring, the book would probably be around the size of a football field.

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Thus, a reading experience which can theoretically be provided by a single person from within a small grassy space in a forest is, from now on, to be driven by so many people in so many places as to boggle the mind, and these reading devices, and the support behind them, must be made available in the far corners of the earth via electronic networks and highly elaborate physical distribution channels. Jason Epstein reminds us that in colonial times early publishers would hawk their wares in the town square. He suggests that we are returning to that paradigm as publishers, and we shouldn't doubt him; but, whereas in the former case of the town square, technical support was a non-issue, in the latter case it is not known whether the publisher will be able to answer questions or even know if he honestly is responsible for a particular bug which may crop up in Liu Wenping's e-book. The Chinese woman may need immediate help from her lonely spot in Ba Bao Shan cemetery, but it is unlikely she will ever find the person who knows the answer. Yes!haq,

in his hut in Africa, will have even greater difficulty if he is to finish his homework tonight.

Even today, as we sit comfortably in the major cities of the world with much simpler appliances, it is difficult to get help with the most basic problems after hours on the telephone or days waiting for e-mail. Many observers enjoy comparing the dissemination of e-reading technology to that of cheap disposable calculators, but there is so much more to contend with as to make the analogy totally unworkable. One may rightly argue that the two devices look similar, with their buttons and displays, and are of a comparable size and shape, and that we have made major advances in our ability to integrate such a product, advances similar to what we have seen in the calculator industry since the 1960s. But that is a smokescreen which ignores differences and probably insurmountable odds against the efficacy of world adoption of e-book technology. This smokescreen, if not based on technological naïveté, is simply a lie.

A more fitting analogy is the cellular telephone, even though technologically it is in some ways more advanced and in some ways less advanced than what is required for a basic e-reading environment. E-books will not require cell switching and cell handoff, nor probably any airwave connection whatsoever. An e-book requires only a tiny serial connection, the equivalent of a cheap modem. But e-book displays already are much more complex, and signal security is more robust, than cell phone technology.

The chief weakness of the cellular phone analogy is one which concerns economics as much as it does technology. Cellular technology is, after more than 20 years, still far more expensive to support than the single twisted-pair telephone line. The quality of the new digital signal is still greatly inferior to and less reliable than that of a wire

connection. The networks are still located almost exclusively in urban centers and along patches of interstates. Because of these things, the cellular phone should be regarded as a luxury item for pioneers, despite the fact that we see it adopted by some lower-income people in large cities. If we are to get anywhere with the analogy between cellular phones and e-books, we must regard the e-book as a luxury item as well, at least for the foreseeable future, and resist the temptation to dream it into a position which it may never enjoy. After all, most people in the world do get the books they need through conventional print. The e-book is not a revolution, but just another technology which can solve certain specific problems, problems which are suffered only in the most civilized corners of the world, admittedly by a constituency which spends a lot of money on reading. If the e-book is a luxury, then there is no point in going further with the notion that the printed book will be dead by 2010.

If a more moderate stance is taken in favor of e-books than that of Microsoft's Dick Brass — if the e-book is to be considered a parallel technology to print in the long run (and this is a much more justifiable position to take) — then we still only see it useful for a relatively small cross-section of worldwide reading needs. The key justifications for both e-books and print-on-demand — the only ones which venture capitalists have ever taken the least bit seriously — have been to help with the problems of bookstore and library glut, the textbook cycle, and pre- and post-peak marketing for titles by the mainstream press, the small press, and self publishers. Every other endeavor is not responding to an identifiable market need, but rather to wishful thinking. Oddly, some of these projects have even been funded.

But, again, the set of problems listed above impacts a relatively small segment of the world's population, though