

An earful about Zvi's e-mail

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..... Zvi is the last name listed in my e-mail nickname directory. Whenever I alphabetize stored mail, Zvi's messages appear at the end, with his most recent one appearing last. So, as it happens, the last message in my alphabetized list is a short note from Zvi's secretary informing me that Zvi was too sick to come into his office and that she would take my message to his home. I regularly clean up my e-mail account. I erase old solicitations, unfunny jokes, and complaints from students about grades. Yet I cannot bring myself to erase this note from Zvi's secretary, even though Zvi died over a year ago.

The personal and professional have crossed in such an unexpected way. The personal observation is mildly embarrassing. E-mail has integrated itself into my life—so much so that it can become an object of sentimentality. The professional observation is of more lasting significance. E-mail has become the seed for significant changes in society. Zvi would have said that the spread of e-mail resembled the spread of agricultural improvements. This resemblance is not self-evident.

Seeds of change

Zvi Griliches was famous for many things, but here I will focus on his study of hybrid corn seed diffusion in the US. He showed how and why the seed was first adopted in a few locations, spreading outward over several years.

His thesis was written in the mid-

1950s, and the kernel of the main idea was timeless. The diffusion of hybrid seed accompanied a broad and very significant set of changes in a vast array of operational procedures and harvesting methods. The statistical methods Zvi used to measure these changes were quite general. They provided a succinct way of summarizing how fast the seeds spread, and what circumstances boosted or hindered this spread.

What does this have to do with e-mail? Simply put, sometimes an example from the past can illuminate the present by framing the broad patterns common to otherwise distinct phenomenon. New technologies transform economic activity in two ways:

- They can make existing activities less expensive, letting someone achieve something previously not possible because of declines in cost. When things become less expensive, resources can be redirected.
- New technologies can change the processes of economic activity, such as when a new technology restructures organizational routines, market relationships, and other activities associated with the flow of goods. Most technology revolutions are associated with such change in work processes.

The diffusion of both hybrid corn seed and of e-mail initiated both types of change.

This is especially easy to see with the corn.

Corn became cheaper to produce. Farmers were already planting corn, but better seed resulted in more output (more ears) per input (land, labor, and fertilizer). Farmers could use their spare time for other activities and their spare land for other crops or livestock.

This transformation also contained the seeds—excuse the corny pun—for restructuring the process of planting, harvesting, and selling. Crop failures became less likely. Same-size harvests required less labor. Higher yields motivated the purchase of larger equipment. Greater output generated new uses for corn. These events motivated searches for new hybrids, a process that still continues today with genetically altered crops.

Parallels

Both of these same broad types of changes are at work with e-mail. E-mail makes it cheaper to accomplish something most people were already doing—that is, communicating. It makes it easier to exchange the information that facilitates daily commercial, professional, and private transactions. Ask anyone who uses e-mail extensively: Distant collaboration is easier. Sales people say that e-mail makes maintaining relationships easier. Administrators say it makes coordinating meetings easier. Researchers say it makes exchanging ideas easier. Then there is the little stuff that keeps society moving. Rather than receive pro-

fessional news and updates at conferences or other annual professional events, it is becoming a norm in many professions to use an e-mail newsletter.

None of these changes alone makes e-mail revolutionary. More often than not these characteristics make e-mail more trivial. Like most people, my e-mail inbox is full of jokes, pictures of babies, and other stuff that I would not have received if e-mail did not exist. Linguists have compiled dictionaries of emoticons, those little symbols of smiling faces and expressions that spice up many messages. Yet, the sum of all these trivial changes, which seem to have occurred ever so gradually, alters the allocation of time and the basic rhythm of activity. Do you know anyone who spends less than a few hours on e-mail every week? Do you know anyone for whom e-mail is not a central part of his or her professional schedule? Most of my friends measure their vacations by the amount of time they spend away from e-mail and the number of messages waiting for them upon return.

Publishing activity, in particular, has changed dramatically, though that is a topic for another day. Just consider this example: Odd as it may seem, I have never actually shaken hands with the editors, staff, or managers of this publication, even though I have been writing this column for over six years. We do everything by e-mail.

For many of these same reasons, e-mail alters the structure of leisure time. Surveys show that e-mail is the most popular home use of the Internet. A close cousin to e-mail, instant messaging, is transforming teenage life. Though instant messaging is only a few years old, many US teenagers are already quite tied to it. Forecasters see more e-mail use on the horizon. The DoCoMo revolution has made wireless e-mail a huge hit with Japanese teenagers. What will US high schools look like when students exchange these little messages all day from portable devices?

All these changes are bringing about the second type of broad change, the restructuring of the flows of goods and services tied to communication. This

change is gradual, and a lot of it seems trivial while it diffuses, but the accumulation of many small things over a period of time results in radically different processes. This transformation is far from over.

That said, e-mail's diffusion possesses some features that corn's diffusion did not. For example, many psychologists have observed that the electronic message elicits a different tone from a writer than either a handwritten letter or a voice message. This has had all sorts of unforeseen consequences. This too is a bigger topic for another day, but a few examples will get the point across. How many of you have sent an e-mail message but later regretted it? How many romances were begun by e-mail, because it brings out a sincere and almost anonymous voice in someone, only to die upon a first meeting void of physical chemistry? How many organizational discussions have been changed because the discussions are recorded in print, then dissected and analyzed by multiple eyes?

To be sure, it is not obviously good or bad that e-mail transforms the words it records. For example, every piece of e-mail correspondence in the White House is saved, documenting more in a day than Nixon recorded over months of audiotape. However, instead of learning about a president's informal manners of speech, as learned from Nixon's tapes, future historians instead will learn about mundane legislation development. The salty stuff will be missing, edited away by a self-conscious politician or staff member who knows the message will end up in an archive. In a way, the tapes were more informative.

Diffusion becomes personal

E-mail's diffusion has directly changed my life. For example, without e-mail I would never have had much of a relationship with Zvi Griliches. Sure, I would have seen him at professional meetings. I still would have felt affection for him because he spoke with the same Eastern European accent as my immigrant grandfather. And like other Jews of my generation, I would have continued to look in awe at

the number on his wrist, tattooed during an unimaginably cruel teenage existence under the torture of Nazis.

Yet, the plain fact is that many people other than me had better reasons to talk with Zvi. I was not one of his many co-authors, colleagues, or past PhD students (see http://people.bu.edu/cockburn/tree_of_zvi.html). My place was far down the standard academic hierarchy, so I had to wait my turn. In person, this meant that there was not much time for anything other than a casual remark, a quick retort, or an encouraging word.

In contrast, e-mail let me occasionally send him a question or exchange ideas, and to reinforce the relationship. Although this came at the start of my career and near the end of Zvi's, it still left something indelible within me. My most treasured e-mail message came almost a decade ago, after a presentation in front of one of Zvi's workshops, when I was still pretty green. The workshop focused on topics in technology markets, and Zvi's comments regularly dominated the discussion. I do not recall all of what happened at the workshop, except that I admitted difficulties with my research and was hammered for it by the audience. Later, I sent Zvi an e-mail in which I lamented about the pain that accompanies honesty. He sent me an avuncular response. I do not remember its details, but I do recall the tone and especially one phrase; he advised me not to become a "bullshit artist." It was not much, just an encouraging word from an aging icon at Harvard to an insecure and naive assistant professor. But here is the bigger point—it could not have happened in person, as it was the sort of conversation that is awkward and for which the moment is never right. Over e-mail, however, it was possible. It also came at the right time. And I've always wished I had kept a copy.

Epilogue

A few years later, and about 40 years after Zvi's thesis on corn, a colleague at Tufts University, Tom Downes, and I traced the geographic diffusion of commercial Internet access providers across

the US. We made a map, explicitly framing the analysis in terms of Zvi's corn thesis, asserting that the Internet represented a trend of similar significance. (See the Maps, Measurement and Interpretation section at <http://www.kellogg.nwu.edu/faculty/greenstein/images/research.html>).

Zvi seemed both flattered and amused by our aspirations, taking the pose of a grandfather embarrassed to see his own habits imitated by his neighbor's children. Early into the project, I showed him our first map. He studied it and after a pause, he smiled ruefully, and declared that a good predictor of not finding Internet access was the presence of much hybrid corn seed.

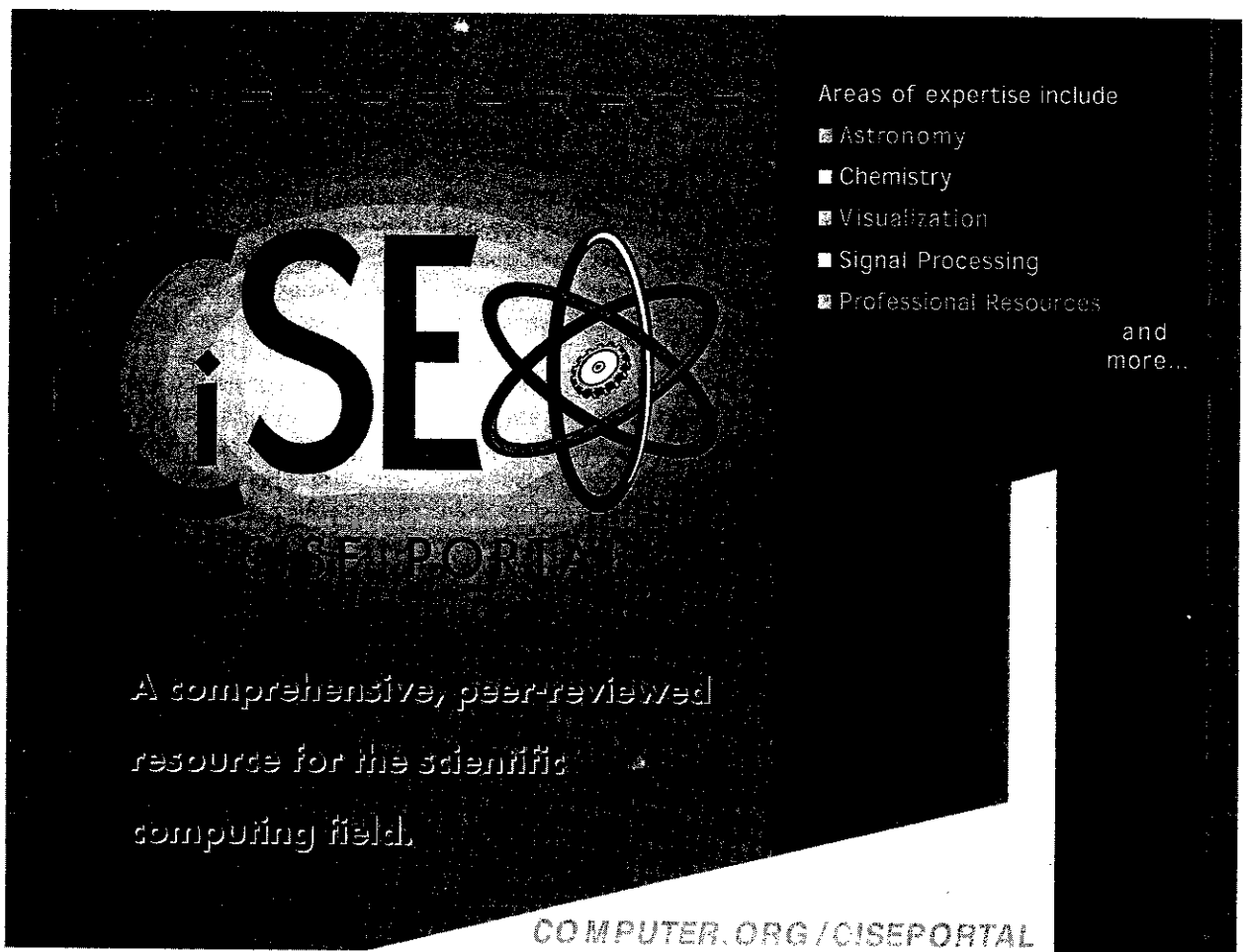
We "talked" a bit more by e-mail, which led to yet another presentation at one of his lunchtime workshops at Harvard. It

was 1997. Our first map showed an uneven diffusion of commercial Internet access around the US. Someone expressed skepticism. It raised a small dispute about how fast markets work and how far-reaching they are—the sort of issue economists debate incessantly. As he usually did, Zvi spoke up. He noted that our map showed there were few ISPs in Cape Cod, a fact he could verify with personal experience. The previous summer he had run up a large phone bill while sending and receiving e-mail from the Cape. That settled the argument.

Some weeks later, I received a package from Zvi. There was a little post-it note with FYI on it attached to a reprint of an article. It was something Zvi wrote for *Science* in the late 1950s about the diffusion of hybrid corn, a piece I referenced in our ISP maps. Almost 70 years old, and he still

wanted to make sure he was cited properly!

Zvi taught me that statistics are only a trace of an activity, not the activity itself. Zvi preached about the importance of understanding the humanity behind these traces, so that researchers can nurture their insight and present their contours in an honest light. Maybe these lessons would have accumulated without e-mail, but I doubt it. The relationship extended over a great distance, increasing the force of small incidents, turning off-hand remarks into little treasures. Maybe that is why I do not erase anything now. I do not want to lose any trace of the seeds Zvi planted.



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