From the Editor-in-Chief

An Evolutionary Look at E-Commerce

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No technology can create a market from scratch. The most it can do is replace an existing technology and expand that technology's market. Of course, this sort of progress naturally fuels the development of further technology. Under the right circumstances, an arcane technology with a niche market can quickly give way to a broader based technology having mainstream appeal. After a couple of generations, the net overall effect of a successful technology can be no less dramatic than the creation of a new market, but the seed must already have been present.

Punk Eek

Theories of natural evolution may have something to teach us about technology. A theory I find appealing is that of "punctuated equilibrium" (nicknamed *punk eek*), as promulgated by evolutionary biologists Stephen Jay Gould and Niles Eldredge (http://www.sciam.com/explorations/072196explorations.html). Traditional evolutionists such as Darwin envisioned a slow and steady evolution of better adapted creatures. Gould and Eldredge observed that the fossil record doesn't support a belief in steady evolution. Instead, they saw long periods of equilibrium with little activity, separated by short bursts of evolution (hence, punctuated).

Their key insight was that the genetic makeup of stable populations of a species doesn't change much. Genetic mutations alone have little effect. However, when a population's environment changes significantly or when it becomes isolated from the main population, it can go through a period of rapid change. In essence, new species emerge from such isolated populations.

A Biological Metaphor

By likening technologies to species and markets to ecosystems, we may find punk eek relevant to our own domain of interest. Technologies emerge from previous technologies when their markets change. Often, the technologies themselves contribute to these market changes, although resources and demand are also factors.

An important consequence of the biological metaphor is that individual technologies cannot exist unless they fit into an ecosystem. Great technical ideas often fail because other technologies they need for their existence aren't ready. Sometimes the people promoting new technologies neglect to build an evolutionary path for them. In some cases, the evolutionary path requires changes in surrounding technologies; in others, changes must occur in users' habits. The latter is less predictable and often more challenging.

The Second Coming of E-Commerce

Let's consider e-commerce as a new technological life form. Will it succeed or fail? This depends on the ecosystems it will inhabit and the species it will displace in order to flourish in (and thus modify) those ecosystems. Some likely candidates for displacement are print catalogs and mail-order purchasing; business processes for purchasing, accounting, and inventory management; manufacturing scheduling and resource allocation; and requirements acquisition.

In fact, the earliest applications of business-to-consumer e-commerce did involve a displacement of print catalogs and mail order. E-commerce clearly had an edge, but the niche it addressed was too

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small and couldn't be readily expanded. People will buy books and CDs from a catalog, but they still want to touch and feel furniture and many other goods.

In business-to-business e-commerce too, distributing catalogs and enabling online purchases is too small a task to significantly pay off by itself. However, linking catalog sales with inventory, shipping, sellers' billing processes, and buyers' procurement processes opens up fertile territory for e-commerce. The considerable activity in alternative standards and approaches signifies only the subtlety of the niches that exist within the territory. Broad themes may suffice during a technology's early stages, but only a genus whose species have evolved to exploit ecological niches can hope to displace the dinosaurs entrenched there. In other words, the effort required for automating and standardizing data formats, semantics, and internal processes of enterprises is essential to the expansion of e-commerce. As the technologies mature, they will spread rapidly to other enterprises.

The Next Wave

As the ecosystem stabilizes or achieves equilibrium, it will become vulnerable to invasion by yet a newer technology. That is, even as the basic problems of business-to-business e-commerce are solved, more interesting opportunities will emerge. E-commerce will go deeper (displacing traditional processes in manufacturing), wider (encompassing products and services provided by different enterprises), and higher (intelligently and interactively acquiring requirements so that enterprises can deliver customized products). The technologies of the next wave—including service composition and virtual markets—are taking shape. They will surely expand, but only when the ecosystem is prepared for them—that is, when business interoperation has achieved a kind of equilibrium. We can't rush evolution.

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