



Unintended consequences of innovation

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Executive summary – In many businesses, the push is on for innovation because it promises growth and competitive advantage. However, many managers and executives are uneasy about innovation because of the risks it entails.

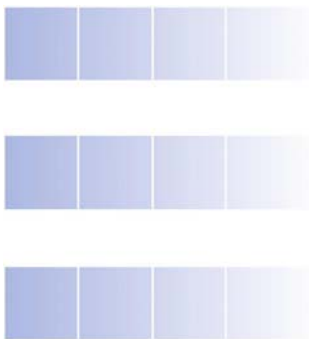
This Executive Technology Report is based on a personal essay by Peter Andrews, Consulting Faculty Member at the IBM Advanced Business Institute in Palisades, New York.

Usually, the risk of innovation is thought of in terms of *failure* and the loss of time, money and opportunity. These can lead to loss of prestige, erosion of profit and reorganizations. But history is full of examples where *success* in innovation has led to unfortunate and unintended consequences, too. Sociologist Robert Merton found that there were five reasons for unintended consequences:¹ ignorance, error, imperious immediacy of interest (I want what I want), basic values (this is the right choice, no matter what) and self-defeating prediction (awareness changes the context). While the last three are tied to attitude and intent, the first two actually can be countered with knowledge. What kinds of unintended consequences are out there to bedevil us (or make life better than we expected)? And what questions and exercises can help us to anticipate and prepare for these consequences?

Simulation example: Exploring the unintended consequences

Let's begin by looking at seven kinds of unintended consequences. For each of these, we will look at the classic instances and explore possibilities of ***simulation***, a technology that offers business new opportunities in development and collaboration.

1. *Side effects* – When aspirin gives you a stomach ache or you have an allergic reaction to penicillin, that's a side effect. A side effect of the plastic packaging that keeps food fresh is a disposal problem. Power plants light our homes and pollute our air. Most of these side effects were invisible or

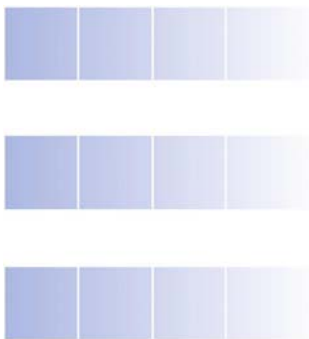




seemed unimportant in the face of “progress,” but now testing and environmental impact statements have become part of the effort to avoid and reduce side effects.

Looking at simulation, *reduction of social skills* (from too much mediated interaction) and *health consequences* (from sitting in front of a screen for hours) are expected side effects. It takes a closer analysis to imagine some of the attitudinal challenges, such as expectations that the real world will conform to hours of simulated experiences. (Think of Peter Sellers in *Being There*, frantically trying to change the real world with a remote control.)

2. *Alternative uses* – A scalpel can be used by a surgeon to heal or by Jack the Ripper to kill. E-mail can bring a picture of a new baby or a computer virus. Simulations, which have tremendous potential in training people how to handle disasters, manage a business or even learn how to learn, have already been used to train terrorists to fly planes and turn them into weapons.
3. *Amplification (scale)* – There were books before Gutenberg invented the printing press, but the sheer volume of printed materials essentially changed history. “Freedom of the press,” after all, has such a fundamental effect that it is written into the constitutions of many nations. What sort of effect on culture comes from millions of players participating in “massively multiplayer online gaming” (an estimated 430,000 in 2003 for EverQuest alone),² sharing simulations over the Internet? Suddenly, we have a large, networked population that has a common informal education. Might their shared experiences, social rules and values bleed over into the real world?
4. *Enablement* – Sometimes an innovation complements an old technology in an unexpected way or completes a puzzle that turns a bad idea into a good one. Create a rocket to bring science fiction dreams to life, and a bomb becomes more deadly. Add encryption to an e-commerce site, and people will make online purchases with credit cards. There are undoubtedly



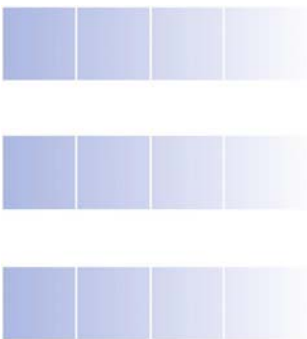


complex products with safety concerns that are just waiting for an easy, automated, verifiable means of training to reach a larger market. Simulation may be the missing puzzle piece.

5. *Different control points* – Photocopied Samizdats (self-published and secretly-distributed materials) helped organize opposition to the Soviet system, which had tightly controlled other forms of communication.

Many an impregnable fortress fell before cannons. And, there are many examples of manufacturers improving their processes until their products become commoditized, shifting the profits to other sectors (such as distribution and services). If simulation moves away from the development lab and play becomes part of work, will new interpersonal networking models and new qualifications for leadership emerge? Will small companies find vulnerabilities in large companies?

6. *Obsolescence* – Video may not have “killed the radio star,” as the Buggles declared in their pop song (MTV’s first music video broadcast in August 1981), but television certainly killed radio theater. Refrigeration put the iceman out of business. Only historians and archers know that a fletcher makes arrows. High speed, interstate highways took popular stops on the journey off the map. When an innovation is widely adopted, jobs, genres and whole towns may disappear. Simulation, along with cost controls and the arrival of “Internet natives” (kids who grew up digital), may marginalize traditional educators. If you can’t use the tools and you can’t coach or mentor, the clock may be ticking (or rather humming an electronic tune) on your job as a teacher.
7. *Ancillary business* – Fifty years ago, there were no Java® programmers, no Web producers, not even any computer scientists who called themselves such. No one networked computers or taught executives how to use them for business. But new, unexpected professions are just one piece of what happens when an innovation becomes pervasive. Think of the car washes, service stations and fast food restaurants that grew up





around the car and the culture it spawned. If simulations become a standard way to get an “edge” in business, we can expect add-on programs that help you track events, assemble portfolios on other participants and calculate the odds of success. We may have professionals who counsel us on different virtual roles to create, and when and where to reveal information about our virtual selves. Simulations may even become new venues for commerce (advertisements are already being worked into some games).

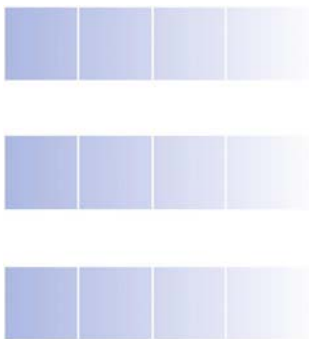
For each of these seven kinds of unintended consequences, you can probably come up with your own examples of each. (And reality being what it is, there probably are examples that don’t fit neatly under any single category.)

Exercises to uncover unintended consequences

The next step is discovering your own examples for innovations that are important to you. You may be able to simply make interesting and important consequences apparent by analogy. That’s fine, but the tendency is to see only the more obvious examples. To push things further, here are some exercises.

First, look at how people are likely to react. Who stands the most to lose if an innovation takes hold and how might they react? In England, the introduction of textile machines led to riots and, in some instances, laws against their use. It’s also worthwhile to imagine how a criminal might make use of a technology. This is easier said than done. It usually requires a deeper knowledge of the culture and motivations of malefactors than most of us have. Military and counter-terrorist units use “red team” methodologies to do this.

In addition to pushing the limits of the dark side, it is worthwhile to consider how people who are driven to solve current problems (environment, poverty, conflict) might use the innovation. The most dedicated people are highly motivated, even desperate to find new ways to make things better and will immediately look at any important innovation with that in mind. And, though they may want only good, “immediacy of interest” could lead them to come up with a solution that creates new problems.



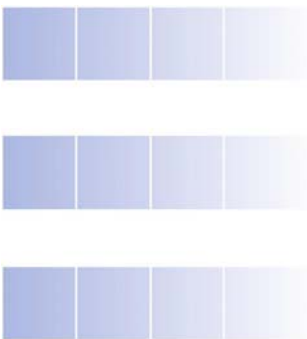


On a more pedestrian level, working out a “day in the life” of a typical user (or several likely users) can pay off in unexpected ways. Once you grab a chunk of their time with an innovation, what do they drop? If the innovation frees them from drudgery, how will they use the extra hours?

Looking beyond the users and the losers, you can take a closer look at the innovation itself. The drug industry does years of testing for each new pharmaceutical; could some creative testing help you know more about the innovation in question? How does the innovation match up with other innovations that are out there? Are there natural pairings? If timing is everything, how does the innovation fit into the emerging zeitgeist (the spirit characteristic of a time)? Does the widespread adoption of the innovation make anything – job, access, opportunity, turnaround – ten times easier or faster?

Perhaps the most interesting unintended consequences come when an innovation’s adoption creates or makes a material change to the infrastructure. This is like creating a whole ecosystem, where new life can flourish. With such a big change, everything cannot be anticipated, but you can do some exploration and, at least, understand the scope of possibilities.

Of course, it’s good to remember that unintended consequences are not always negative. The benefits to society of the individual selfish acts of capitalism – Adam Smith’s “invisible hand”³ – represent a positive unintended consequence. Luckily, the same questions and exercises that help you to discover threats may also reveal opportunities. And with more complete knowledge, the chances of unintended consequences – and the overall uneasiness of pursuing innovation – can be reduced.





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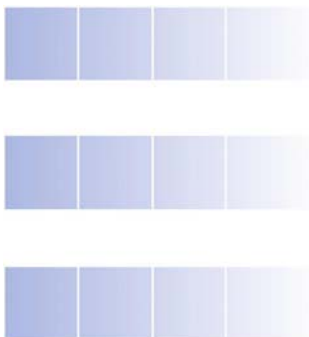
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About this publication

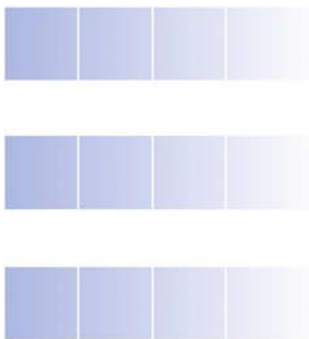
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KnowlEdge Management: Capturing a company's collective expertise wherever it resides – databases, on paper, in people's minds – and distributing it to where it can yield big payoffs

Pervasive Computing: Combining communications technologies and an array of computing devices (including PDAs, laptops, pagers and servers) to allow users continual access to the data, communications and information services

Realtime: "A sense of ultracompressed time and foreshortened horizons, [a result of technology] compressing to zero the time it takes to get and use information, to learn, to make decisions, to initiate action, to deploy resources, to innovate" (Regis McKenna, *Real Time*, Harvard Business School Publishing, 1997.)

Ease-of-Use: Using user-centric design to make the experience with IT intuitive, less painful and possibly fun





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