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YOUR WINDOW ON IBM INNOVATION

The many facets of complexity:
Unthinking complexity: Bypassing the simple solutions
Diffused complexity: Hiding the overhead
Chosen complexity: Insisting on intricacy
Layered complexity: Overflowing in-boxes

FEATURED CONCEPT

The many facets of complexity

A new Think Research series uncovers the causes of needless complexity and provides solutions

If a company's employees can't provide a reason for each task that they do; the value it brings to the business or customers; or how it connects with their jobs, then the organization is probably beset with needless complexity. And there's no doubt that the business will suffer because of it.

Sometimes complexity brings value

Obviously, not all complexity is bad. Some problems are inherently complex - chip design, weather forecasting and cracking the genetic code come to mind. And trying to simplify such tasks would lead to useless results - here's a very simple model that predicts the weather with 100 percent accuracy:

On any given day, the weather will include one or more of the following conditions: sun, clouds, rain, hail, sleet, snow, freezing rain and darkness.

While this model is completely accurate, its predictions aren't very helpful - a more complex model with a great deal of data as well as climatology expertise is necessary to get useful predictions. Fortunately, there's an

entire profession devoted to attacking this problem, and providing information that can be easily accessed by laypeople (on a TV, radio or Web site) and used to make decisions.

In the same spirit, IBM's Almaden Services Research group offers the first strategy for dealing with needed complexity: give it to an expert (even one outside the corporation, if necessary) to handle. Set up a group to deal with a complex problem, provide the necessary tools and data, and ensure that group members can talk sensibly about the problem with the non-experts who have to make decisions based on the results.

Sometimes, companies can avail themselves of a second option: technology. For example, a hundred years ago, owning and operating a car was an adventure. A driver had to be able to crank the engine, know how to diagnose and fix engine problems or even make his or her own spare parts. Cars weren't very reliable and driving at speeds of 40 miles per hour called for heroic efforts. Modern automobiles themselves are **far** more complex than they were in 1905, but the complexity is almost entirely hidden from the user, making the experience of managing the technology far simpler.

Sometimes complexity destroys value

Of course, not all complexity is necessary. IBM Research has identified four classifications of needless complexity:

- Unthinking complexity
- Diffused complexity
- Chosen complexity
- Layered complexity

Unthinking complexity

Unthinking (or localized) complexity is the most common kind of needless complexity. It arises when the person designing or implementing a system doesn't bother to look for simple ways of accomplishing a task, which creates more work. Some examples:

- A Web page that requires a reader to scroll to the top to click the "next page" link instead of duplicating the link at the bottom of the page
- A long list that is broken up into equally-sized segments instead of being accessible alphabetically or by date
- A system that shows all times in Eastern time, instead of converting them to match the user's time zone

The answer to unthinking complexity is simple: think about the user. IBM can help.

Diffused complexity

Diffused complexity bleeds value from the organization. It typically arises when a process that had been performed by specialists is pushed out to a broader group. The company usually does this to reduce overhead, but the fact is that the overhead doesn't go away, it just gets hidden.

A typical example of this: having professionals do their own copying to eliminate the need for copy center personnel. While this may make sense for occasional light-volume copying (especially if there's a copy machine nearby), it's a foolish economy to have an executive make 100 copies of a

presentation.

When an organization loses sight of the total cost of a process, there's a great danger of creating diffused complexity.

How does an organization avoid diffused complexity? Realize that self-service doesn't equal free - and that untrained people may be far less effective at a task than people who do it all the time. The second article in this series will focus on how to combat diffused complexity.

Chosen complexity

Some organizations seem to create complex solutions even when simpler solutions are available. IBM Research refers to this as chosen complexity. Some examples:

- Requiring employees to manually answer questions about their workstations' configuration when that same information is already being automatically collected
- Requiring daily tests to see if a process has been completed when the process can't be finished in less than a week

When someone has the temerity to ask "do we need to do this?" the answer is frequently "we've always done it this way", or, even worse, "we like to be extra-safe".

If an employee can't explain the purpose of a process to a newcomer, the organization may be the victim of chosen complexity.

How does a company combat chosen complexity? The first step is to develop and communicate clear statements of the value created by processes. Before adding to a process, review the reasons for performing the process and make sure the new step will add value. And above all, encourage employees to look out for processes and work items that stop making sense as the environment changes. The third article in this series will delve further into chosen complexity.

Layered complexity

Layered complexity may well be the most insidious form of complexity because it specifically attacks leaders - middle management and technical leaders - forcing them to spend their time doing trivial tasks instead of their real jobs (providing leadership, selling and delivering products and services and meeting with customers).

What kind of trivial tasks are these? A typical example is forcing middle managers to review and approve decisions already made by first-line management or employees - for example, by requiring two or three levels of approval for small-dollar purchases or travel.

Recognizing layered complexity is simple - just look for the key people in an organization who don't have enough time to get their work done. If their inboxes grow day to day, if they are always dealing with the urgent and rarely with the important, you've found victims of layered complexity.

What can be done about layered complexity? To identify its location, start by looking for choke points - roles that are involved in the steps to review, approve and handle exceptions from many processes. Fighting it is difficult - requiring that a company prioritize its processes and decide which ones are vital to the business and which ones are just nice to have and should

receive lower priority. Once the priorities are clear, management must eliminate or automate the less important processes. Or, even more radically, push down the ability to say "yes" instead of requiring many approvals - empower first-line managers and even non-managers. The last article in this series will explore layered complexity in more detail.

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Contact one of the experts below to discuss the ideas in the article or to see how IBM Research can help your organization:

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YOUR WINDOW ON IBM INNOVATION

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FEATURED CONCEPT

Diffused Complexity

Are costs being reduced, or just hidden?

The second article in a Think Research series that uncovers the causes of needless complexity and provides solutions.

Pumping your own gas is one thing. But what if a customer ordered a car and received a box of parts and a wrench in return for his or her money? Not likely, of course, but the truth is that it's not far from what some organizations do to their employees and customers under the banner of "saving money" or "user empowerment." IBM Research refers to this as **diffused complexity**, and it is an effective way for a company to pick its own pockets.

Sometimes complexity brings value

Self-service can be a powerful tool - one that yields lower costs and happier customers or employees. If a task is simple enough for an untrained person to do it in less time than it would take him or her to turn it over to an expert or an assistant, then it is an excellent candidate for self-service. Supermarkets provide the prime example of this principle, letting customers pick their own goods and, in some cases, even allowing customers to be their own check-out clerks.

Another example can be found in the long-forgotten steno pool. It used to be that very few businesspeople wrote their own memos or papers; instead, they would dictate and a trained professional would transcribe. The

executive would then read over the transcription and handwrite corrections; and after a number of cycles, the finished product would be mailed. The advent of the personal computer and word-processing software made this process a perfect candidate for self-service.

Sometimes self-service destroys value

But sometimes self-service can be a bad idea, especially if it ignores the cost differentials among roles in a company. If converting a task to self-service makes it require more of an executive's time than it did before, or if it blocks someone from proceeding until the task is complete, self-service may be a mistake.

One of the common motivations for making a task self-service is to reduce costs - after all, the organization no longer has to pay for the experts or assistants who used to perform the task. But the costs of the process don't go away - they just get diffused out to all of the people who are now forced to do the job, and those people may well be forced to spend time on trivial tasks instead of doing their real jobs. Or they may be unhappy at being forced to fend for themselves, which can be problematic if a company pushes a task onto customers without giving them a clear benefit in exchange.

Moving away from the steno pool model for creating documents, for instance, is one example of how self-service can sometimes work against the best interests of the company. While most businesspeople have learned to type and can create their own letters and reports, they often do not know how to effectively use the graphic capabilities of modern office suites to convey their key messages - instead, they create pages of bulleted text, small fonts, ill-chosen colors and busy pictures, all of which detract from the message they are trying to deliver. Because a document stays on the executive's desk until he or she is finished with it, there's the danger of over-improvement - polishing a document far beyond its value. And there's also the danger of bad quality - misspellings and grammatical mistakes may not be caught before delivery because there's only one set of eyes looking at the document (automated spelling and grammar checks help, but software is not perfect).

Amateur Experts

But, of course, employees are asked to perform duties that are much more complicated than creating their own documents and presentations - and much more fraught with potential problems and additional costs. For example, many companies are asking their employees to use online travel reservation systems instead of calling an agency or using an internal travel department. The stated goals of these systems include enforcing travel policy, encouraging cheaper flights and eliminating travel agency fees, but shifting this work to high-priced employees doesn't lead to cost-savings. It leads to diffused complexity.

This process decision seems like a simple way to save money, but making travel reservations can be a fairly complex task. There are, of course, some situations where everything is clear and the most convenient itinerary is also the cheapest - and online systems are ideal for such trips. However, many trips fall far below this ideal, and the traveler is required to juggle factors like these:

- Knowing when the system's suggested itinerary is unacceptable (whether because the price is too high or the connections are too

uncertain), and how to override it to get a feasible itinerary (such as when the times fail to meet business requirements)
- Figuring how to perform a ticket exchange for a cancelled or rebooked trip
- Choosing between alternative airports or routings

In one case that IBM Research's services consultants studied, the system offered only one choice for a trip between Phoenix and London - a $9,000 fare that required two plane changes, even though there was a $4,000 fare available with a shorter travel time. This trip required over an hour's work, including calls to the travel agency's help desk, to figure out how to book the cheaper fare.

The problem is that these systems are often deployed with very limited employee training - and that training is usually on how to navigate the system's menus, rather than on how to input the necessary information so the system can provide good options. And employees, who used to be able to rely on the expertise of the travel agent (both in eliciting the right information from the employee and in knowing what was reasonable and what wasn't), now have to spend time trying to coax the system into giving them acceptable itineraries and pricing.

Often, because employees do not access fares and other details on a daily basis, they may not understand or trust the system options. One common workaround IBM's services consultants have seen used by employees is to access a commercial travel site, such as Expedia or Travelocity, to investigate alternatives and determine if the corporate system is providing the best options. And, if an employee only travels a few times a year, then he or she has to relearn the system each time. Obviously, these are extra steps that add time and cost to performing the task.

IBM Research's experience indicates that companies that convert complex tasks like travel arrangements to self-service wind up with a large number of annoyed and unhappy employees - and this continues even after they have had time to learn the system. This is often due to the fact that the company only provides training aimed at the mechanics of the system, neglecting the additional information and knowledge people need to know to effectively perform the task. In the travel reservation example, this information could be alternate airport and hotel options, optimal routings and connection times through particular airports, and airline policies about changes and refunds. Companies should listen to the stories their employees are telling about such self-service systems.

Solutions

The fundamental law of diffused complexity is this: **spreading out costs doesn't make them go away**. The second law is also simple: **untrained people are expensive**.

These laws don't mean that distributing a process (and its costs) is always wrong; they do mean that companies have to be conscious of the burden they're putting on their employees and must communicate the value gained with them.

In light of these laws: In the supermarket example, the customers gain time because they don't have to wait for the clerk to help them pick out items, and they have the option of self-checkout or the traditional system. In contrast, the users in the online travel system example have to spend extra time and the trade-offs may make it possible that the organization has

actually lost value by implementing the system.

IBM Research's advice is simple: When designing a process, a company must consider the costs and value across the entire organization, not just the group that owns it.

Some of the factors to be considered include:

- Which employees would have to perform the process?
- What is the cost of their time (both direct cost and opportunity cost) compared to the cost of performing the procedure centrally or with specialists?
- What training will these employees need? Remember that they'll need to be able to understand the results the process produces, not just mechanically traverse the system menus. As a rule of thumb, employees will need to know the same types of things that a centralized group or specialists know today.
- Evaluate the new process after it has been deployed for three to six months. Listen to employees' stories with an open mind. Seek to understand the good and the bad. And be sure to ask how much time is now being consumed in comparison to what was consumed before. Don't be surprised if the cost equation has tipped in an unintended direction.
- Be prepared to take additional actions to remedy any ill effects from diffused complexity. Companies may need to train people on the underlying content, change policies, change the system, or rethink the entire process. If the company remains open to this kind of follow-up action, they are much more likely to reap true benefits.

If a leader must deal with diffused complexity, yet has no immediate control over it, one action to take is to identify specific people within his or her group who will become experts in that topic. Then, diffused complexity can be funneled to these people, or others can go to them for support when learning the process or if they are running into difficult challenges. To make this type of strategy work, the company will need to invest extra education and training into the designated subject matter experts (SMEs), and it may have to change some work responsibilities around to enable them to perform these tasks, but it can help reduce the overall cost and delays that diffused complexity is bringing to the business.

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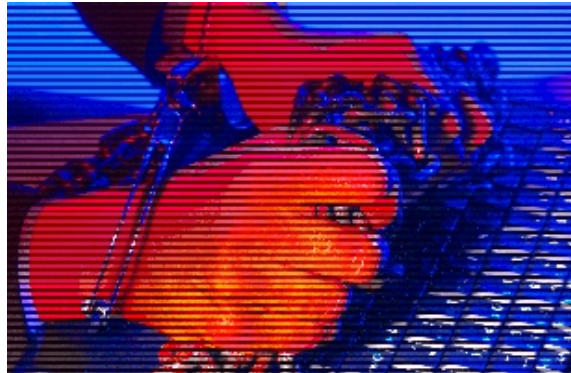
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The many facets of complexity:
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FEATURED CONCEPT

Chosen Complexity

Is the company choosing clarity or complexity?

The third article in a new Think Research series that uncovers the causes of needless complexity and provides solutions.

It's easier to add than subtract - and over time, processes often become more complex, but create no new value. Many companies fall into that trap, which means they are making choices that aren't optimal for their businesses.

Choices can destroy value

Organizations don't choose complexity by chance - instead, they create complex solutions and processes in response to attitudes like these:

Defending against all failures, previously encountered or imagined
  • Our services consultants see this in risk-averse organizations, and in parts of organizations where a key mistake may have led to great problems.

Preparing for every contingency, even if quite unrealistic
  • This can come from risk aversion, or may simply be related to a discomfort with anything unplanned and may relate to leadership or employees preferences.

Always seeking to make improvements

- This sounds like a good thing, but often these cultures do not think about the cost of those improvements in comparison to the value. This often exists in parts of the organization where precision is important, such as finance, accounting and legal.

Embracing complexity
- These choices don't help business; they hinder it. They burden everyone who executes the process forevermore, hiking up the total cost. And even more importantly, they squeeze out more important activities. They may even take away the ability to apply common sense.

Problems

Doing two things when one would suffice

At one client, IBM services consultants discovered a complex system for logging activities. This client's customer required that it be able to identify the employees who worked on each procedure of the products produced. So the employees were required to sign a log documenting their work procedures. Since this was a manual process, employees sometimes forgot to do it (and some employees "forgot" because they didn't understand why). Employees were also required to use a magstripe recorder to log their hours - and they were diligent about this, because it drove their paychecks.

There were several people on staff whose job included ensuring the completeness of these manual logbooks. They would compare the logbook to the time-recording system to determine if signatures were missing.

In helping this company to improve, the consultants asked: "Does your customer need signatures, or can you simply give them your time-recording records?" At first, everyone was sure that the signatures were required, but after a discussion with their customer, the logbook was retired. All along, they had made things more complex - all because they did not understand the requirement, and more importantly, had never asked.

Counting on miracles

At another client, IBM consultants discovered that a manufacturing process produced a substance that took five to ten days to cure. A test was required nightly to see if the substance was ready - but they tested every night, beginning with the very first night. When asked why, the classic answer came forth, "We've always done it this way." After a little fact-finding, they began testing on the fifth night, the earliest that the substance could possibly be ready.

Prioritizing deadlines over value

One organization fell into the trap of prioritizing deadlines over value. The company was integrating a purchased company into an existing business unit. They needed to communicate the career path process, and the two companies had very different ways of doing it. The team wrangled over how to deal with the issue, and then came up with an idea - they would merge the two processes together.

Unfortunately, neither process was simple, so the merged process was extremely complex. But the team had met their tight deadline. They

declared success and rolled the process out to thousands of employees.

Then the true cost became evident. First, the document to explain the process was 38 pages. Due to its size, most employees didn't take the time to read it. Meetings were held to explain, and re-explain, the new process. And since it was complex, groups began to interpret key aspects, often in ways that were inconsistent between groups. Many employees were required to resubmit their information - especially the employees who were diligent to meet the original deadline. It was not only a costly process roll-out, but one that penalized employees for doing what they were asked to do.

The examples above are, by no means, an exhaustive listing. Chosen complexity is lurking everywhere, from overlapping role assignments, to convoluted process hand-offs, to who interacts with customers and when, to an overabundance in product and feature offerings, to pricing schemes, etc.

Solutions

To some extent, susceptibility to chosen complexity is a cultural issue, which makes it complex at its core. It may require that companies rethink their business practices and IBM Research can help with that.

And companies can help themselves with a few steps:

1. Begin every project with an estimate of its dollar value for the company (i.e., How much is it worth to fix this problem, meet this need, do this work, etc.?). This may be difficult, but it is a helpful exercise to generate a target for designing total cost (including the cost of all employees' actions). Remember there is always an opportunity cost. Thinking of employee time as sunk cost (or worse, free) is a big step on the road to needless complexity.
2. Once the value of the project is established, be sure that the total cost doesn't exceed the value. Appropriately relaxing deadlines so that they don't get in the way of making the right decisions helps companies avoid creating complexity.
3. Be very clear about the value of a new project; specify the tangible and intangible benefits. This is important for communications and future improvements, as indicated below.
4. Communicate the value. This will help to ensure the rationale is sound. And it can help employees apply common sense and identify valuable improvements.
5. Review the value of a project before you make improvements. New employees often get involved and the institutional memory of the benefits gets lost. Companies should evaluate recommendations in light of their ability to enhance value while maintaining the cost/benefit equation identified in #1 and #2.
6. Encourage employees to ask, "Why?" People recognize unnecessary work and enjoy getting rid of it. Even so-called silly questions may be an indication that messages need to be re-communicated, or that changes in the environment have tipped the cost/benefit equation away from delivering value.
7. Plan to simplify - schedule periodic re-evaluations of processes and standards. Some things will need to be changed, and some things may have over-stayed their usefulness. In today's business environment, the value bar is constantly going up. Without "spring cleaning," companies build clutter, much of which will be chosen complexity.

If someone is handed chosen complexity and does not have direct control to change it, there may be relatively little he or she can do about mitigating its effects. The reason for this is that the complexity is built into the process and procedures people are expected to perform. The employee may be able to gain approval to go around certain process steps as conditions warrant, or he or she may have the latitude to develop another path through the process. Of course, if there are steps required for which no value can be expressed, this can help the worker justify these changes.

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Layered Complexity

Complexity chokes organizations

The last article in a Think Research series that uncovers the causes of needless complexity and provides solutions.

The time-consuming part of being a manager is not necessarily managing; it can often be the tangential activities that take up the hours of the day.

Most companies have layer upon layer of activities that managers are responsible for completing - approving IDs, tracking mobile phone accounts and other travel expenses, tracking and reporting system security, ensuring that employees have turned in necessary corporate documentation, and approving or reviewing small purchases. No wonder, then, that many managers feel less like people managers and more like bureaucracy managers. They are prevented from doing what they were hired or promoted to do.

Layers destroy value

These seemingly small things can add up to 150 e-mails per day, 10 to 15 phone calls and nearly endless meetings. This can severely limit the time a manager has to lead people and manage the core business of the company.

Another insidious side effect of all these process requirements is that each requires time that could be spent managing customer relationships, selling or delivering products and services or finding innovative ways to beat the

competition. When this is carried too far, the bureaucracy wins and the company loses.

Companies in this predicament are suffering from layered complexity, a situation where a number of trivial requirements are given to leadership from multiple directions without an understanding of the collective impact of those requirements. This can lead to a landslide of work - and more importantly, to choke points. Choke points are places within the organization where the people can't seem to get everything done because they are required to fulfill inbound work from too many processes. Although these choke points frequently occur in the middle management ranks, they can occur elsewhere as well.

Problems

Layered complexity is created when processes are initially designed, but even more commonly, when they are being redesigned to make improvements. There are several potential problems that can happen during this phase:

Assuming triviality: Processes need steps for reviews, approvals and exceptions, and companies typically want these steps to be performed by upline managers and executives to maintain control. Because there are relatively few of these steps and exceptions in an individual process, the designers think the time required of these people is trivial.

The problem is that there are many process designers thinking about these requirements in the same way - and they are often targeting the same levels of leadership in the company to perform the work. Because no one is thinking about the collective impact, these requirements simply roll onto people, choking out the work they are uniquely qualified to perform.

Assuming managerial oversight is vital: This problem stems from a dangerous assumption or belief - that managers have to be consulted on every decision. The implication is potentially disastrous: employees who feel less empowered and invested in their work, and who may not even fully complete the requirements, knowing that someone else will come to the rescue.

Assuming automation won't work: Process designers may be working in a vacuum and may not have a good sense of the relative worth of a particular process to the goals of the company. They may assume that their process is too important and requires too much intelligence to be automated. This approach creates a situation where managers are spending their time on tasks that aren't crucial to the success of the company (e.g., requiring manual reviews of all expense reports, no matter how small the amount). Taking into consideration the company's goals and the entire landscape of its processes is the only way to make sure that leaders' time is used most effectively.

Assuming everyone needs to approve: In matrixed organizational structures, there are often people who perform similar roles. In many situations, these roles need to coordinate their actions or decisions. For instance, in a situation where there is a client contract "owned" by one part of the business that is being staffed out of another part of the business, there may be at least two different teams of attorneys who care deeply about the implications of the contract and its execution.

In these instances, the process typically calls for these parties to get together to decide what to do. And they do that, usually after a series of scheduling delays that may complicate the problem even further. Then, each group debates the pros, cons, issues and problems - sometimes endlessly. This process may go on for too long because no one has full authority for the decision. They all have a piece of the action, but no one is (or feels) authorized to make a decision. Instead, they must come to consensus, often an almost insurmountable task.

When a company creates layered complexity, it has lost sight of the collective impacts of trivial requirements on the people who must perform the work. But even more importantly, it has lost sight of the real work it expects and needs for people to perform. Everything that someone is asked to do has an opportunity cost, and something much more valuable may be missed.

Why don't people simply prioritize correctly and do what is most important first and leave the rest for later? For various reasons, these trivial requirements often command an inordinate amount of immediate attention, typically because someone else is waiting - there is a built-in "nag" mechanism, human or automated, to ensure they get done. So even the best employees default to the urgent tasks and leave the important ones undone.

Solutions

IBM Research has identified some ways that companies can begin to find and root out layered complexity in their businesses:

1. Identify choke points. These are the roles that a company tends to defer to when requiring review, approval and exception process steps. The first clue may be the people who cannot seem to get work done, who complain about long hours and never-ending in-bound requirements, and who may go for weeks sometimes before answering important e-mails. Our experience is that there are typically two to three adjacent roles in the hierarchy that are choke points.
2. Review the work required by the people in these positions. If the work consists of many small tasks from many different processes, that's a sure sign of layered complexity.
3. Prioritize processes and make choices between them. Controls are important and necessary, but where companies go wrong is that they prioritize these controls over the principal work of the business. Generally, the processes that enable a business to earn a profit are the highest priority. Once a company has prioritized processes, it can review the work required by each of them with a more balanced view.
4. Rethink the steps that are doled out from each of the processes in light of the process priorities and the opportunity costs for the choke point positions. Can some of these steps be eliminated altogether? Can other steps be automated? Can some be delegated to lower level employees? But be careful to eliminate choke points, not simply move them.
5. Think through the timing of various process requirements to avoid the bunching problem. If the end of the quarter is a particularly busy time for key players, then move necessary administrative requirements to other times of the quarter. Companies should learn to exercise the amount of control that they do have.
6. Clarify who has approval power with steps that require multiple players. Minimize the steps that require multiple roles since it tends

to delay action and leads to each player looking to the other to take the responsibility for the ultimate decision.

7. Managers themselves can make a difference in their own workloads even if the underlying cause of the complexity is not addressed. The most important action for them is to delegate as many of these tasks as allowed by company policy.

IBM Research can help - contact Sara Moulton Reger (moulton@us.ibm.com) or David Singer (singer@almaden.ibm.com).

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Contact one of the experts below to discuss the ideas in the article or to see how IBM Research can help your organization:

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