REAL INNOVATION

TIMELESS TECHNIQUES FROM THE AUTODESK INNOVATION GENOME PROJECT

BILL O'CONNOR

Is there such a thing as an "Innovation DNA"? Are there timeless principles that innovators have applied for thousands or even millions of years to create the things that have shaped our world? If so, how can we discover and use these principles to make our own work more innovative?

These were some of the questions we were wrestling with back in 2011 in the San Francisco offices of Autodesk, a design software company based in Silicon Valley. It was questions like these that inspired us to embark on a ten-year project that would take us back to the earliest origins of innovation—which we estimate to be 3.5 million years ago, starting with the remarkable innovation known as the stone hand axe—in search of what we now call the Innovation Genome.

INNOVATION: A TOPIC AS URGENT AS IT IS FUZZY

So, why the interest in innovation at Autodesk? It was simple: many of Autodesk's best customers—20 million designers, architects, engineers, and digital artists from 160 countries—had become intensely focused on the topic, and they were constantly asking us all kinds of things about innovation: Do we know what it really is? Do we know how it's done? Do we actually know how to do it at Autodesk? How does Silicon Valley innovate? And the kicker, the most important question: Could we help them become more innovative?

Our customers, who create the buildings and bridges, consumer products and industrial machines, as well as the games, TV shows, and feature films we see all around us, must be innovative if they are to succeed, and because Autodesk was the company creating the complex technologies that enabled them to do their work, they quite reasonably assumed that Autodesk would have some answers to these important questions.

The thing was . . . we usually didn't.

Now, that's not to say we hadn't done a lot of careful thinking about innovation; of course we had, as demonstrated by the many innovation-related presentations Autodesk executives had been giving at conferences and other industry gatherings.

THE SEARCH FOR REAL INNOVATION

Our executives started making these presentations in 2006, when Carl Bass took

over the company's CEO role. Over the next five years, Carl had given a good number of high-profile talks about innovation, which I helped him prepare in my role as his speechwriter. I also had been working with Autodesk's chief technology officer Jeff Kowalski and vice president of strategy Jon Pittman on their innovation talks—and I had even started giving these presentations myself.

By 2011, Autodesk had earned a pretty good reputation for our perspective on innovation. We had defined innovation, explored it, debated it, and offered our perspectives on it hundreds of times in our presentations—and, in the process, we had addressed all of the now well-known topics in the innovation canon:

- What is innovation?
- What's the difference between invention and innovation?
- Should we focus on breakthrough innovation or incremental innovation?
- Is innovation a cultural phenomenon or an individual achievement?
- What processes should organizational leaders implement to inspire innovation?
- How can we measure innovation?

Almost Useful: The Innovative Continuum

Along the way we had created some interesting concepts, like the Innovation Continuum, which demonstrates the useful insight that every innovation goes through five distinct phases:

1. First, the innovation is impossible, meaning no one has ever before done or created it.
2. Second, it becomes impractical, meaning the innovation now exists but is available only to a select few.
3. Third, the innovation becomes possible, meaning it has become ubiquitously available and is a true innovation because it has had a significant impact on the world.
4. Fourth, it becomes expected, meaning it has become commonplace enough that, while still valuable, it is not surprising or novel any more.
5. Fifth, the innovation becomes required, in that it has become a fully integrated part of the world landscape.

I developed the Innovation Continuum—which presents the full journey from something being a wild idea (impossible) to being a fundamental part of the world (required)—with fellow Autodesker Jim Awe in 2009. This was a great example of our work on innovation around that time: after five years exploring the concept and engaging with customers and audiences all over the world on the subject, we had become adept at helping people think about innovation. However, we hadn't yet cracked the code of how to help people actually "do" innovation.

ABOUT THE AUTHOR

Bill O'Connor is Autodesk's Innovation Strategist, and Founder of the Autodesk Innovation Genome Project.

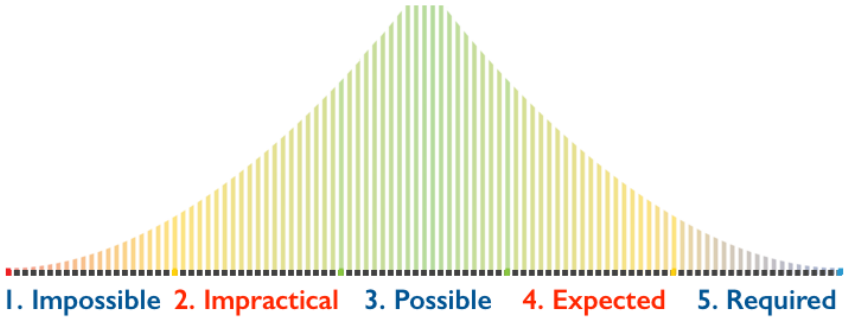

Figure 1. The Innovation Continuum

The Dreaded Curse of IBNU—"Interesting But Not Useful"

By the spring of 2011, Autodesk had become what I would eventually describe as "IBNU"—Interesting But Not Useful. People would listen to our presentations about innovation and comment on how interesting they were, but I would think to myself, "Well, okay, I'm glad you liked the presentation, but I don't think I've given you a damn thing that can actually help you to become more innovative." Basically, we were offering some compelling words, images, and concepts about innovation, but they weren't providing any practical help with the task itself—it was kind of like spending the whole summer talking about surfing without ever getting in the water.

So the next question was, how do we get beyond IBNU and start to develop insights and techniques that will help people become more innovative? Where can we look for real-world inspiration and information about this elusive topic? We came up with three answers to that question.

The Autodesk Ecosystem as a Source of Innovation Information

The first answer was to look at the work we were doing at Autodesk and with our customers—from 3D printing and robotic systems to generative design and artificial intelligence—as a source of real innovation. And by real innovation, we weren't referring to the kind of "innovation poetry" that makes up about 90 percent of what we might archly call the "Innovation Industrial Complex." No, we were talking about the exact opposite of that kind of purely theoretical work, and we had defined innovation/real innovation as "the art of establishing something new or different out in the real world that has a significant impact." At Autodesk we had been exploring dozens of innovative projects for the previous five years, which gave us a valuable context for the methodology we would eventually create.

The Innovation Secrets of Silicon Valley

Our second source for insights about innovation was Silicon Valley, that famous epicenter of technology, startups, and innovation situated in the San Francisco Bay Area. We started looking for innovation patterns that made Silicon Valley different (see Figure 2) and were able to infuse our innovation work with the spirit and best practices of our home town.

Figure 2. The 7 Innovation Secrets of Silicon Valley

3.5 Million Years of Innovation and Inspiration

Our third answer to the question of how to go beyond IBNU was somewhat counter-intuitive, but it ultimately proved both interesting and useful. We knew that the innovation work we'd been doing at Autodesk, and the work being done by other Silicon Valley innovators, would give us two good innovation datasets. However, we soon saw that our scope would need to be broader, and certainly go beyond the realm of technology, if we were to achieve our stated objective of creating bona fide innovation techniques.

We realized that to identify the timeless universal principles of innovation we would have to do a little intellectual time travelling—all the way back to the very first innovation in human history, some 3.5 million years ago.

INNOVATION: IT'S MORE THAN TECHNOLOGY, AND MORE THAN 30 YEARS OLD

Why peer all the way back to the dawn of history for innovation insights and techniques?

Autodesk and Silicon Valley were both rich sources of information about innovation. However, we recognized that, because both are based on technology, focusing our efforts entirely on those two sources would ultimately be very limiting and would blind us to, or cause us to devalue, innovations that were not technological per se or not somehow related to technology.

We also realized that it would be difficult to identify any new universal principles of innovation if all we did was focus on what everyone else in the innovation world was focusing on, which was primarily the past 30 years of technology.

In other words . . . Silicon Valley.

We started to realize that, because we were smack in the middle of the global

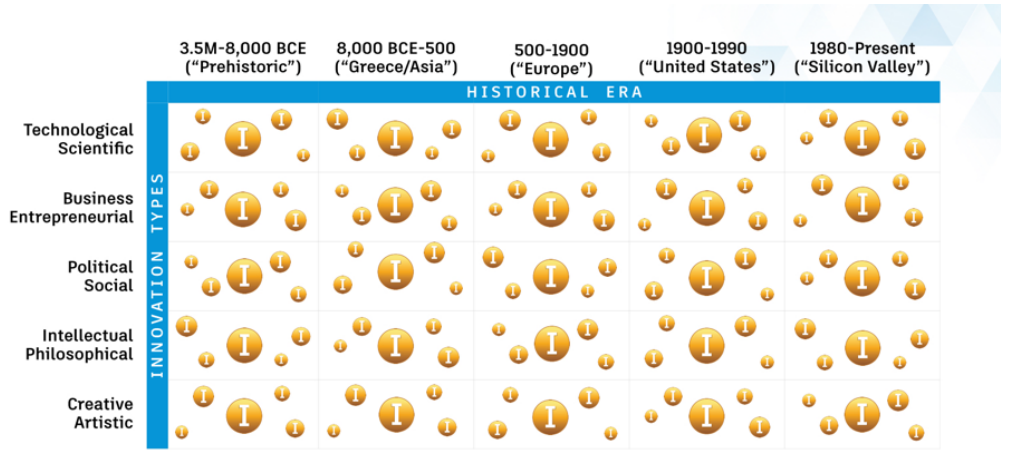

Figure 3. Innovation Genome Research Parameters

center of technological innovation, we were subject to the preconception that innovation and technology are quasi-synonymous, which isn't true. Most of the recent literature on innovation—focused as it was on people like Steve Jobs and Mark Zuckerberg, and on companies like Google, Twitter, and Airbnb—featured relatively recent technological innovations, but that was just part of the picture, because real innovation goes back much further, and runs much more widely, than we usually assume.

Fortunately, if we learned one thing about innovation from the research we did during our IBNU phase, it was that the origin of real innovation goes back not decades or even thousands of years, but millions of years. Moreover, the full dataset of real innovation is much wider than that of technology alone, which is actually just a subset—albeit an important one—of innovation.

Innovation is 3.5 million years old—a far cry from the limited lens we often use to frame this topic in Silicon Valley. Acknowledging this, we decided to cut the Gordian Knot of technological determinism by selecting and studying what we considered to be the one thousand greatest innovations in human history, and to use that list of human achievements as our guide for developing practical and robust innovation techniques.

The Five Kinds of Innovation

The next challenge we faced was how to determine the thousand greatest innovations. To address this challenge, we—and by "we" I mean myself plus a small army of MBA students and undergraduates from UC Berkeley and Hult—created a grid that delineated five phases of human history (see Figure 3) and, to avoid weighting the list too heavily in favor of technology, five types of innovation:

1. Technological/Scientific
2. Business/Entrepreneurial
3. Political/Social
4. Intellectual/Philosophical
5. Creative/Artistic

This "time/type" grid enabled us to select and study innovations that were not primarily technological, such as the theory of evolution, cubism, the corporation, democracy, labor unions, open innovation, logic, etc. We selected our first 200

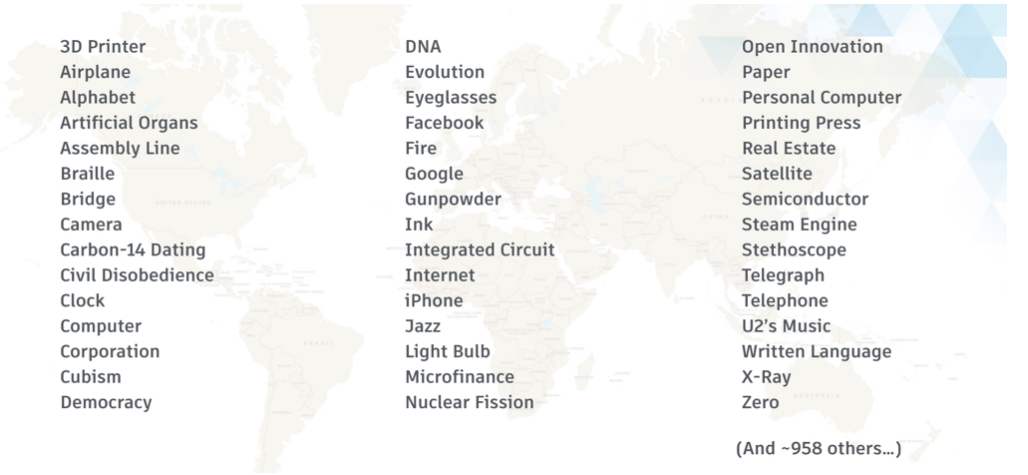

Figure 4. Greatest Historical Innovations (42/1,000)

innovations, 42 of which are shown above. As we developed this list, we realized that a new corollary was starting to come into view, one that reinforced our previous decision to study the full range of innovation. The idea was that the wider the range of innovations we studied, the more robust and universally applicable the techniques derived from those innovations would be. That idea turned out to be not only initially promising but ultimately true.

In other words, we posited that, if we were to study not only how technological innovators like Edison and Jobs approached their work but also innovators such as Aristotle, the Beatles, Adam Smith, Georgia O'Keefe, Orson Wells, and Benjamin Franklin, the techniques we developed would be of greater practical use because they would have been drawn from a more universal source.

With this basic framework in place, we started studying our selected innovations one-by-one, looking for any salient patterns we thought could lead to insights and, eventually, techniques for real innovation. At some point we realized that we were instinctively creating a kind of "innovation genome"—that our systematic study of the full realm of innovation was being done in the spirit of the investigations that had led to discovery of the Human Genome, as well as the "music genome" that powers the music service Pandora and other, similar, genome-esque projects.

Early Epiphanies: Some Essential Principles of Innovation

The grid shown in Figure 5 (see following page) presents one of the first analyses we conducted of our list of historical innovations. It lists the innovations vertically, with a series of six "innovation questions" that we started seeing everywhere displayed across the top. These six principles were specific ways of looking at the status quo that had historically led to breakthrough innovations:

1. **Look:** What can we look at differently?
2. **Use:** What can we use for the first time or in a new way?
3. **Context**: How can we look at the status quo in a new context?
4. **Connect:** What can we connect that is currently disconnected?

Innovation	Era	Look	Use	Context	Connect	Change	Create	TOTAL
Agriculture	P1	0	1	1	0	1	0	3
Calendar	P1	0	0	1	1	1	0	3
Cave paintings	P1	0	1	0	1	0	1	3
Cheese	P1	1	0	0	0	0	1	2
Fire	P1	1	1	0	1	1	0	4
Money	P1	0	1	0	0	1	1	3
Religion	P1	1	0	0	1	0	1	3
Rope	P1	0	1	1	1	1	0	4
Spear	P1	0	1	0	1	1	0	3
Wheel	P1	1	1	1	0	1	1	5
Written Language	P1	0	1	1	1	1	1	5
Abacus	P2	1	1	0	1	1	1	5
Aqueducts	P2	1	1	1	1	0	0	4
Arithmetic	P2	0	0	0	1	1	1	3
Bridge	P2	1	1	1	1	0	0	4
Cataract Surgery	P2	0	0	1	0	1	1	3
Democracy	P2	1	0	0	0	1	1	3
Glass-blowing	P2	0	0	1	1	1	1	4
Ink	P2	0	1	0	1	1	0	3
Paper	P2	0	1	0	1	1	1	4
Pulley	P2	0	1	1	1	1	0	4
Toilet	P2	1	0	1	1	1	1	5
Battery	P3	1	0	1	1	1	0	4
Darwinism	P3	1	1	1	0	1	0	4
Fireworks	P3	0	0	0	1	0	1	2
Light Bulb	P3	0	0	1	1	1	1	4
Mechanical Clock	P3	1	1	1	1	1	0	5
Navigational Compass	P3	1	1	0	1	1	0	4
Printing Press	P3	0	0	1	1	1	0	3
Radioactivity	P3	1	0	0	0	0	1	2
Refrigerator	P3	0	1	1	1	1	0	4
Telephone	P3	0	1	0	1	1	0	3
Zero	P3	1	1	0	1	1	1	5
Airplane	P4	1	1	0	1	1	0	4
Artificial Kidney	P4	1	1	0	1	0	0	3

Figure 5. The Innovation Genome

5. **Change:** What can we change, alter, or redesign?
6. **Create:** What can we make that is truly new?

Once we had identified these questions as being ubiquitous in the history of innovation, we decided to go deeper and find out more about them—for example, which of them had been asked most frequently, which had had the greatest impact, etc.

We discovered that one reason these questions were so powerful was that they offered would-be innovators natural pathways out of the status quo and led the way to what we could call the "status novo." Starting with that very first innovation from 3.5 million years ago, a specific set of questions have always been asked, explicitly or implicitly, in the pre-innovation stage of any innovation to arrive at the post-innovation stage. Put another way, the river between "what is"

Figure 6. Autodesk Innovation Genome Engagements

and "what could be/should be" has always been be bridged by asking this specific set of questions.

Identifying these potent innovation questions was the first tangible output of studying the historical innovations, and over the next six years we got into kind of a groove where we would select a new set of innovations (usually 50 or 100 at a time), analyze them to identify useful (and often undiscovered) patterns, and derive techniques from those patterns that people could use to do real innovation. Out of this process we developed a cohesive innovation methodology comprised of five specific and interdependent innovation techniques, which we now call the Five Essential Innovation Techniques.

It should be noted that this project, as it evolved, was far from some kind of intellectual exercise or purely theoretical exploration. In fact it was much the opposite of that—it was a search for insights that would lead to practical and powerful innovation techniques. Autodesk's location in Silicon Valley/San Francisco was invaluable in developing techniques that would actually work out in the real world, because whenever we did a very first version of a particular technique, we were able to test it instantly in the "living laboratory" of Autodesk's SF offices, which included the Autodesk Gallery, a kind of design museum that showcases our customers' work and our own fledgling innovations. This location, plus a steady flow of customers from around the world who were coming through the gallery to talk with us about innovation, gave us the ideal environment in which to test, refine, and perfect the innovation techniques we were developing.

Between 2011 and 2017, we presented the latest research and techniques from the Autodesk Innovation Genome Project approximately 450 times—with two particular Autodeskers, Chris Tisdel and Jana Hildebrand, playing critical roles in the development of the project—to a wide-ranging set of customers and organizations, including the following:

- Many of Autodesk's largest, most important customers, generally companies in industries that are strategically important to us and have annual revenues between $2 billion and $75 billion
- Some of the leading technology companies in Silicon Valley/San Francisco, such as Tesla, Google, Twitter, Facebook, Airbnb, Rocketspace, and LucasArts/ILM
- Government and military organizations, such as the U.S. Department of Defense,

Figure 7. Five Essential Innovation Techniques

U.S. Navy, U.S. Air Force, the White House Presidential Innovation Fellows, as well as officials and political leaders from more than 50 countries. (See Figure 6 on the prior page for a selected list of companies.)

Each presentation gave us a golden opportunity to hone our techniques, especially when we applied them directly to customers' specific projects and challenges. I believe that this combination of wide-scope research, plus the ability to consistently test and improve our techniques with real people working on real projects, is what has enabled the Autodesk Innovation Genome Project to have the impact it has had to date.

INNOVATION: WHAT IS IT AND HOW DO YOU DO IT?

Having established the context for our work, we can now turn to our definition of innovation, and then to the five-step methodology we developed for doing real innovation.

In our attempt to go beyond IBNU and create useful techniques, one of the first things we did was to determine our own definition of innovation: "Innovation is the art of establishing something different or new in the real world that has a significant impact."

To create our definition, I started by researching about 75 other definitions. There are several reasons why we define innovation as we do. First, we consider innovation an art, not a science, as it cannot be accomplished through purely logical means. Creating "something different or new" requires imaginative, nonlinear, and often counter-intuitive thinking. Moreover, because our goal is to establish an innovation "in the real world," we have to think beyond product specs, business plans, and other classic elements of "business as usual," and instead focus on the holistic question of what kind of different or new experience could we create that people would actually embrace? To do that successfully, we have to combine traditional left-brain approaches with right-brain elements, such as instinct, passion, creativity, etc., otherwise we're likely to end up with an invention (i.e., not an innovation) that, even if it is different or new, can't be established in the real world, and thus ends up having no impact.

Our definition also states that innovation is about establishing something "different or new," because many innovations are not new, strictly speaking, but a new combination of existing ideas, things, components, inventions, etc., whose new arrangement creates the innovation.

This definition sets us up for success as we work to create real innovation because, as we set our sights on establishing something in the real world, we have to take into account all the factors involved in doing so—left-brain, right-brain, and everything in between.

THE FIVE ESSENTIAL INNOVATION TECHNIQUES

With the above definition as our foundation, let's look at the five-technique innovation methodology. To develop these techniques, we took our current understanding of the 350 innovations we've studied thus far and distilled it into a simple methodology that anyone can understand and use. Here are the five essential innovation techniques that have been employed for millions of years by our greatest innovators:

1. Visualize the innovation environment
2. Develop innovation targets
3. Generate innovation ideas
4. Prioritize the innovation ideas
5. Create innovation projects

Innovation Technique #1: Visualize the Innovation Environment

The first technique is to sketch out your innovation landscape to create a kind of "aerial view" of the areas in which you might have an opportunity to innovate. This visualization starts with four essential building blocks—company, customers, competition, and context—and then lets you map out key elements in each of these areas, as well as connections and lines of influence that illustrate valuable interrelations.

In our research and in the application of these techniques, we've found that if you don't start with a visualization you will most likely miss significant areas in which to explore opportunities for innovation. At Autodesk, for example, some of the most important "neighborhoods" of our own current innovation landscape include:

1. **Cloud Services/Subscription Business Model:** Transitioning from our traditional desktop software delivery method and our traditional perpetual license business model to an offering that "lives" in the Cloud and is available by subscription.
2. **Generative Design:** Moving from "telling the computer what to do" to "telling the computer what we're trying to do," which means that we give the computer inputs and it gives us many design options in return, which we then curate into (ideally) the best possible design.
3. **Additive Manufacturing/3D Printing:** Technologies that are fundamentally changing the way we make things.
4. **The Internet of Things:** The process of integrating sensors into the things we create, thereby connecting them and blurring the line between products, services, and experiences.
5. **Artificial Intelligence:** The ongoing development of increasingly intelligent machines, which are getting better and better at doing things that were once the provenance of humans (only).
6. **The Future of Work:** A holistic examination of all of the above, plus many more trends and technologies that are shaping the fundamental nature of human work.

One final point about this first technique: visualizing the innovation environment isn't a one-time event; it should be constantly updated to reflect the changing landscape in which you're trying to innovate. Moreover, a fully visualized innovation environment is the launch pad for the second technique, the

development of innovation targets, as described below.

Innovation Technique #2: Develop Innovation Targets

The second step is to use the map of your innovation environment to generate what we call innovation targets. These targets are carefully crafted sentences, each of which outlines a specific area in which you think your innovation could be easily applied. For example, you might create an innovation target around leveraging the emerging power of the Internet of Things for your company, as we've done at Autodesk.

Your target could also be an audacious goal, like launching three radically different products within a year or doubling your revenues within, say, six months. The outsized ambition of such goals has a two-pronged benefit. First, just the act of creating innovation targets starts separating you and your organization from the competition, which is essential for innovation. Second, whether or not you actually hit your specific innovation target, the ideas you will generate by trying to hit it will always yield different, and definitely wilder, ideas than would come from a more conventional target.

We usually help people generate three to five innovation targets, and then take them through the rest of the process, one target at a time. Here are some of most powerful innovation targets we've used over the past six*f* years with some of Autodesk's most strategic and/or largest customers:

- How can we complete all of our projects in half the time with no decrease in quality or creativity?
- How can we incorporate generative design into 25 percent of our most important projects within the next month?
- How can we create a foolproof way for the poorest women in the world to save money for their children?
- How can we radically increase the amount of measurable innovation we achieve?
- How can we identify and hire 50 brilliant young people over the next two years?

After generating these targets, the company works on them systematically, using the next three steps in the process. My sense at this point, based on five years of innovation consulting, is that a large, complex organization should be working on approximately 8-12 innovation targets at a time, and that the discipline of identifying, developing, and acting on innovation targets will be a key success factor in the future, especially as automation and artificial intelligence make it easier to instantiate bold new ideas.

Once the innovation targets have been identified, we can move through the rest of the process, which is to take each of the targets, one by one, through the phases of innovation ideas, innovation prioritization, and innovation projects.

Innovation Technique #3: Generate Innovation Ideas

The third step is to generate innovation ideas, starting with a specific innovation target. In studying innovation systematically, we have identified specific questions that, when applied to a particular innovation target, generate a tremendous range of new and different ideas. After we generate them, we develop them, combine them, and look for the strongest ideas or sets of ideas possible.

Although this technique is the third in the methodology, it's actually the first we came across in our research, speaking purely chronologically. Early on we saw

that the fundamental "DNA" of even the most disparate innovations—fire, democracy, steam power, Twitter, etc.—often included the exact same set of questions that, explicitly or implicitly, had been the driving force in moving them from the pre-innovation state to the post-innovation state. In addition, we discovered that every innovation we studied had between two and four critical innovation questions embedded in it. We eventually compiled a list of about 60 questions that had been asked throughout history by the people who were doing real innovation.

Discovering this consistent set of questions was an exciting development, because it was the first thing we found that we thought might be part of the true genome for innovation. The only problem, as we quickly realized, was that handing someone a list of 60 questions was not a practical way to help them innovate—especially in today's fast-moving world.

To test our list of questions against the reality of the workplace, we created what we called the "9:17 AM Principle," which was based on this scenario: "Okay, it's 9:17 AM and your arch rival/biggest competitor has just launched an incredible product that is going to impact your sales and even possibly your corporate strategy (something like the iPhone or the Tesla). You are the person responsible for the product that this new arrival is attacking, and your CEO just emailed to say that she wants you to present a response to her by 2 PM the next day." In such a situation a person needs innovation techniques they can use quickly and efficiently, which rules out the list of 60 questions.

We kept shaking that list to see which questions would fall out and which would stay high up in the conceptual tree. We eventually pared it down to 50 questions, then 28, then 14, finally arriving at the following seven questions, which we just couldn't reduce any further and didn't feel we could improve upon.

For any innovation target you're focused on, you ask:

1. What could we look at in a new way or from a new perspective?
2. What could we use in a new way, or for the first time?
3. What could we move, changing its position in time or space?
4. What could we interconnect in a different way, or for the first time?
5. What could we alter or change in terms of design and performance?
6. What could we make, creating something that is truly new?
7. What could we imagine to create a great experience for someone?

We created this version of the innovation questions five years ago, and they have been used successfully hundreds of times by companies from a wide range of industries and countries around the world.

This technique sounds simple, and to some even simplistic, but it's not. When you start with a good innovation target and ask these seven questions, the result is a set of ideas that is greater in volume, quality, and creativity than anything I can generate with the techniques I have known and used for years. This is significant to me because I'm "innovation geeky" enough to know that I've run about one thousand innovation/strategy/brainstorming sessions in my 20 years in Silicon Valley and have assembled a pretty big bag of tricks over the years. I don't think it's an accident that this technique gets results that are so much better than average—after all, it was literally derived from the practices of hundreds

LOOK	HIGHER What could we look at from a higher level?	REVERSE What could we reverse or look at inversely?	VALUES What values could we switch? (Bad/Good)	KID How could we look at this like a kid would?	IGNORE What could we ignore that everyone "knows is true?"	HOLISTIC How could we look at this in a more holistic way?
USE	LEVERAGE What could we leverage better, or for the fist time?	FOUNDATION What could we use as a foundation for something else?	SUBSITUTE What could we substitute for something else?	ASPECT What new aspect of something could we use?	APPLY What could we apply in a new way or context?	CHANGE What could we change and then use differently?
MOVE	IMPORT What could we import from another field or realm?	REARRANGE What could we rearrange or reconfigure?	REPLACE What could we replace with something else?	REMOVE What could we remove altogether, to help us streamline?	SPEED What could we speed up or slow down?	FREQUENCY What could we make happen more/less frequently, or at different times?
INTERCONNECT	POWER What could we use to power something else?	COMBINE What things could we combine to make a new thing?	NETWORK What could we turn into/ make more like a network?	TRANSPARENCY What could we make more transparent, connecting us with more information?	OPEN What could we make more open to enable co-creation?	PARTNERSHIPS What people or groups could we form new partnerships wth?
ALTER	QUALITY How could we radically increase equality?	DESIGN How could we change/ improve design?	PERFORMANCE How could we change/ improve the performance?	AESTHETICS How could we make this more beautiful, improving the aesthetics?	EXPERIENCE How could we improve the overall experience?	STANDARDIZE What could we standardize/align/unify to make things better?
MAKE	PROCESSES What new processes could we create?	MEANING What new meaning could we create/infuse?	HARNESS What could we harness to make something new?	INSTATIATE What could we instantiate into something new?	FUNCTIONS What new functions could we create?	SPECIALIZE What could we make more specialized, and discussed?
IMAGINE	AMPLIFY What could we amplify or increase?	EASIER What could we make easier, or more fun?	NEGATIVES What negatives could we get rid of?	CRAZY What crazy idea could we try that just might work?	SCI-FI What could we learn from Sci-Fi ?	TRY What could we just try, to see what happens?

Figure 8. The 7/49 Innovation Questions

of innovation geniuses over the past 3.5 million years.

At this point, one obvious question is, "What about all those other innovation questions?" As we simplified the original list of 60 questions down to the essential seven, we also saw the next layer of the innovation questions where, for example, if you've already asked the "look" question you can go deeper by asking six other questions, which are all different ways to look at things differently.

Figure 8 above displays six specific ways to ask the seven general innovation questions listed above, for a total of 49 questions. Each of the 49 questions will help you generate different innovation ideas than each of the others. So, in the phase where you're generating innovation ideas, you can choose to use only the seven questions, or include some or all of the 49.

So, to recap: once you've (1) visualized the innovation environment, (2) developed some innovation targets, and (3) generated a range of innovation ideas for a specific target, it's time to prioritize those ideas and decide which to pursue. A session with the innovation questions usually results in about 50 ideas being posted on the board; out of those ideas, 50 percent to 80 percent will be new ideas. Prioritizing new and potentially innovative ideas is particularly difficult because, frankly, organizations are pretty bad at prioritizing in general, let alone when facing ideas that are new, startling, imaginative, etc.

To address this challenge, we looked to innovation history, and also to the somewhat odd (but also cool) practice of startup competitions. When I serve as a judge in these competitions, usually in Silicon Valley, I usually vote against a startup team for one of two reasons—and sometimes both:

1. One is that their idea isn't wild enough, meaning it's not different, surprising, imaginative, creative, etc., which in turn means it's not likely to give the customer a "Wow!" experience—or the competition an "Uh-oh . . ."
2. The other is that their idea isn't worldly enough, meaning it's not sufficiently grounded in the dynamics and conditions of the real world, and is therefore just not that doable.

With these reasons in mind, we decided to reverse-engineer this double-failure

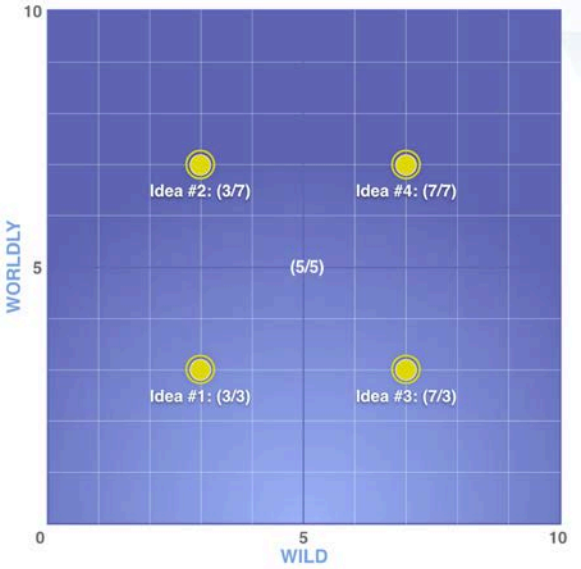

Figure 9. Innovation Prioritization

metric and switch it around to be a double-positive metric—something that would measure both how wild and how worldly an idea was—and therefore, how "high priority" it was (see Figure 9).

Innovation Technique #4: Prioritize the Innovation Ideas

We start this phase of the process by asking two questions about every idea: how wild is it, and how worldly? By wild we mean how different it is, how surprising, how radical, and what potential it has to change things in an impactful way. By worldly we mean how practical and how doable it is—in other words, how realistic it is to attempt the idea. The group votes on each idea by a quick show of hands and, based on the results, we look for the highest ranking ideas. For example, a 7/7 idea is one the group has ranked as relatively wild and relatively worldly—in short, an idea worth serious consideration.

Four ideas are shown in the sample rating chart above, each schematically representing its specific quadrant:

1. Rated a 3/3: This kind of idea has limited "wildness" and is also fairly hard to do. We don't adopt ideas in this quadrant because there are better ones to consider.
2. Rated a 3/7: This idea is kind of boring or unimaginative, but it's easy to do. This is the kind of doable but blah idea that passes for innovation in many organizations. Ideas like this are also often classified as incremental innovation. It's hard to make a boring idea more interesting, so we give these ideas limited consideration.
3. Rated a 7/3: This idea is very wild but not very worldly—not yet. This quadrant is a great place to look for innovative ideas because, with targeted brainstorming, we can make it more practical so it can move to the upper-right quadrant, which is where we want our ideas to be. This quadrant is usually where corporate innovation goes to die, because it's hard to defend ideas that are not yet practical. That's one of the reasons this quadrant structure is

so useful—it allows the group to see that, while the idea is not yet practical, as part of this process we can work to make it more practical.

4. Rated a 7/7: This idea is both wild and worldly, which means it is well on the way to becoming a valuable innovative idea. We can keep improving ideas in this quadrant until they reach the relatively exalted status of a 9/9.

And that is the main point of the fourth technique: to identify and/or create innovation ideas that are at least a 7/7. Once we hit this range, the excitement in the room usually rises perceptibly, because people start to see that these are not only great ideas but also easy to do—in other words, the best of both worlds.

By the end of the fourth technique we usually have the following:

- Some ideas in quadrant 1 (3/3 ideas) that are not worth pursuing
- Some ideas in quadrant 2 (3/7 ideas) that are usually not worth pursuing, although some of these ideas can occasionally be made "wilder" with some targeted brainstorming
- Some ideas in quadrant 3 (7/3 ideas) that are definitely worth pursuing and improving, so that they can move up into quadrant 4
- Some ideas in quadrant 4 (7/7 ideas, 8/8 ideas, 9/9 ideas) that are definitely worth pursuing

As we segue to the next technique, the creation of innovation projects, we pick the two best ideas to move forward in the process. However, we also make sure to capture other promising ideas from this fourth phase of the process, and use them to establish an ongoing list of innovation ideas. Any idea on this list can be brought out again at any time and either be evaluated as a potential project or, if further development is needed, improved to raise its overall score.

Innovation Technique #5: Create Innovation Projects

The fifth step is to select the two highest rated innovation ideas and convert them into innovation projects. This is the final essential technique, because for real innovation to happen it must be channeled in a way that the typical organization can engage with—a.k.a., as a project. No matter how dysfunctional or non-innovative, every organization has some mechanisms in place to execute projects, and ending up with a real project to execute is one of the reasons I think this methodology has gained traction in recent years. Once you take a potentially powerful innovation idea and ground it in the form of a project—the atomic particle of organizations—it becomes harder to avoid doing it because, after all, focusing on projects is what we do at work, right?

Let's say we're starting with a theoretical 9/9 idea, which means that the group has deemed it both extremely wild and extremely worldly. At this point the group is usually pretty excited, because people want to get right to work on an idea with so much potential. To help them continue that momentum, we developed a four-step technique for turning a brilliant 9/9 idea into a doable project:

- **Brilliant Description:** First you describe the idea as accurately and compellingly as possible in a one-page summary. This is critical, because at this point you're trying to create a kind of "conceptual tank" that can roll across the (most likely) hostile landscape of your organization and withstand all the incoming fire. A perfectly crafted summary is powerful because it reflects precise thinking, and you will need that

kind of precision to explain, defend, and evolve your basic idea as you develop your innovation project.

- **Thought Experiment:** You next write another one-pager that is positive and future focused. As much as the brilliant description is neutral and accurate, the thought experiment should be optimistic and brimming with all the good things you expect to happen as a result of your innovation project. This document is helpful in identifying additional possibilities and avenues for success, and when it's done it's useful to go back and review the brilliant description for any potential changes.
- **Threat Assessment:** This one-pager is as negative—and, frankly, paranoid—as the thought experiment is positive. This is essential because, as you move forward, different people are going to ignore, resist, and even block your idea for a variety of reasons. Suffice it to say that you must identify the people you think are going to oppose you and try to predict when they are likely to do so, and how much resistance they will put up. This document is also likely to yield insights that can help you polish and perfect your brilliant description.
- **Boss Approval:** Once you've written up these three documents, you're ready for the final part of technique #5: the boss approval. The point here is to consciously set your innovation project apart from your other projects; if you don't, your new project will likely suffer from the lack of attention, resources, etc., that most innovation work experiences. If you come in with a highly rated innovation project and your boss is really committed to innovation, you should get a resounding "Yes." If they don't, well, that's another topic entirely (and it says more about your boss than the idea itself). But assuming they say yes, you'll (finally) be in the best possible position to do some innovative work.

These are the five essential innovation techniques we developed based on insights we gained from studying 350 innovations over the course of 3.5 million years. We apply them consistently at Autodesk/SF, and in many locations around the world through the Autodesk consulting team.

APPLYING THE AUTODESK INNOVATION GENOME METHODOLOGY: CASE STUDIES

Over the past six years we've engaged with all kinds of organizations around the world. The following case studies—which include two in-depth studies and a few top-level summaries—show why and how the Autodesk Innovation Genome methodology was applied and what the results were.

Case Studies

Fluor

In March 2014, I began talking with Chris Tisdel—a fellow Autodesk innovation strategist at the time and now the founder of the innovation consulting firm Ruckus—about innovation with Fluor, a leading global engineering and construction company. Fluor expressed interest in doing something really different, in finding ways to go beyond traditional brainstorming within the company and to generate some genuine disruption. In response to this challenge, we suggested that they introduce a small group of Fluor staff to the Innovation Genome methodology; specifically, to run the group through a two-day workshop on how they could engage their customers in new and different ways.

At this two-day workshop, that handful of individuals produced hundreds of ideas that were eventually prioritized according to Fluor's perceived degree of value and ease of implementation. These prioritized ideas were further vetted, based on how much each Fluor participant was willing to invest in each idea/initiative. The Fluor participants were impressed with the results of this methodology, and suggested to their business transformation and innovation team that they adopt the Innovation Genome as a standard part of their process moving forward.

In the following months, the conversation around innovation at Fluor grew stronger, with the Innovation Genome at its heart. Fluor was planning a major innovation event they called Innovation Unwrapped, and they were curious about whether the Innovation Genome might have a part to play in the workshops at this event. Chris suggested that they give a workshop to a large, diverse group of Fluor participants to assure the business transformation and innovation group that the methodology not only would work but would be of great value in guiding Innovation Unwrapped participants to create some "big ideas." Chris facilitated this workshop successfully and was given the go-ahead to develop a weeklong workshop that would fuel the Innovation Unwrapped event.

The first annual Innovation Unwrapped event was hosted by Autodesk in its San Francisco Gallery in November 2015. Forty-nine participants were chosen from roughly 800 entries from every part of Fluor's business around the globe. Fluor also brought multiple executives to act as coaches and mentors for each team. The participants spent a week in workshops where the Innovation Genome was used, first to generate and prioritize new and different ideas, and then as a launching pad for those ideas. The teams left San Francisco after a week of workshops in which they generated hundreds of ideas, some of them very disruptive. They were given 90 days to develop their business plans, which would culminate in a "Shark Tank" type of presentation to Fluor's "C-suite."

The success of the first Innovation Unwrapped event led Fluor to do a second event in the fall of 2016, also at the Autodesk Gallery in San Francisco, with even more people. The second event was also successful in generating some potentially innovative ideas, which the Fluor teams are currently pursuing.

Hult Prize

While presenting an early version of the Innovation Genome to the Hult International School of Business in 2012, I met Saul Minkoff and Karl Teien, who were getting their MBAs at Hult. They were also in the early stages of developing their startup idea for the Hult Prize competition, a global event held jointly with the Clinton Global Initiative. It involved two thousand teams from universities across the world in a competition to found a startup around a central theme. That year the theme was to alleviate food insecurity for 20 million people living in urban slums within the next five years. Saul, Karl, and their teammates had just begun working on their idea for the competition: a startup called Pulse Savings.

They had seen the Genome presentation and thought the methodology could help them develop their startup for the competition. We prepared for the regional competition (San Francisco Bay Area/Silicon Valley) over the next few months, using the Genome methodology to innovate around every aspect of the startup, and we were excited to win that regional competition, coming in ahead of teams from Stanford, Berkeley, and MIT. From there we advanced into the finals, where six teams (out of the initial 2,000)

would present their ideas in front of President Clinton, Nobel Laureate Muhammad Yunus, and a thousand other dignitaries in New York City.

Although Pulse Savings didn't win the million-dollar prize that night, they continued their work after the competition. They raised substantial venture capital funding and built out the technology platform while working in India. This was one of the first times the Genome had been used successfully in the early stages of creating a startup, and it gave us many insights into how to make the techniques even stronger.

Case Study Summaries

- **CDM Smith:** At this Boston-based design and engineering firm, CIO David Neitz applied the five essential innovation techniques over the course of a year. That process led to a specific breakthrough innovation that played a key role in Neitz being given a 2016 leadership award by the CIO Symposium at MIT Sloan.
- **Rocketspace:** This is one of the world's leading innovation accelerators, with locations in San Francisco and London and soon more to come around the world. We've presented the Genome methodology at many Rocketspace conferences and events and taught it to their Fortune 500 clients, many of whom have applied it at their companies.
- **Real Change:** This is a company that offers learning expeditions to Silicon Valley, where they bring people and teams from around the world to learn about the latest in technology and innovation. We have presented the Genome methodology to dozens of groups—many from European and Asian governments—through Real Change, which has helped spread the methodology around the world and into the realm of government.
- **Innovation Consultants:** Leading Silicon Valley-based innovation consultants Michael Perman and Judah Pollack have both applied the Genome techniques to their clients; they have found the methodology modular enough to incorporate into their own consulting techniques. They sometimes use the techniques as they are, and sometimes tweak and revise them in interesting ways to fit the needs of particular clients.

WHAT'S NEXT?

At Autodesk we have spent the past year connecting the Autodesk Innovation Genome Project to other innovation initiatives inside the company. The result is called the Future of Making Things workshop, which is now being rolled out around the company and to our customers as a comprehensive program for helping customers envision and create their own specific future of making things.

In terms of the Genome per se, to date we have examined 350 of the 1,000 historical innovations we're ultimately planning to study, and from that dataset we've derived the five-technique methodology described in this narrative. We currently are taking a break from analyzing the historical innovations and have shifted our focus to applying and evolving the current methodology, but at some future point we are going to study the full list of one thousand great historical innovations, which I believe will lead to additional insights and techniques.

The past six years have been quite a journey for us, and with innovation becoming an increasingly important topic in the global economy, we're looking forward to the next chapter of the Autodesk Innovation Genome.